BEGIN W/ WHY:
ETHICS AND VALUES IN BEGINNING DESIGN

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In order to develop critical habits of mind that scaffold resilience and adaptability in students, we propose that beginning design education needs to be grounded in discussions of ethics and values, beginning not with questions of “how...?” but with questions of “why...?”

We are educating a generation of designers who will enter a rapidly changing and increasingly complex world in which the means and methods of making are in flux. Many of the prevailing pedagogical paradigms were shaped during the last century; in the Atelier or Bauhaus models of design education, where the why and the what of the discipline is known, it made great sense to begin with the how of skill building, as those particular skills were known to inform such expected outcomes.

In response to situations in which the outcomes are unknown, today’s curricula needs to focus on developing adaptive and agile systemic and integrative thinkers rather than focusing on disciplinary adherence and skill building.
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In 1990, scientists in Parma, Italy, observed what has come to be known as the mirror neuron light-up an MRI being used to observe the brain of a Macaque monkey. This well-documented episode about the accidental discoveries in laboratories that influence next generations of research has become, for some of us anyway, a pivotal moment in understanding the ways we respond to the world around us.

Observing our empathic responses, whether in a laboratory or in the course of our daily lives invites some questions: can we hone our skills of observing the world in ways that can elicit enhanced empathic responses? If we understand more about the conditions and forces that are imposed on the diversity of life around us, might our capacity to experience empathy toward all forms of life expand?

As we explore these questions another threshold of questions opens: with a well-developed empathy muscle, do our sharpened responses inform a more ethical way of making choices as designers? Will our choices of materials, tools, suppliers, waste management and the user experience be filtered in ways that inform our expectations to do no harm in the world? Can we hone the empathy muscle in ourselves and our students so that our creative responses align elegance and ethics?

Stephen Goldsmith, an associate professor in the College of Architecture at the University of Utah, will initiate a conversation about honing the empathic response as a learnable skillset that informs our students’ sense of ethics.

As an artist, craftsman, founder of a non-profit community development organization creating affordable housing and workspace, and as an educator coordinating the urban ecology degree in our college, Stephen’s experience in honing the empathic responses of his students may provide some insight into new ways of expanding the early design students’ skills. Citing examples born from the heuristic knowledge experience offers, Stephen’s presentation will explore ways to hone the empathy muscle as our students come to understand their complex relationships with the family of things.
CONFERENCE PAPERS
Disembodied Circle: A Twelve Step Manual
Brian Ambroziak, Camille Lane and Macy McCarty, University of Tennessee, Knoxville

The objective is to represent an architectural idea at one-to-one scale. This is the architectural act in a compressed form... It is right that somewhere early in students’ education they come into contact not only with the conception of an object but the enormous and joyful responsibility for realizing it as well.¹

Tod Williams, “OBJECT” from Education of an Architect

The exercise entitled Disembodied Circle is part of a one-hundred level course entitled Visual Design Theory. The problem allows young designers to engage a highly personal three-dimensional space, one that makes the often more abstract processes of the design studio more tangible. The exercise provides a forum in which to examine the consequences of various physical conditions and question fundamental design decisions related to scale and site as well as appreciate various phenomenological determinants of place. The magic of this exercise lies in its absolute simplicity, its ability to emphasize how subtle shifts in dimension can profoundly affect one’s psychological reading of a space. In a relatively short period, students undergo a wonderful transformation from an interstitial state, that of the wall, to an external and then internal realization of an archetypal condition – the inscribed circle.

In describing the various architectural realities made possible by methods of re-presentation, the architect John Hejduk writes in his essay The Flatness of Depth, “Architecture can be observed both from a distance and internally (close-up); we can become internally ingested by it, become part of its interior. Instead of just being an outside observer or an outside spectator, we can become part of its very interior organism. We become physical-organic participants; we become enclosed. Architecture is the only art form that affords us the opportunity of being voyeurs who watch from the outside from the outside and also of being interior watchers.”² While Hejduk’s essay acknowledges the unique ability of architecture to be inhabited, he devotes only a single paragraph to the constructed reality of architecture. For obvious reasons, such as cost and time, the one-to-one reality of architecture is seldom confronted in schools of architecture. The exercise Disembodied Circle is important precisely because it allows for an engagement with the external (the physical) and the internal (the psychological) complexities of design.

But the exercise also goes one step further by not merely considering the external-internal condition as a mere threshold, a thing that may be passed through in a single gesture. In The Sphere and the Labyrinth, Tafuri states, “The collegio... constitutes a giant question mark on the meaning of architectural composition: the ‘clarity’ of the planimetric choice is subtly eroded by the process with which the various parts engage in mutual dialogue; the single space secretly undermines the laws to which it pretends to subject itself.”³ In the Disembodied Circle exercise, the idealized form of the circle creates an artificial stability and requires a new dialogue between the physical participants. This conversation acknowledges real space and time and most eloquently the reciprocal agreement forged between various participants to accept a simultaneous process of making and being. “Simmel... recognizes this in his Metaphysics of Death: ‘The secret of form lies in the fact that it is a boundary; it is the thing itself and at the same time the cessation of the thing, the circumscribed territory in which the Being and the No-longer-being of the thing are one and the same.’”⁴ By engaging the student and requiring them to serve both as voyeur as well as form itself, this exercise adds even greater complexity to Simmel’s study of boundary. Ultimately, the exercise aspires to maximum simplicity and incorporates experience as a dynamic component separate from traditional visual tactics of the design studio and unique to the perception of space. The following pages serve as a field manual to this “twelve-step” strategy for spatial perception.
STEP 01

Gather twenty to thirty beginning design students, find a relatively flat grassy field on campus, and compose yourselves at arms length into what you consider to be an ideal circle.

...
**STEP 03**

Once a perfectly smooth circumference has been achieved, begin walking clockwise — leg over leg — watching the center and attempting to appreciate the quality of the circle that you form. These movements create an almost centrifugal force that reinforces the circle’s fundamental attribute.

...

**STEP 04**

After one full rotation, proceed counter clockwise while again absorbing the circle that you form.

...
STEP 05
Take two large steps back with arms still outstretched but not touching.

...
**STEP 07**

Return to your original position and take two small steps toward the center. Notice the intimate nature of this new condition - this is a space for whispering.

...
**STEP 09**

Remove your shoes and while standing directly behind the take two steps back.

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**STEP 10**

You are now looking at a disembodied circle. The form that you were once part of has been purged from your body as the wall has been transformed from an interior reality to an exterior condition. This newly created planemic territory now exists as an outer boundary or a barrier. Through a series of primitive operations, the participant has experienced something much more profound than mere passage from interior to exterior.
STEP 11

Take several steps forward such that you are inside the ring of shoes. At this point you come to understand the verticality of the inscribed circle as you look skyward.

...
Notes


2 The exercise was first conducted in 2009 with Ben Nicholson while on his campus visit to lecture on and exhibit his project entitled *Labyrinths*.


5 Ibid., 5.
Introduction

A critical site documentation process is necessary for beginning designers to answer the question, why here? Traditional forms of site documentation lack the depth to reconstruct a site from its thickest, deepest layers. A basic site plan or figure ground drawing tells a very small part of the story and is often an act of replicating the known, specific locations of buildings and the blank ground that they rest upon. These single layered representations lack the nuance of place—culture, history, materiality, ecology—and many other unseen forces within site. As a result, these forces are illegible at first glance and often ignored by the beginning design student.

Revealing the potential (and power) of place, from big-picture context to the tactility of its materiality, is critical to projecting an appropriate architectural fit. The process of mapping (or site indexing) as the vehicle for perennial site discovery allows students to read a site (and all of its qualitative conditions) through multiple lenses and filters. As an analytic process, mapping forces students to actively connect the dots, linking place to ecology, ecology to history, history to physical infrastructure and so on. It allows students to construct and champion their own site narratives—informed by seeing and shaped through discovery.

And subsequently, the act of representing their constructed site narratives, a choreographed dance between permanent and temporary agents acting on a site, challenges the beginning design student to navigate and map relationships between analog processes (i.e. the act of marking) and digital compilations (i.e. the act of compressing and layering). This coupling allows for newly-found opportunities for communicating complexity of place in simple terms or revealing the seemingly simple place in complex terms. It requires students to engage time on a different scale and magnitude—realizing the weight and presence of the physical while trying to make sense out of the phenomenal.

This paper presents several mapping processes and techniques that utilize the acts of observing, plotting, surveying, tracing, rubbing, layering and storytelling to ensure productive and effective site sleuthing. The site mappings shown are iterative and scaled across studio years; some as a catalyst of design process others within a broader context. As students are introduced to an array of site documentation and mapping methods at the earliest stages of architectural education, the value of place and the role of narrative are embedded within their design process.

Siteless

The “site” for the work discussed in this paper is Drexel University, in Philadelphia, Pennsylvania. Drexel’s Architecture program has two tracks, one of which is structured with two years of full-time study and four-years of part-time coursework. In this model, Drexel undergraduate students have two “typical” undergraduate years and for the remaining four years, work full-time in a firm during the day and attend classes at night. This brief description of the program is important context in our proposal that mapping is not simply a method of documentation or a visual typology but rather a way of thinking that holds academic and professional value. Because of Drexel’s unique curricular structure, the beginning years of the 2+4 architecture program require an acceleration of skill and more critically, a deep embedding of design processes and values within each student.

Students “leave the nest” after year two and while the studio courses remain, the students themselves are transitory. They are in a sense siteless, they are without their own studio desk, a traditional studio culture and
have far less collective intelligence to draw from their peers as they develop their design projects largely on their own. On the flip side, they are generally working 40 hours a week in a design firm and gain many professional skills not typically afforded to an undergraduate student. This unique structure succeeds with pedagogy that supports curiosity (and in turn self-motivation), rigor, and connection to its rich urban context. We will present student mapping work from across the curriculum and define the possible levels at which mapping could operate in design education.

Problem-Seeking

“Each time a landscape project begins there should follow an extended period in which one may simply discover what already exists, most of which will not be obvious or quickly ascertained. The introduction to a site project has all too often been reduced to systematic and quantitative formulas for analyzing site from a distance. By contrast, trace concepts [landing, grounding, finding, founding] enables designers to come to grips with their intuitions and experiences of place, allowing these impressions to direct the unfolding of the project.” -Christophe Girot

The ability to problem-solve casts a wide net over a design education’s outcomes and values, but how we get there varies greatly. We would like to assume that site is a constant in beginning design education, but know that many perennial design exercises in the foundation years are siteless and tend toward formal compositional exercises. Important in their own right, still, problem-solving without place.

Mapping, not as a singular technique but as a process, is accessible to students at any level and encourages a student’s curiosity about place alongside their eagerness to design. Exercises geared towards defining and documenting the unseen allow each student to uncover what’s (not) there through their own lens and develop a unique position on the project before the formal design process begins. This process instills the value of place in design, asserting that Architecture doesn’t make place but Place makes architecture.

Mapping the Curriculum

Grounded

In the foundation studio at Drexel, students are introduced to site progressively—in scale, type and complexity. In a series of five projects across their first year, the conditions of “site” evolve from the following: siteless, constructed, precedent-as-site, urban infill, and water’s edge. The last two projects of the first year directly apply mapping thinking and technique for the development of a site narrative and become a driver for the designs to follow.

The tactile nature of a site is sometimes the hardest to access or easiest to overlook. A site can be observed from anywhere, even remotely, but the activity, artifacts, seasonality and other subtleties are not accounted for. More importantly, a student’s perception and translation of those conditions are often muted and as a result, the site is generalized. Two projects, taught in the first year, employ observation and experience to stave off this generalization of site.

Fig. 1 Photograph Mapping of Found Decay Processes along Lancaster Avenue

The Urban Observatory project asks students to walk several blocks of Lancaster Avenue, a historic urban artery in Philadelphia that pierces Drexel’s campus. First, through photography, students look through their own lens and develop photo-mappings that convey their reading of the site. (Fig. 1, 2) Photo mapping helps students curate a position on the site, edit out information, and develop a familiarity with the qualitative. In conjunction with their individual site photo-mapping, students also developed a group map to notate their collection of seen and unseen qualities of the site.
The observatories individually designed by students were developed in tandem with the group map, generating not only a deeper connection of their own perception of site but a more inclusive understanding of their classmates varying views of it as well.

The second project to incorporate mapping and the last in the first year studio sequence is a boathouse on the Schuylkill River. While still within Philadelphia city limits, the boathouse site is wildly different from Lancaster Avenue—warranting a new approach to mapping. Armed with flags, string, I-level apps, and their own pacing as a unit of measure, 200’ of shoreline was surveyed. This collective effort kicks off the semester and the project. Working in teams, students develop a single map that records their survey of topography, trees and site activity. This mapping process had a stringent set of rules, only one team member could work on the map at a time, team members had to record their time in/time out while working on the map and also post their progress to the mapping blog. This time intensive and methodical process required students to layer their survey—mediating quantitative information and qualitative reading. The map was intended to be a living document, messy, and open to interpretation by the next student. (Fig. 3)

This particular mapping exercise commanded nearly half the time allotted for the project, running simultaneously with the student’s individual design process. The process of creating these drawings armed students with a deep understanding of the reality of the site. They developed their own projects with quantitative information that could only be collected accurately on site; subtle grade changes, tree heights and canopy diameters; balanced with their qualitative readings, ranging from the worn nature of the ground to the interweaving of activity on the margins of the site. The translation of these observations infers where they intervene and justify why. A new tactile understanding of section, evolves from a simple dark line below the building to an integral part of the design that carries meaning and an individual understanding of place.

The Rowhouse design problem is a mainstay of architectural education in Philadelphia. There are many constraints at play in the rowhouse, but not many variables. The rowhouse as an infill typology is limited to a 14-16’ in width and a 40’-60’ in length, and at a typical height of three stories it stitches itself into the streetscape. This design problem can be technically tricky for students, packing the program of a single-family home into an urban shoebox turned on end (not to mention wrestling with neighboring elevations in the hope of blending together the rowhomes on either side). As a fall-term project in the second year studio, this in and of itself is a tall order and is very tightly prescribed.

To test the limits of these constraints and the way in which students viewed the project year after year, we integrated mapping strategies early. This particular cohort had already developed projects through site mapping which made it an excellent opportunity to test a traditional project through a new lens. It was an opportunity to re-condition the rowhouse and test the possible outcomes from mapping qualitative conditions in the area surrounding the site.
Initially students chose a ritual of dwelling: cooking, eating, cleaning, reading, exercising, etc. These rituals were studied in detail (outside of the program of the rowhouse) and became the filter by which students would view the site and their house.

Two site visits followed, the first, a fact-finding mission. In-class, students took stock of the physical conditions of the neighborhood, scale, materiality, use/program, vacancy, etc. Which materials were most commonly used, what height were the stoops, how wide are the sidewalks, are there corner stores? The documentation to follow was photography based, once students had their collection of notes and photographs they were tasked with curating them into their own site zine. The zine format was chosen so they could be easily reproduced and distributed, one to each of their classmates, amassing a collective cross-section of the site conditions.

Sharing these among the class generated dialogue that filtered out commonalities, debunked pre-conceptions and set a baseline for the individual site visits to follow. In these second (third or fourth) visits students mapped qualities that may affect their dwelling ritual; sound, view, enclosure, smells, etc. Each student defined this quality on their own and mapped its location or intensity on the site. Yet, with only one quality mapped, little information could be revealed, students uploaded and shared their qualitative mappings as digital layers—the studio could pull from these layers and composite them to test relationships in those layers that highlight their own filter or reveal unforeseen overlaps with their classmates.

With a catalog of site layers to compare, students relied on filtering conditions of the site applicable to their program and ritual. Forcing them to ask, “Which conditions does the architecture choose to accept and which does it deflect?”. The effect of mapping on this particular project made the site omnidirectional; mapping encouraged the folding site of conditions into the space on all three faces of the rowhouse.

Systemic

Transitioning and balancing their daily professional life alongside their part-time evening academics, students enrolled in upper level design studios find themselves embedded within the urban, sub-urban or rural contexts of Philadelphia and its region. Their daily commuting regimen from home to work to campus and then back home again for four intense years enables Drexel’s design students to witness and participate in an evolving urban landscape - but perhaps more importantly, provides them with time to develop an in-depth familiarity of how city and landscape systems intimately relate to one another.

It should not be any surprise that upper level design studio problems engage the city and its surrounding landscapes as a living laboratory for investigative analysis, mapping and test-fitting. The design problems have varying degrees of building programs and site scales - ranging from a contemporary monastery situated within Philadelphia’s Fairmount Park System to incubator office space inserted within the vibrant Center City District to post-industrial residential development along the
waterfront of the Delaware River, yet all strive to meet the upper level curricular objective of providing students with diversified methods and representational strategies for decoding the temporal and the permanent layers of place.

For example, in the third year studio sequence, students are asked to initially read (and reconstruct) their site as a composition of systems extruded in layers. (Fig. 6) This reading of a site provides students with the understanding that site is structural. It is fundamentally comprised of a series of dynamic relationships that exist between man-made, constructed (or Anthropocene) layers - transit, stormwater, building, utility infrastructures - superimposed onto the physical structure of landscape systems - geology, soils, hydrology, and native flora.

Concurrent to their systemic reading, students are instructed to develop an experiential narrative situated on-site that projects how the existing perceptual qualities embodied within the physical site can inform the appropriate design response on the site. (Fig. 7) In other words, students are simultaneously working between both quantitative and qualitative site readings - and being forced to understand how the interaction between two or three structural site systems (and their resulting ecological processes) are directly translated into the spatial and tactile experience. Working in-between the qualitative and the quantitative allows students to discover Why and How hidden driving forces embedded deep within the site relate to and impact perception-based, surficial field observations.

However, when urban sites are selected for third and fourth year design studios and design charrettes, students are challenged with revealing the layers of constructed palimpsest that has all but erased the visibility of existing natural systems within urban settings. Here, students are confronted with trying to answer Why and When the context of the site transformed itself and How can they provide voice to invisible natural systems and respect the memory of prior histories and cultural conditions.

In these situations, students are asked to consider the dimension of time (as it relates to revealing changes within physical systems and cultural systems or behaviors) as an additional layer that activates their site research and mapping process. In contrast to extruding and isolating individual structural system layers, students instead resort to coupling specific layer interactions (i.e. urban grid and hydrology systems) in order to focus on specific points of shared overlap or isolated difference between selected system layers. (Fig. 8) The resultant mapping process often yields a rich layering of information that allows for the identification of specific areas of interest within a greater site context and further articulates a visual
Citing Site

narrative of the site’s history through compressed and collaged imagery. Additionally, these exercises provide students with greater facility to navigate research and resource materials as well as greater awareness and respect for the importance of history in the context of interpreting and reading a site.

Fig. 8 Student Mapping of Urban Grid Transformation along the Schuylkill River through time

Expanded

At the end of their undergraduate studies, students embark on individual thesis investigations. Their exposure to a vast array of site scales, documentation techniques, methods, and perspectives equip them with a unique skill set to produce an authentic reading of place and establish layered values embedded deep within a site. Furthermore, the continuous re-introduction and re-iteration of site mapping as a design catalyst to generate architectural form, programming, and project cadence - across many varying site types and conditions - has proven to students that sites are indeed alive. They are composed of competing forces and contradictory histories and cannot be fully understood solely from any one perspective - and they change - constantly - from morning to evening, from winter to spring, from one election cycle to the next. The seasoned design student no longer questions “Why should we map?” but instead critiques the appropriate pairing of mapping technique and forecasted outcome.

Over time, students self-propel their genuine interest and inquiry into specific site conditions - transforming into an expert of a particular system or ecological interaction and expanding their knowledge base and abilities to navigate data-rich resources and archives. Their mappings begin to not only demonstrate their thoughtfulness and nuanced sensitivity to site but express an expanded development and interpretation of site. In the physical sense, student site mappings begin to tackle an expanded scale of influence and scope- challenging the traditional boundaries that define site. For example, a student focusing on a particular site layer, such as hydrology, soon realizes that to fully understand hydrology and waterways, an expanded investigation into the natural systems - specifically, geology, topography and soils - is integral to uncover the narrative of hydrological systems. Additionally, to further articulate the important role that hydrology plays in pre- and post-industrial cities, students must further expand their research and active mapping process to uncover and make clear the specific relationships between natural systems and man-made systems, such as waterways, topography, railways, transit infrastructure and industrial development. (Fig. 9)

While expanded research and mapping often happens over the course of the design problem (in contrast to an isolated block of time dedicated to site analysis within the design process), the resulting expanded site mapping can provide simultaneous readings of a place, acting as a visual history archive and personal site diary - as sectional figure-ground and soil X-ray - as photographic journal and contaminated “hot spot” guide. But, perhaps most importantly, the site mapping enables students to both situate and position their architectural design responses in relationship to time, history and event - acknowledging that their design responses registered within the site

Fig. 9 Student Mapping of Regional Post-Industrial Site
today are equally susceptible to the shifting systemic forces of tomorrow.

Moving Forward

“As a creative practice, mapping precipitates its most productive effects through a finding that is also a founding; its agency lies in neither reproduction nor imposition but rather in uncovering realities previously unseen or unimagined, even across seemingly exhausted grounds. Thus, mapping unfolds potential; it remakes territory over and over again, each time with new and diverse consequences.” -James Corner

Documenting these mapping processes across the curriculum has revealed their potential to affect the outcomes of an architectural education. Making time and space for mapping in studio coursework can provide a meaningful entry point into the design process and the making of architecture. It encourages thinking through site in beginning design that becomes integral to a student’s design process. This folding in approach exposes beginning design students to honest realities and equips them with an artillery of options to investigate.

This exposure to the complexities of site has the potential to humble and confound a young designer - their new definition of site greatly exceeds the limits of fixed, bound property lines and has the potential to be influenced by larger landscapes of politics, economics, histories, myths, narratives, etc. Asking “why here?” begins the conversation; equipping students with the tools to answer the question sparks genuine inquiry for understanding what defines Place.

Moving forward - the advancement of mobile software technology provides students with a dynamic set of mapping resources that have the capability of both tracing personal trajectories within space and measuring the physical (and phenomenal) realm by means of complex algorithms and outputs. App-ing unleashes a new potential within the mapping process by producing a landscape of new data, metrics, and information related to a specific point - a GPS coordinate - in space and time.

Access to this ever-growing wealth of data in the palm of the hand is an immense asset to the design process, connecting designers with user needs, municipal interests, opportunities for environmental revitalization, and more. However, it also poses an extreme challenge, demanding pointed analytical thinking to synthesize and effectively apply this information. The process of mapping provides students the tools with which to agilely navigate this data-driven world, selectively filtering the most relevant information to guide their design decision-making process.

Additionally, we must not lose sight of the physicality of architecture, urban space, landscape, human beings and the role that designers play in the construction, realization and sustainability of personal interactions in real space and in real places. The critical thinking that comes from working with the tactile nature of the environment, thinking through hand sketch and experiencing first-hand the built environment that we live in is as important (and arguably more so) than solely relying on the metrics of its daily performance produced by an app.

Utilizing mapping as a process for reading (and re-reading) the environments that students will be operating and intervening within exposes the beginning design student to the complexities and site artifacts created from ecological and economic interactions through time. And it is from this discovery and the process of citing site that strengthens and deepens the connection between design student and the environment or site - ultimately contributing to the shaping of individual (and authentic) design thinking while producing stewards of our built environment.

Notes


FOUND IN TRANSLATION: The Importance of Curiosity, Context and Creativity in the Beginning Design Studio

Nikole Bouchard, University of Wisconsin–Milwaukee

New Ways of Seeing the World

*Found in Translation* is the very first design studio of the 3-year Master of Architecture graduate curriculum. The pedagogical approach to this formative course synthesizes familiar and unfamiliar, cultural, spatial and technical approaches to design by linking common issues across multiple scales of architectural experimentation. Every exploration has media strategies embedded within the project structure to ensure that incoming graduate Students, with no architectural design background, are simultaneously learning how to think critically, how to develop productive design processes and how to represent architectural concepts via a wide array of 2D and 3D, analog and digital techniques. This Beginning Design Studio consists of five architectural explorations that build upon one another over the course of the semester. Every exploration in the design studio celebrates and demonstrates the significance of **curiosity, context, creativity and innovation** in the design process.

Curiosity

One of the persistent goals in this design studio is for Students to develop an expertise in finding the unfamiliar in the familiar and to renew each subject and object that they encounter through a process of critical discovery and speculative disclosure. The path toward this disclosure is as fresh and informative as the results; it is an act of interrogation, discovery, representation and explanation.

To begin, Students select an Artifact that mediates between the body and the environment. Next, they analyze the Artifact with extreme curiosity. Employing orthographic projection techniques, Students produce comprehensive graphic descriptions of the Artifact that render the unknown visible.

Using curiosity as a driver, Students graphically answer questions regarding the Artifact’s physical, material, tectonic and performative qualities. From there, Students further examine the Artifact through a process of critical dissection and transformation in the form of abstract compositions. In these acts of discovery, curiosity is key as it enables Students to break free of their preconceived notions and enter the exciting world of innovation.

Context

Using their Artifact insights, Students speculate on the contextual conditions in which the Artifact might be logically sited. These context considerations are informed by the curious discoveries made in analyzing the Artifact. The site conditions are thought of as an extension, or opposition, of the Artifact’s characteristics. With this in mind, Students construct a Receptacle that both houses the Artifact and mediates between the Artifact and the selected context. In effect, the Receptacle requires fluid translation between 2D and 3D design and demands an insightful reaction to a specific situation.

Creativity & Innovation

These curious acts of discovery and insightful considerations of context are key components that lead to creative and innovative design. This liberating approach to the design process enables Beginning Design Students to break free of their preconceptions and step into exciting, unfamiliar territory. For the final intervention of the course, Students are asked to design a Kunstkammer Sanctum for a curious client with an Artifact festish. The previously developed architectural concepts provide the lens through which all Kunstkammer Sanctum design decisions are made. The combination of curious inquiry, keen context observations and creative transformations results
in imaginative and innovative beginning design.

**PROJECT 01: Body Armor**

Students begin the first semester of their graduate education with a week-long “warm-up” exploration that immediately asks them to demonstrate curiosity, challenge preconceived notions of context and exercise creativity.

In German the word for dress, gewand, includes the word for wall, wand, implying the close relationship between the cover of the human body through a dress and the enclosure of a building. In this way a dress can be seen as both clothing and architecture.

In **PROJECT 01: Body Armor** Students design and fabricate a structure that wraps and encloses a selected portion of their body. Students construct this *Body Armor* with a series of materials that are unconventional for the production of a typical textile. The *Body Armor* is not seen as clothing, but as a volume and form that envelops and responds to their body, in other words, the context. From there, Students study the *Body Armor*’s qualities as a scaleless object through a series of photographs and measured, hand-made drawings.

*Translation, Exploration & Documentation*

The goal of **PROJECT 01: Body Armor** is to translate a formal idea into a series of material operations. Students learn to abstract an object focusing on its formal and spatial qualities. Simultaneously, they learn to carefully consider and conceptualize the relationship between the individual parts of an overall form and its expression as a united whole.

Sketches, study models, full-scale prototypes, measured drawings and photographic documentation are the ways Students establish an iterative design process and explore the form, space and movement of the Artifact they’ve produced. Students carefully consider repetition, difference and sequence as well as the spatial characteristics of their constructions.

*Modeling, Drawing & Photographing*

![](image-url)
Students fabricate their Body Armor using two materials from a given list. Creativity, precision, craft and intensity with which Students interrogate the material is paramount.

Most Students in the first design studio of the Master of Architecture program have little-to-no experience with and exposure to architectural thinking and making. This “warm-up” exercise asks Students to immediately begin working with materials like basswood, cardboard, museum board, newspaper, envelopes, vellum, trace paper, backer rod and connectors like paper clips, zip ties, safety pins, round head fasteners, thread and gromets. Students select a spatial verb to work with like bend, branch, bundle, fold, interlock, knot, nest, peel, shear and wrap to experiment with creative ways to manipulate materials that are relatively new to them. These curious explorations are then sited on their body, where they are asked to refine the architectural forms to respond and react to this newfound context.

**PROJECT 02a: Artifact Analysis & Abstraction – Subject and Measure**

A persistent goal of this Beginning Design Studio is for Students to develop an expertise in uncovering the unfamiliar in the familiar and to renew each subject and object that he/she encounters through a process of critical discovery and speculative disclosure. The path toward this disclosure must remain as fresh and informative as the results; it should be an act of interrogation, discovery, representation and explanation. This process involves numerous transpositions of scale, object, solid, void, texture and media.

In **PROJECT 02: Artifact Analysis + Abstraction** Students select an Artifact, essentially a type of “Body Armor”, that mediates between a human body and some external force such as a projectile, another body or the environment. Students are asked to assume that they have never seen this subject before, or anything quite like it. The objective in this first sequence of problems is to produce a graphic description of the Artifact by exercising extreme curiosity. Students are to fully represent the Artifact and all of its parts via a thorough set of at least four constructed plans, elevations and serial sections that are drawn with graphite at precisely 1:1 and composed elegantly on opaque paper. Emphasis is put on using a variety of line weights and line types and maintaining any and all construction, regulating, referential and iterative markings.

**Measurement & Construction of Drawings**

The establishment of a system by which the Artifact can be measured is essential to the recording of the object. First, Students determine an increment of measurement; a logical unit based on their analysis of the Artifact. For example the thickness of material, the dimension between center lines, the increment between repetitive features - Any of these might suggest a unit with which Students can both measure the Artifact and construct drawings of it. The initial set of drawings are freehand sketches, followed by a second set that is constructed. Students devise organizational rules for their drawings - Rules that emerge from the curious analysis of the primitive. Regulating lines, referential systems, iterative markings and so on help ground the drawings in the context of the page. These compositions are seen as an archeological site where layers of information are superimposed so as to allow, within the same drawing, multiple indices or references to the characteristics of the original Artifact.

**The Importance of Asking Great Questions in the Beginning Design Studio**

Good Designers exhibit the ability to ask great questions within a given context and the skills to find creative answers to these inventive inquiries. **PROJECT 02: Artifact Analysis + Abstraction** is the first of many moments throughout this semester-long design studio where Students are trained to ask great questions, and ultimately, to find creative answers. Initial questions refer to the Artifact’s physical properties. For instance, what are the Artifact’s primary volumes and geometries and is there an established formal hierarchy? What are the part-to-whole relationships and what are the proportions of these components? From there, Students dive deeper into questioning the material conditions of the Artifact, like is the object made of more than one material, and if so, how do these materials connect with or bypass each other? Do these materials transform in shape, hardness and texture across the Artifact? These inquiries directly relate to questions regarding the construction of the Artifact. Is it made of one piece or many separate pieces? If many separate pieces, how are the components connected? Are they cast or are they molded and is the construction process additive or subtractive? From there, Students move from questioning the Artifact’s formal attributes
to exploring its functional qualities. How might the Artifact transform from a static position to an animate one and what is its range of motion? What dynamic forces are built into it and how are these forces made visible and/or invisible? What might the Artifact do and how might it interact with a body?
These types of questions are simply a launching pad to catapult Beginning Design Students into the World of curious inquiry. Throughout the entire semester Students are trained time and time again to ask critical questions and find inventive answers in every step of the design process.

**PROJECT 02b: Artifact Analysis & Abstraction – Critical Dissection**

In the next phase, Students further examine their Artifact through a process of critical dissection and transformation. The key term here is “critical.” In other words, the detailed examination of the Artifact must proceed with a careful awareness of its organization, of its construction, of its functions, of its formal structures, and with an anticipation of its deeper order. The point is not to indiscriminately divide the subject into a vast number of parts, nor to eradicate any sense of its origin, but to expose its modes and methods of fabrication, of conforming to a body and of performing a task. In other words, Students transform an intensely 3-dimensional subject into a series of 2-dimensional compositions that communicate the essence of the Artifact.

**Critical Transformation**

Students construct a series of *at least* three abstract compositions using the same rules and techniques that they developed in *PROJECT 02a*. Students must carefully consider the disposition of elements as well as their techniques of representation so as to adequately demonstrate the concept of their dissection, the taxonomy of the components and the components’ relationships to the original Artifact. Students use a combination of two spatial verbs for each abstract composition that they produce. The verb selections must relate to the discoveries that the Students have made about the inherent qualities of their Artifact.

**Analog, Digital and All of the Above**

In the spirit of experimentation, Students may create these abstract compositions by hand and/or with computer software. For hand compositions, Students consider using re-scaled photocopies and trace paper overlays of their *PROJECT 02a* drawings to dissect and transform. For digital abstract compositions, Students scan and/or photograph their *PROJECT 02a* drawings to re-draw selected portions of them using AutoCad or Rhinoceros. Dissections and transformations may be done with Photoshop, Illustrator, AutoCad and/or Rhinoceros.

**Reiterating the Importance of Asking Great Questions in the Beginning Design Studio**

Once again Students are bombarded with a flood of incredibly important questions to ask, beginning with the most obvious, “What have you discovered about your Artifact?” From there Students consider how the answer to this question will inform their strategy for dissecting and transforming their Artifact to produce creative design explorations. Students are expected to question whether their Artifact’s components remain intact or become autonomous and likewise, does each component become itself segmented and dissected? How might the abstract composition result in a taxonomy of components that are classified, organized, displayed and ultimately transformed? What might the logic of this dissection and transformation be and how will it support an architectural concept? How will the drawing process and line types reiterate these ideas? Are lines hard or soft, flexible or stiff, outlined or infilled?

Students are encouraged to ask these types of questions consistently throughout the entire design process. As a result, they are trained, from the very beginning, to be curious and inquisitive designers constantly in search of critical information that in turn informs creative design ideas.

**PROJECT 02c: Artifact Analysis & Abstraction – Constructing, Selecting and Injecting the Site**

In the final phase of *PROJECT 02* Students begin to speculate on the generic conditions of a context in which their Artifact might be ‘logically’ sited. To do so might suggest a specific relationship to gravity, as in *grabbing*, *hanging*, *elevating*, etc. Or a specific programmatic operation, as in *opening*, *revealing*, *concealing*, *protecting*, etc.

These considerations of site are to be informed by the discoveries that Students have made in analyzing their Artifact and the speculations they have made relative to its provenance. The conditions of site can be thought of as an extension of the characteristics of the Artifact or a site that might resist those characteristics. Understanding site, or context, through this lens quickly breaks any preconceived notions that Beginning Design
Students might have relative to the notion of site and context.
Once Students have identified the characteristics of their site, they select a specific location within the School of Architecture & Urban Planning building where these contextual conditions exist. Next, the task is to construct a Receptacle that can both house the Artifact and that can mediate between the Artifact and the selected site. Receptacle designs begin by being based off of the PROJECT 02b abstract compositions. This is an exercise in going from 3D to 2D, then back to 3D. Material selections are informed by the Artifact’s physical components. For instance, is the Artifact layered, cast, sculpted, bolted, etc?

The Receptacle design is to expand on the Artifact’s material, programmatic and operational characteristics – Observations that were made in PROJECT 02a and PROJECT 02b. The Receptacle must also operate as the structural armature with which the Artifact is to be attached, suspended, inlaid, etc. The ambition is for the site to be reconsidered within the framework that the Students have constructed for the Artifact. The Receptacle interface will produce a reading of the site that was previously impossible. The final Receptacles are made of architectural materials like wood, metal, rockite, plaster and acrylic.

PROJECT 02: Artifact Analysis + Abstraction demonstrates a design process that teaches Beginning Design Students to exercise their curiosity through the critical analysis of an Artifact, to consider existing conditions of a given context and to develop creative and conceptually rigorous design interventions using architectural methods and materials.

PROJECT 03: Found Ground Site Construction

Next, Students produce a comprehensive set of photographic explorations of the sited Receptacle. Using selected and/or isolated portions of these photographs Students once again use the process of transformation to construct at least three digital collages, each expressing a distinctly different landscape condition. For instance, smooth-scape, step-scape, crater-scape, hill-scape, cape-scape, cliff-scape, etc. From there, Students translate these 2-dimensional, digital collages into 3-dimensional, physical models that convey curious and creative landscape scenarios. Students are encouraged, but not required, to experiment with the CNC mill, 3D printer, laser cutter and woodshop tools in the development of their landscape surface, stereotomy and structure models. As in PROJECT 02, Students are asked to experiment with architectural materials such as wood, rockite, plaster, metal, cork, canvas and plastic in an attempt to familiarize them with the art and craft of building.

PROJECT 04: Apparatus for an Artifact Obsession

In PROJECT 04: Apparatus Students use the spatial, material and construction knowledge that they’ve gained from PROJECT 02c: The Receptacle to address their curious Client’s Artifact obsession. To begin, each Student is asked to create a unique and specific Client narrative that is based on their Artifact discoveries. The task is to design an Artifact Apparatus that’s roughly scaled within a +/-12’x12’x12’ volume and sited within the context of one of their three manufactured landscapes from PROJECT 03: Found Ground.

Students construct an Apparatus that has a specific relationship to both the Artifact (and similar Artifacts of various scales) and their Client’s body. The Artifact Apparatus must accommodate their Client’s body movement according to a specific, selected activity and provide opportunities to reveal, conceal, collect and protect their Client’s precious assortment of Artifacts. As in PROJECT 02c: The Receptacle, the final Apparatus must be constructed of architectural materials like wood, rockite, metal, textiles, etc. The intention is to interrogate the formal and structural boundaries of each material selection relative to the fabrication methods and the technologies that are available.

Radical Reconfiguration

First, Students reflect on their models, drawings and photographs from PROJECT 02c: The Receptacle. They are asked to consider if there is a potential logic to the transformation and re-organization at the scale of an Artifact Apparatus? And how might these raw materials be manipulated, re-structured and transformed to produce an Artifact Apparatus that accommodates the curious Client’s Artifact collection and body? The task is to translate form, space, structure and material across multiple scales in a synthesized and sophisticated manner. Major consideration and emphasis is placed on the design of spatial, structural and material hierarchy. Students are challenged to develop a systematic method of support. How might the Apparatus structure
Fig. 4 Found Ground photo collages by graduate students Jack Grover, Tia Milkova, Patrick Osowski and Tyler Weis. reinforce and amplify the design’s formal, spatial, material and
functional attributes? Additionally, Students are asked to develop an overriding system that effectively contains and/or supports the structure, and that mediates between the Apparatus and the Environment, or context.

Selecting an Activity for the Curious Client

In The Human Figure in Motion (1887-1901) Edweard Muybridge focuses mainly on domestic activities like, “for men, ‘walking upstairs or downstairs,’ ‘lifting log,’ ‘digging with spade,’ ‘pushing lawn roller’; and for women, ‘walking up incline carrying two buckets,’ ‘picking up towels or brooms,’ ‘pouring water from jug,’ ‘standing and ironing,’ ‘spanking children,’ or ‘falling onto mattress’. Clearly these activities are dated, not to mention sexist! To begin PROJECT 04: Apparatus, Students are asked to select an activity from the following list: sleeping, washing, cooking, eating, working, collecting, displaying and admiring. The Artifact Apparatus design must directly respond to this activity and be finely tailored to the Client’s Artifacts and body movements.

Once Again, in the Spirit of Curious and Creative Inquiry

To no surprise, Students begin the design process once again by asking and answering a number of critical questions. For instance, “What discoveries have emerged from the analysis of the Artifact and how will these ideas directly influence design decisions in the development of an Artifact Apparatus?” Additionally, Students develop key questions related to scale, material, structure, transformation and part-to-whole conditions. Is the Apparatus light or heavy, smooth or rough, flexible or stiff? Does the Apparatus physically manipulate its environment or is it physically manipulated by the surrounding context? And once again, as with PROJECTS 02 and 03, Students develop design models with architectural materials such as wood, rockite, metal, stone, acrylic, shoji paper and cork.

PROJECT 05: Kunstkammer Sanctum for a Curious Client

The possibilities developed through PROJECT 02c: Receptacle and PROJECT 04: Apparatus are advanced in relation to a distinct landscape condition that each Student constructs in PROJECT 03: Found Ground. First, Students select a specific site from their Found Ground explorations for further discovery. They are asked to treat this landscape as real and fundamental and to assume the site has geographic coordinates similar to Milwaukee, WI. With this in mind, Students consider climate, solar orientation and seasonal conditions.

For the final project of the semester, Students design a Kunstkammer Sanctum for a curious Client that has an Artifact fetish. The Kunstkammer Sanctum must function as a place for sleeping, washing, cooking, eating, working, collecting, displaying and admiring these fetishized Artifacts. The Sanctum must also be protected from the natural elements, such as wind, rain, heat and snow.

As Students develop their Kunstkammer Sanctum design they are asked to address a number of key questions with the conceptual rigor that they’ve developed through their comprehensive and critical Artifact analysis. For instance, how does circulation and the movement of the Client’s body play a role in the design? And how are moments of resting and viewing accommodated throughout this circulation sequence? How is enclosure conceived of, and how might this form of protection respond to the everchanging seasonal and/or daily influences such as weather and solar orientation? Does the structure and/or superstructure support this enclosure and relate directly to the discoveries that emerged from the Artifact analysis and the Apparatus design? What are the fundamental material conditions of the Kunstkammer Sanctum and how might moments of transparency and opacity be achieved relative to the Client’s needs and desires? How does the Kunstkammer Sanctum consider architectural issues related to large or small, heavy or light, dark or bright, thick or thin, closed or open, rough or smooth and stiff or flexible? Once again, this curious question-forming, careful consideration of context and creative inquiry is introduced, and now, by the end of the semester, instilled in the Beginning Design Student – Paving the way for productive design process paths.

Refinement & Re-Presentation

It is important for Students to recognize that their architectural concepts, which were derived from their Artifact analysis, will provide the lens through which all of their design decisions for this project are made. Design decisions must inevitably be made at multiple scales and consider diverse contexts - From how a building touches the ground to the detail of how a door sits within a wall.
First, Students are asked to select their favorite moments from their Receptacle and/or Apparatus. The initial step is to re-scale these moments at a minimum of three scales and subsequently embed each scale within the other. This permits Students to mine the conceptual characteristics of their designs at multiple scales. These re-presentations are imagined at the scales of landscape, space and detail.

Next, Students place their project in their selected site in a way that takes advantage of their landscape’s most adaptive characteristics. From there, Students develop their project in relation to this specific context and the other curious Clients (their neighbors) that surround them. Students must revise their design proposal in response to these external forces that are inherent within this created context.

As Students hone their site construction and Kunstkammer Sanctum design, they emphasize what they perceive as the Design’s essential tectonic characteristics. Therefore, qualities of striation, undulation, shearing, moments of angularity, vertical or horizontal attenuation, etc. must be part of the manner in which Students creatively manipulate the context and make adjustments to their architectural proposal. Equally important is the way that Students consider their architectural proposal as it alters the context. Does it also need to be striated, undulating, attenuated, etc.? That is to say, Students must think about site not only as an abstracted geological landscape, but also as a condition that should be defined by an architectural project.

Found in Translation, the very first design studio of the 3-year Master of Architecture graduate curriculum, expose Students to the range of possibilities entailed in various methods of design to make them aware of the power that Architecture has to shape our World and our perceptions of that World. This Beginning Design Studio incessantly attempts to render the familiar unfamiliar and to discover the unknown that is always lurking in what we think is known. Students are trained to exercise their curiosity and formulate critical questions at every step of the design process. This, along with their sensitivity to site-specific contextual conditions, equips them with the ability to transform the banal and mundane into the magical and marvelous.

The primary objective of an architectural education is to communicate the power of continued and committed creative activity. The production of diverse design Artifacts such as drawings, collages, models and photographs is essential to the development of an architectural project. This Beginning Design Studio provides Students with the opportunity to hone their fundamental skills: the ability to intensely observe and investigate a situation, the ability to conceptualize and frame an idea through intense inquiry, and subsequently, the ability to creatively develop an organizational strategy which allows the materialization of that idea into spatial and tectonic terms.

Notes

Fig. 6 Artifact Apparatus model by graduate student Zak Wosewick.
Fig. 7 Kunstkammer Sanctums by graduate students Leeann Wacker, Jeremiah Huth, Amy Morrison, Valerie Davis, Tia Milkova and Zak Wosewick.
THE DINNER PARTY: *Making Iterations with Empathy to Create Gestalt*

Nikole Bouchard, University of Wisconsin–Milwaukee

**One Event from Many Perspectives**

The Dinner Party is the second visualization course of the 3-year Master of Architecture graduate curriculum. The pedagogical approach to this formative design seminar incorporates the conceptual and technical aspects of representation to give graduate students, with no architectural design background, a well-balanced and solid design foundation to build upon. This Visualization II course is built around the theme of The Dinner Party. Students are asked to consider, conceptualize and construct representations that convey every aspect of their specific Dinner Party as it relates to a Leitmotif of their choice. These aspects are broken down into 12 visualization explorations over the course of the semester. The Dinner Party presents and prompts a breadth of visualization techniques that demonstrate the importance of Making/Iterations, Empathy and Gestalt in design.

**Making / Iterations**

To begin the semester, each Student selects one of the following Leitmotifs: Animalism, Darkness, Decay, Déjà Vu, Dissolution, Double, Fear, Labyrinth, Mask, Morselation, Rage and Vagabondage. From there, Students are asked to begin conceptualizing The Dinner Party. The Leitmotif must drive every aspect of the narrative, planning and presentation of The Dinner Party. Students are expected to pursue this Leitmotif with a productive kind of obsession. With initial ideas in mind, Exploration 01: Meal Menu ensues. The first step in planning The Dinner Party is to determine and visually describe, via a clear, concise and compelling graphic print piece, what the 3-course Dinner Party meal is, and why. Explorations 2-12 follow, and are executed with the same acute awareness and control of every Dinner Party detail. The 12 Dinner Party explorations are:

01. **MEAL MENU**
   What’s for Dinner?

02. **TO TABLE MAPPING**
   Where Did You Find That Food?

03. **CHARACTER DESCRIPTION**
   Who’s the Host?

04. **EVENT ANALYSIS**
   What Happened?

05. **DOMESTIC DESCRIPTIONS**
   Analysis of an Iconic Architectural Project

06. **FRANKEN HOUSE**
   Found in Transformation

07. **EXPLODED ASSEMBLY**
   Dissect, Describe & Detail

08. **MAKING MOTIFS**
   Colors, Patterns, Textures & Motifs

09. **DINNER DOMICILE**
   Evocative Images of the Imagination

10. **FOUND IN TRANSLATION**
    Making Miniatures

11. **LIGHTS, CAMERA, ACTION!**
    Fantastical Photographs

12. **THE PORTFOLIO**
    The Art & Craft of Producing a Publication

These 12 explorations demonstrate the power of making iterations in the architectural design process. The simple Leitmotif idea and the single Dinner Party event can be understood from multiple perspectives and explored in numerous ways via many mediums.

**Empathy**

Empathy in architectural design is incredibly important.
Designers create spaces for people to experience and inhabit, therefore it’s imperative that Designers are empathetic and can understand the emotions of others. The Dinner Party is innately a human experience. By critically and creatively developing the Dinner Party host, the Dinner Party narrative and all aspects of The Dinner Party event, Students are taught to operate with empathy in every step of the design process.

**Gestalt**

Throughout the semester, Students develop a set of skills that enable them to efficiently and effectively communicate their architectural aspirations to a wide range of audiences. Emphasis is placed on how imaginative, conceptually rigorous and thoughtful the 12 Dinner Party representations are, and how fluidly Students work between multiple forms of media and software platforms. EXPLORATION 12: The Portfolio asks Students to carefully curate and craft a gestalt publication that compiles all explorations into a comprehensive and cohesive body of work.

**EXPLORATION 01: The Meal Menu**

The first step in planning The Dinner Party is to determine and visually describe what the 3-course meal will be. EXPLORATION 01: Meal Menu asks Students to answer the question “What’s
for dinner?" via a clear, concise and compelling Graphic Meal Menu. Students select a Leitmotif from the following list: Decay, Double, Mask, Labyrinth, Rage, Morselation, Animalism, Darkness, Vagabondage, Fear, Déjà Vu and Dissolution. Next, they are asked to let their conceptual interpretation of their Leitmotif drive every aspect of the planning and presentation of The Dinner Party - From the 3-course Meal Menu, to The Dinner Party Host Character Description, to the Colors, Textures, Patterns and Motifs that wrap the ceremonial space of the event. Students are expected to pursue this Leitmotif with a productive and intense obsession. The Leitmotif must guide and determine every design decision that is made and idea that is visually communicated.

Good Designers exhibit the ability to ask great questions and the skills to find creative answers to these insightful inquiries. **EXPLORATION 01: Meal Menu** is the first of 12 instances throughout this semester-long visualization seminar where Students are trained to ask critical questions, and ultimately, to find creative and empathetic answers. To begin, Students are asked to consider the theme, mood and atmosphere of their Dinner Party as it relates directly to their Leitmotif. Next, what is the Dinner Party narrative and how will this story influence the cuisine? What will the 3-course meal consist of and what are the colors, forms, flavors and textures of these foods? Ultimately, how will the answers to these questions effect the design of The Dinner Party, the graphic presentation of the Meal Menu and the conceptualization of all aspects of The Dinner Party?

As the second (and last) course in the visualization curriculum, this seminar attempts to introduce Beginning Design Students to a very wide range of means, methods and skills. In the week-long **EXPLORATION 01: Meal Menu**, Students are taught to develop conceptual rigor and exercise their ability to analyze, diagram, abstract, transform, compose and annotate visual information. This exploration requires Students to work fluidly between multiple software platforms including Rhinoceros and Adobe Illustrator, Photoshop and InDesign. After selecting a graphic precedent, Students iteratively diagram the composition, lines, proportions, forms, text, etc. to better understand the underlying compositional strategy. From there, Students create their Meal Menu by applying a series of transformational operations to their analysis diagrams. Attention and emphasis is put on the inclusion and graphic quality of grids, points, lines, text, hatches, forms, images and colors. The ultimate goal is to produce a Meal Menu graphic that is compelling and clearly conveys the Student’s specific Leitmotif.

**EXPLORATION 02: ______ to Table Mapping**

EXPLORATION 02: ______ to Table Mapping asks Students to answer the question, “Where did you get that food?” via a clear, concise and compelling Mapping Presentation Board.

Forever associated with the planning and design of cities, maps have been essential in the creation of lived space. But mapping differs from planning as it requires the excavating, discovering and unfolding of interrelated and invisible forces. Mapping is inherently a generative act that reveals new relationships amongst otherwise disparate parts. An important part of mapping is the acknowledgement of the Map Maker’s own participation and engagement with the cartographic process. The act of choreographing specific layers of information is based on the Map Maker’s imagination. Maps have the power to function as innovative wings that can transpire us into unknown territories beyond the furthest reaches of our imagination.

Once again, Students are asked to consider a series of critical questions that enable them to better understand and empathize with their Dinner Party host and the people involved in the “____ to Table” process. For instance, what ingredients does The Dinner Party meal consist of and what is the quantity of each ingredient? Where is The Dinner Party host sourcing these ingredients from and who are the “players” that are involved (i.e. animals, farmers, truckers, etc.)? What are the routes and distances that these ingredients travel throughout the “____ to Table” process and how are the items transported from point to point? What is the cost and timeline of the “____ to Table” process and how do the answers to these questions support the specific Dinner Party Leitmotif?

To answer these questions Students produce a Map that explicitly communicates the geographical relationships of these sourced ingredients. They are asked to consider diverse graphic techniques, like the effects of aerial photography overlaid with points, lines and hatches versus a pure line drawing Map. Additionally, how might the inclusion of high-resolution photographic images help to set the scene,
mood and environment of the Leitmotif-inspired Dinner Party and the “___ to Table” process? Students are encouraged to explore the effects of color, tone and texture as powerful visual communication tools. Once again, Students are required to

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Fig. 2 EXPLORATION 01: Meal Menu and EXPLORATION 02: ___ to Table Mapping by graduate student Joe Gaudreau.
introduce subtle and sophisticated text annotation to their work in an effort to create a compelling and concise final product.

**EXPLORATION 02: _____ to Table Mapping** demonstrates to Students the importance and value of committed and continued iterative making. By the second week of this course, Students realize that they can approach a single design problem, *The Dinner Party*, from a number of diverse perspectives – *The Meal Menu*, *The ______ to Table* Mapping, and so on. Simultaneously, Students are trained to consider these diverse perspectives and approaches as a gestalt body of work, not as a series of unrelated experiments. Strong emphasis is put on the conceptual and aesthetic continuity between these first two explorations, and ultimately, between all 12 explorations of the semester.

**EXPLORATION 03: Character Description**

**EXPLORATION 03: Character Description** asks Students to answer the question, “Who’s the Host?” via a convincing and captivating *Photographic Collage* and *Source Material Catalog*.

We tend to trust photographs and believe that they offer a window of comprehension into the past. Historically, we’ve been trained to subscribe to the idea that “seeing is believing”. Over the years photography has evolved, resulting in a gradual shift from documenting and perfecting reality to constructing alternate universes and fabricating fantasies. Today’s tools and technologies enable us to create fictional “facts” that are composed of disparate times and spaces. This flexibility in visual communication has become so fluid, yet stubbornly loyal to the idea of “truth” that the vocabulary of this visual language has grown immensely. **EXPLORATION 03: Character Description** requires Students to see photography as a “re-mixing” device that can creatively craft false, but empathetic realities.

First, Students are asked to use their conceptual skills and ability to empathize with and visually communicate the needs, desires and emotions of this unique individual.

Students begin by familiarizing themselves with the work of the following Photographers: Olivier Boberg, Gregory Crewdson, Philip-Lorca DiCorcia, Peter Funch, Todd Hido, Dandida Hoffer, Yves Marchand & Romain Mefer, Richard Misrach, James Mollison, Robert Poldori, Cindy Sherman, Julius Shulman, Alec Soth, Joel Sternfeld, Jeff Wall and Michael Wolf. Based on their answers to the previously posed questions, Students craft a *Character Description Photo Collage* that extracts and recombines numerous selected elements from photographic works of their choice. The *Photo Collage* must credit the photographer with subtle text annotations and construct the Character within his or her environment. The goal is to deconstruct and reconstruct a false image that is so well crafted it appears to be a true story. Careful consideration must be given to the lights, tones, textures, moods and emotions of the images in relationship to one another and in support of *The Dinner Party* Leitmotif.

**EXPLORATION 04: Event Analysis**

The next iteration of *The Dinner Party* asks Students to host and strategically document *The Dinner Party* via a content-rich photographic compilation.

From its earliest days, the moving image has been used to observe and document the dynamic transformations of objects and events in space. **EXPLORATION 04: Event Analysis** asks Students to interrogate a specific realm of visual data, *The Dinner Party*, not as if it were comprised of discrete things, but rather as arrays of visual data and information that are in constant flux. With this, patterns and effects exist spatially and temporally, arising from differences of intensities and durations that are unique and inherent to *The Dinner Party* event. Like in **EXPLORATION 03: Character Description**, Students are asked to investigate the fine line between the real and the virtual World. Context and concept must weave together, as visual representation becomes a tool for the manipulation and representation of reality.

Once again Students are asked to carefully consider a series of critical questions that are related to their *Dinner Party*. What will the focus of *The Dinner Party* be and how will the event be
framed conceptually, physically and emotionally? What is the theme, mood and atmosphere of the event and how does this directly support *The Dinner Party* Leitmotif? Students are expected to continue developing a conceptually clear narrative.
During the actual Dinner Party event, Students capture at least 40 photographs at a determined time interval then compose and present these photographs, or a selection of these photographs, in a single image that describes the entire Dinner Party, from start to finish and from atmospheres to emotions.

**EXPLORATION 05: Domestic Descriptions**

EXPLORATION 05: Domestic Descriptions asks Students to thoroughly research, analyze, understand and diagrammatically describe an iconic project from a given list of celebrated architectural precedents. This research is presented in the form of annotated, descriptive diagrams.

In other words, this exploration is a visual close reading. Students use their diagramming skills to visually communicate the architectural essence and historical implications of their precedent. Using their architectural history and theory knowledge, Students are asked to understand their precedent both as an isolated object and as a moment in time. Drawing is used to question the architecture at hand and to inspire new architectural interpretations. Students use drawing to visually communicate their precedent’s typology, structure and function; to analyze, understand, explore and experiment. These diagrams provide a launching pad into EXPLORATION 06: Franken Houses, further emphasizing that these iterations of The Dinner Party are interrelated and part of a “Big Picture”, or gestalt. Architectural precedents include:

- **Villa Rotunda (1566)**
  - By Andrea Palladio
- **Schröder House (1924)**
  - By Garrit Rietveld
- **Kaufmann House (1946)**
  - By Richard Neutra
- **Church at Firminy (1963)**
  - By Le Corbusier
- **House IV (1975)**
  - By Peter Eisenman
- **House of the Painter (1984)**
  - By John Hejduk
- **Maison Bordeaux (1998)**
  - By Office for Metropolitan Architects (OMA)
- **Mobius House (1998)**
  - By UN Studio (OMA)
- **Moriyama House (2005)**
  - By Ryue Nishizawa
- **Seattle Central Library (2005)**
  - By Office for Metropolitan Architects (OMA)
- **Zollverein School (2006)**
  - By SANAA
- **Ordos 100 No. 7 (2009)**
  - By MOS

**EXPLORATION 06: Franken House**

In EXPLORATION 06: Franken House Students strategically select and transform specific diagrammatic descriptions that they’ve produced in EXPLORATION 05: Domestic Descriptions to create a space for The Dinner Party that clearly empathizes with the host’s needs and desires.

Denise Scott-Brown once said of the influences for the Vanna Venturi House, “Palladio in front and Aalto in back. Sloping roof. Big Chimney. Symmetrical windows. These are all images of American and English homes. But juxtaposed with this are classical quotations and also quotations from the modern movement. A lot of theory of Corbusier in here.”

For EXPLORATION 06: Franken House Students sample and transform the formal and aesthetic sensibilities from the celebrated architectural precedent that they’ve analyzed in EXPLORATION 05: Domestic Descriptions. The goal of EXPLORATION 06 is to transform selected 2-dimensional diagrams into a 3-dimensional space - The fictional space in which The Dinner Party takes place. In this regard, EXPLORATION 06 is a mash-up; The collaging and blending of diverse formal and aesthetic strategies in search of an uncanny architecture that supports the Student’s Leitmotif concepts in the clearest and most compelling spatial way possible. The Franken House must be a unique architectural space that has characteristics which speak directly to and empathize with The Dinner Party host and his or her event. This is an exercise in sampling, or appropriation, and formal development through the transformation and defamiliarization of familiar formal tropes.

To produce this newfound space Students work fluidly between multiple software platforms, like Rhinoceros, AutoCAD and
Adobe Illustrator, to create a number of spatial iterations that address key questions. Students must strategically select and diagram in such a way that these transformations clearly reinforce the conceptual framework of their Dinner Party. Students must also consider what type of space best suits their Dinner Party meal menu, host and event? How many people does the space accommodate and how does the space relate to the human body? Is The Dinner Party space opened or closed, light or dark, unified or separated? Is it safe or dangerous, welcoming or foreboding, cozy or uncomfortable? How might scale and proportion support the Leitmotif concepts? Students must empathize with their Dinner Party host in order to successfully transform their precedent diagrams into a space that meets the physical and emotional needs of this unique character and their event.

**EXPLORATION 07: The Exploded Assembly Drawing**

Architects produce drawings that describe how an architecture is built. An ever-occurring process for architects is to produce scaled, 3-dimensional models that ultimately need to be constructed as full-scale, 3-dimensional spaces. To achieve this, the Exploded Assembly Drawing is paramount. This drawing type is not simply a representation of an idea – It is a working, living and growing document that has the power to communicate the part-to-whole relationships of an architectural project.

In **EXPLORATION 06: Franken House** Students produced a 3-dimensional digital model that describes the space in which The Dinner Party takes place. **EXPLORATION 07: The Exploded Assembly Drawing** asks Students to now “dissect” this space, then produce a “kit of parts” instruction set. These drawings are not simply representations of the Franken House – They are much more than that. These documents help Students to better understand the space that they’ve constructed and to devise strategies for building a 3-dimensional physical model of
their Franken House later in the semester.

The Exploded Assembly Drawing must express basic ideas about space(s), form(s), structure(s), furnishing(s), interior skin(s), exterior skin(s) and ground relationship(s) of the Franken House. Students use the skills that they’ve acquired and this powerful drawing type to meticulously disassemble their Franken House into its component parts and articulately describe the process of re-construction.

Again, Students are faced with a series of important questions that prompt them to think in a critical and iterative way about The Dinner Party gestalt. For instance, how does the Exploded Assembly Drawing strategy reflect and support The Dinner Party Leitmotif? And how does the composition of design elements on the page further emphasize and communicate these ideas?

EXPLORATION 08: Making Motifs

In New Geographies 3: Urbanisms of Color, Gareth Doherty states that, “Shlonek? Literally, ‘What’s your color?’ is a popular greeting in Arabic. Used as pervasively as ‘How are you?’ or ‘How’s it going?’, the phrase implies that Color is a measure of a person’s wellbeing.” 02

Colors, textures, patterns and motifs have the power to conceal and reveal. To attract and repel. To evoke and emote. To create space and impact place. These design techniques are often times underestimated in contemporary architectural practice. Too often we default to the given and generic color, texture, pattern and symbol libraries that our softwares provide us.

But these architectural applications have the ability to elicit emotions. Architectural theorist, Sanford Kwinter has written that, “(Petra) Blaise’s architecture both generates and suspends desire.” 02 Her impassioned spatial constructs rely on the use of colors, textures, patterns, motifs and lighting effects to produce emotional spaces and sensorial experiences. When asked, “What’s your favorite Color?” by Harvard PhD candidate Nicole Beattie, Blaisse replied, “…Lime Green...because of its absolute positive energy, its sunny glow, its imagined smell...Lime Green makes me so happy...It provides me with an enormous optimism, an energetic urge for life and a need to create...Lime Green creates this kind of reaction, don’t you think?” 02

EXPLORATION 08: Making Motifs asks Students to develop their own color palettes, textures, patterns and motifs that are specifically designed to conceptually and concretely support their Leitmotif, thus their Dinner Party. How can the attuned and intelligent design and use of colors, textures, patterns and motifs accentuate and amplify the user experience of an architecture? How might these architectural applications convey specific concepts, achieve desired atmospheres, elicit certain emotions and produce undeniable reactions? EXPLORATION 08: Making Motifs directly demands that Students confront these questions and empathize with their Dinner Party host.

As always, Students are asked to consider what ideas, atmospheres, experiences and emotions they are trying to produce. What materials will be used to construct The Dinner Party space and how will these decisions effect the user experience? Are materials matte or shiny, opaque or translucent, smooth or rough, natural or artificial, subtle or bold? Is the space illuminated with natural or artificial light and how will these decisions effect the experience? What are the sizes and proportion of the fields of colors, textures, patterns and motifs? Students ultimately use these designed elements in their future iterations of The Dinner Party to produce evocative images of the event. The more Students experiment, explore and iterate, the more material they have to produce magical imagery in the next steps of the design.

EXPLORATION 09: Dinner Domicile

During an artist talk in 2010, photographer Gregory Crewdson stated, “To me the most important thing is the story that’s inside of you. Every Artist has a particular view of the world.” 03

EXPLORATION 09: Dinner Domicile asks Students to visually communicate The World in which their Dinner Party takes place by producing imaginative images that take into account all of their projects and production thus far in the semester. In other words, the goal is to create a gestalt image.

In his essay Eidetic Operations and New Landscapes, landscape architect and theorist James Corner describes the “…Pairing of two elements to produce a new Image, a conception that is otherwise not picturable...Such Eidetic Images are fundamental stimuli to creativity and invention; They do not represent the reality of an idea but rather inaugurate its possibility...” 04
EXPLORATION 09: Dinner Domicile Students pair strategically selected views of their 3-Dimensional event space digital model.
(EXPLORATION 06) with their color palettes, textures, patterns and motifs (EXPLORATION 08) to produce imaginative images of their Dinner Party. As always, the Leitmotifs guide the way Students produce and visually communicate spatial qualities, experiential perspectives and seductive stories. Students consider that “architecture is not simply a platform that accommodates the viewing subject. It is a viewing mechanism that produces the subject. It precedes and frames its occupant.” 05

Students must strategically select the colors, textures, patterns and motifs that most clearly support the conceptual framework of their Dinner Party and amplify their ideas about mood, atmosphere, environment and experience. The goal is to produce evocative images that have clear aesthetic and emotional qualities — including, but not limited to dreamy, strange, fake, plastic, bizarre, uncanny and surreal.

**EXPLORATION 10: Found in Translation**

When asked in an interview with Eye See Hue Magazine, “delineate your creative process”, photographer Laurie Simmons replied, “basically I need to keep making things, so to that end I am always looking for new things to make.” 06

EXPLORATION 10: Found in Translation is an opportunity for Students to continue exploring their Dinner Party through the productive and iterative process of making with the focus being the production of a 3-dimensional physical model.

This physical model is in many ways the culmination, synthesis or gestalt of all of the projects from this semester. Students are asked to physically produce their Franken House (EXPLORATION 06), the space in which The Dinner Party event (EXPLORATION 04) takes place. This space is a result of the transformed Domestic Descriptions (EXPLORATION 05) that is tuned specifically for The Dinner Party host (EXPLORATION 03). The expectation is that Students use their Exploded Assembly Drawing (EXPLORATION 07) to aid in the construction of this space. Additionally, the color palettes, textures, patterns and motifs that were developed (EXPLORATION 08) and deployed (EXPLORATION 09) must be physically manifested in the EXPLORATION 10: Found in Translation model.

Taking inspiration from architects like Allied Works, Herzog & DeMeuron, MOS, OMA, SANAA, Steven Holl and artists like Laurie Simmons and Thomas Demand Students fabricate a 3-dimensional physical model of their Dinner Party space. This model is seen as being composed of several miniature set pieces, with construction sizeable enough to photograph. Students often alter and/or adjust their design in order to thoroughly photograph it in the following EXPLORATION 11: Lights, Camera, Action!

Using various physical model making methods and digital fabrication tools Students produce a beautifully executed and crafted 3-dimensional model of The Dinner Party space. Students ultimately use this physical model as a design and visualization tool that is photographed to produce evocative and imaginative images of The Dinner Party event.

**EXPLORATION 11: Lights, Camera, Action!**

When photographer James Welling asked fellow photographer Laurie Simmons about the photographic process of her Color Coordinated Interiors 1983 she replied, “My shooting set-up was very primitive. I had the small rear screen, a slide projector, a couple of miniature theater lights and a set of Japanese Dolls called the Teenettes.” 07

Architects are not the only creative professionals that construct models as a way to visualize their imaginative ideas. Many world-renowned photographers like Laurie Simmons, James Casebere and Thomas Demand create fantastical physical environments as a way to produce emotive images of the imagination. EXPLORATION 11: Lights, Camera, Action! asks Students to thoroughly investigate their Dinner Party space model from EXPLORATION 10: Found in Translation through a series of carefully composed, well-executed, evocative photographic images of the imagination.

Regarding her Color Coordinated Interiors 1983 creative process, Laurie Simmons stated, “I set up small rooms in my Studio that barely existed beyond the moment they were photographed. These miniature spaces were temporal, leaned on books and tin cans and were held together by tape and paper clips. The black and white pictures ended up looking like real places to me. The scale was ambiguous and I liked that way. The doll houses and boxes of vintage furniture that I used in my set-ups often came with old dolls that I tossed in a reject pile in a
Fig. 6 EXPLORATION 08: Making Motifs and EXPLORATION 09: Dinner Domicile by graduate student Matt Winder. corner of my Studio. One day I added a doll figure as an afterthought and I haven’t really stopped since.”
Using a camera, Students collect numerous views of their physical model to construct a photographic narrative of their Dinner Party. Students use the camera as a tool to not only document, but to discover. Taking inspiration from the photographs of Laurie Simmons, Phillip-Lorca diCorcia, Todd Hido and James Welling Students create and capture a distinct story, mood and atmosphere that describes their Dinner Party.

EXPLORATION 12: The Portfolio

First impressions are extremely important. The Portfolio is an autobiography in a sense. It says everything, or nothing, about a Designer. It’s incredibly important for Designers to curate and craft their Portfolio in the most compelling and clear way possible. A shoddy Portfolio can make great work look terrible, and a stellar Portfolio can make terrible work look great. In some ways, the Portfolio package is just as, if not more important than the work within it. Designers want their audience to stop on every page of their Portfolio. To become engrossed and engaged with the content - One spread, after another. The ultimate disappointment is a breeze-filled, flip of the pages. Quality curation and gestalt designer can ensure that this does not happen.

With this said, EXPLORATION 12: Portfolio asks Students to curate and craft a gestalt publication that describes their entire Dinner Party (EXPLORATIONS 01-11), from start to finish.

Based on their previous explorations, Students develop an overall aesthetic agenda that supports and amplifies their Leitmotif-inspired Dinner Party. The goal is to create a consistent layout approach from exploration-to-exploration that allows for flexibility and distinction between their iterative experiments. As the culminating exploration of the semester, Students are expected to demonstrate their complete range of visualization skills in this comprehensive and conceptual gestalt publication.

Many Perspectives of One Event

For Designers the ability to successfully represent a complex spatial and visual idea is as essential as being able to come up with that idea. Therefore it’s critical for Designers to develop a set of skills that enable the efficient and effective communication of architectural aspirations to a wide range of audiences.

The Dinner Party Visualization II course teaches Beginning Design Students to critically question, observe, document and transform multi-scalar design ideas into irresistible and empathetic images of the imagination. Throughout the semester Students develop imaginative, conceptually rigorous and thoughtful approaches to design and visualization while understanding the importance of empathy in creating special spaces for human inhabitation.

Notes


03 Crewdson, Gregory. Artist Talk (Dallas: Dallas Museum of Art, February 3, 2010).


06 Simmons, Laurie. Interview (Eye See Hue, September, 2011).

Fig. 7 EXPLORATION 10: Found in Translation by graduate student Jeremiah Huth.
Staging Innovation in First Year Design Pedagogy: the K-State Experience

Jason Brody, Katrina Lewis, Jon Hunt, Aaron Schump, Lynn Ewanow and Lisa Last, Kansas State University

Kansas State University’s College of Architecture, Planning and Design is in the fifth year of an initiative to assess and institute changes to our beginning Environmental Design Studies (ENVD) program. In this paper we discuss our work in this initiative and reflect on the ways that the National Conference on the Beginning Design Student (NCBDS) has helped us make sense of ENVD’s past, present, and future. In the first part of this paper we review the recent history of ENVD, describe the curriculum, and discuss some of the conditions that have structured the way we deliver first year design. In the second part we review a content analysis we conducted of three recent NCBDS proceedings and discuss how this analysis has helped us (a) situate our experience within a spectrum of beginning design cultures and (b) make evolutionary changes to ENVD. This paper describes deliberate steps taken to prepare a complex and structured system for innovative growth and development. We do not presume to break new ground in beginning design pedagogy in this paper. Rather, it is our hope that this reflective presentation of our experience on the ENVD working group will be helpful to others undertaking similar initiatives.

Environmental Design Studies at Kansas State University

ENVD is the common first year design program of the College of Architecture, Planning and Design at Kansas State University in Manhattan, Kansas, USA. It generally serves 180 students in nine or ten studio sections and support courses, feeding students into the Interior Architecture & Product Design, Architecture, Landscape Architecture, and (as one pathway) Regional & Community Planning programs of the College. The interdisciplinary first-year studios (ENVD 201, 202, and 299) cover foundational studies including introductory principles, processes, and vocabulary of environmental design, emphasizing two- and three-dimensional visualization of objects and spaces. The curriculum is structured to create consistency across multiple studios, with professors following a common ENVD Syllabus and Handbook. The program is administered by the Director of Environmental Design Studies, the faculty ENVD Coordinator, and an academic advisor dedicated to the College’s beginning design students. It is coordinated via weekly meetings of beginning design studio faculty.

The present ENVD curriculum at K-State was established in the mid-nineties. Its pedagogy is part of a design tradition that originated with the so-called Texas Rangers in the fifties and diffused through schools like Cornell, Cooper Union, and Syracuse in subsequent decades1. K-State’s version was promoted by Mark Shapiro, who before becoming department head of Architecture at K-State had taught at Syracuse with Werner Seligmann; transformation of this pedagogy to ENVD was led by a three person team comprised of faculty from each department who tested and revised the problem sequence for a full year before implementation into the curriculum. Like other descendants of the Texas Rangers tradition, ENVD emphasizes the perception and definition of abstract space. Prior to 2012 the ENVD problem sequence included exercises on three parallel planes, definition of space within a cube, extension of space within a landscape, and play on interior/exterior spatial definition, a sequence that echoed the 9-square problem of the Texas Rangers. We have since adopted a new problem set that relies less on pure abstractions while retaining the essential emphasis on perception and definition of space.

In the nineties and today, a key objective of ENVD is to provide a common foundation in beginning design education for approximately 180 students in nine to ten sections, taught by a range of tenured, tenure-track, and adjunct faculty in three departments and four disciplines. Development of ENVD in the nineties in particular was a response to a rather chaotic period in which individual faculty had greater autonomy to teach
beginning design as they saw fit and brought the varied perspectives of their own design educations as well as the prejudices of their disciplines with them— an environment that led to uneven preparation of students and tension within our College. The presumption of the curriculum—one that drew from the tradition of the Texas Rangers brought through Syracuse University—was that architecture had certain identifiable principles that could be defined and taught through a series of explorative exercises, and that this would lead to literate design practices that opened rather than inhibited creativity. As important as the design of the curriculum, then, was its administration. This has been handled through establishing a consistent syllabus, handbook, lesson plans, grading standards, field trip planning, and supplemental instructional materials, with coordination handled through a weekly meeting of all ENVD faculty from across the departments. Tensions between foundational structure, disciplinary focus, and faculty autonomy continually bubble up but overall the system has led to increased student performance and retention as well as increased departmental satisfaction. ENVD has long been seen within K-State as the "secret weapon" of our College.

Our current review process was initiated in 2012, partly stemming from a natural process of periodic review and partly as a result of a boomlet in young faculty who had not been around when the curriculum was established and had not experienced the unevenness and unpredictability that made its common foundational structure important. It started with a facilitated survey that revealed broad agreement on pedagogical objectives of ENVD as well as some variation on how effective particular aspects of the curriculum as delivered were in meeting those objectives. Subsequent to the survey a working group comprised of faculty from each of the disciplines was formed to institute and review changes. We first adopted a new problem set, adapted from a sister program at the University of Missouri— Kansas City, that met our existing pedagogical objectives with exercises that involved less abstraction and generally more immersion in real context and study of precedents. We also organized a set of common instructional lectures that drew on unique expertise across our faculty and attended to revision of handbook, syllabus, and problem sets based on a review, distillation, and reorganization of an extensive body of instructional material.

The National Conference on the Beginning Design Student: connecting to a community of practice

As our taskforce has worked to update our curriculum, we have also conducted a content analysis of several years of NCBDS conference proceedings. We did this analysis to assess the current state of beginning design—to see what NCBDS as a whole was talking about, to identify innovative new trends and approaches, and (importantly) to see how innovations were being translated into curricula and pedagogies. This research was exploratory. While it was not explicitly part of the charge of our working group we embarked on the research anticipating that it may be constructive to our deliberations.

We summarize findings of our content analysis here, as they are pertinent to how we have gone about reviewing and updating our curriculum. We reviewed every article from the 27th, 28th, and 29th proceedings of the NCBDS, the last three years of proceedings that were readily available online at the time that we began our research. We first eliminated from our analysis any article that did not explicitly address first year undergraduate design education, as this has been the focus of our taskforce work. 62 out of 230 articles met this initial criterion. We then engaged in an iterative process of reviewing the remaining articles, identifying themes, discussing commonalities and intersections, coding articles based on preliminary commonalities, discussing and resorting themes, identifying central issues, and recoding articles and drawing evidence from them to flesh out our understanding.

Recent NCBDS proceedings comprise a rich tapestry of scholarship. The papers discussed teaching, research, observation, analysis, seeing, drawing, perspective, diagramming, mapping, making, fabrication, play and activism, addressing pedagogy, visual literacy, sustainability, the role of technology in design, and the role of design in society through projects as diverse as chess sets, liquid containers, wearable kinetic sculptures, site installations, and buildings.

Taken as a whole the predominant conversation across this scholarship was a dialogue between papers concerned with instilling a culture or ethic of making and those who viewed the principal concern of beginning design being the perception and definition of space. The former set addressed “techniques in craft”, a “methodology of play”, “generative processes”, “the process of forming”, “operations”, “operational character”, and “establish[ing] a way of working”; the latter, on the other hand, emphasized “awareness”, “presence”, “perception as a mode for architectural thought”, “abstract visual language”, “analytical thinking and drawing as a means of understanding”, “interactive processes of seeing, imaging, and representing”, and drawing out the “ability to see and analyze space”. Papers concerned
with making discussed exercises and pedagogical strategies geared to develop beginning design students’ capacities for creative discovery through active constructive work. Those concerned with seeing depicted issues of perception, representation, and understanding as fundamental, and also emphasized abstract space and appreciation of phenomenological understanding of place.

The dominant framing of our curriculum lies in the latter camp. To be sure, categories of making/seeing are not mutually exclusive, in either NCBDS proceedings or in our own curriculum, and an ethic of craft is an important shared value at K-State. The distinction, though, is constructive to the extent that it situates exercise, curricula and pedagogical objectives within broader cultures of beginning design. The distinction framed much of our discussion as we reviewed our curriculum and helped us distill what had become a cumbersome set of objectives down to three: perception and definition of space; ethic of craft; and professional literacy, a triad that has become our lodestone guiding subsequent decision making.

In addition to drawing out the substantive dialogue spanning NCBDS proceedings we also analyzed the rhetorical form of papers. Although nearly all of the papers cited literature – to either substantiate the general objectives or specific tasks of a project or to make the work relevant to the NCBDS audience – only one paper, our own, attempted any kind of formal methodology that might test a hypothesis or research question³. None of the papers assessed outcomes both objectively and systematically, although many were anecdotally reflective and a few were cognizant and transparent about their failures as well as successes. Instead, the discussion of teaching beginning design itself, whether elaborating studio problems, discussing motivations of actors, and documenting class outcomes, seemed to provide its own (usually-implicit) validation.

Just twelve of the articles rooted their discussion in paradigmatic cultures of beginning design (mentioning Beaux Arts, Texas Rangers and especially the Bauhaus). A minority of the papers – 22 out of the 62 we reviewed in detail – addressed the curricula of their home institutions beyond an individual class. Most successfully in this regard, a pair of 2011 articles (Bagnall et al.’s Triple Grounding and Kelly, Freeby and Lucas’ paraSITE’s Progress) couch discussion of a new sequence of studio exercises within the historical evolution of beginning design curricula at Cal Poly San Luis Obispo. The articles describe how Cal Poly’s culture of “learning by doing”, imposition of state budget cuts, and understanding of shifting student temperaments and capabilities all impacted operation of classes, spurring faculty to throw out old assignments and test new approaches to teaching that might both revitalize and advance a beginning design culture that developed over decades.

Rather than systematic scientific inquiry, the majority of NCBDS papers we analyzed – 54 out of 62 – involved narrative descriptions of how authors went about teaching beginning design. In essence the papers in this set employed a practice story genre. Individual authors here placed greater or less weight on particular elements of their story: some emphasize the background and context precipitating their studio exercise; some the philosophical or pedagogical underpinnings; some the sequential process or steps students undertake in the exercise; some the background, capabilities, or motivation of the students in the course or the students’ experiences in struggling through a project; and some the outcomes generated through their course instruction. Nonetheless, each of these practice stories guides their audience through a narrative with a beginning, middle, and end that captures the what, who, how, and why of a design studio or class experience.

This finding was a contrast to a tacit and ultimately naïve assumption about the nature of beginning design scholarship that had shaped our interest in the study. On the one hand, one could frame – as we had initially done – beginning design scholarship as a form of scientific inquiry that at least aspired to explanatory theory, testing through rigorous experiment, incremental accretion of a cumulative body of knowledge, and the like (a straw man to be sure)³. The practice story genre of beginning design scholarship, however, suggests that it would be both more accurate and more constructive to view NCBDS as a community of practice⁴. Communities of practice involve collaborative learning amongst groups of people who share a domain or sphere of interest. Viewed within a community of practice lens, the narrative storytelling typical of beginning design scholarship calls attention to actors, contexts, motivations, actions taken and results. If scientific inquiry suggests detached objectivity and the pursuit of universal knowledge, communities of practice focus attention on the subjective production of practical, context-specific knowledge. In both NCBDS generally and in aiding our working groups’ attempts to update our curriculum, this latter emphasis seems the more significant.

**Discussion**
Following Stein and Harper, our working group distinguishes innovation from creativity.

Creativity involves the use of imagination or originality in its own right; innovation refers to the introduction of a new method, idea, or product to a present setting. Innovation in this sense is context dependent, a heralding of “news of a difference” within a complex web of meaning operating in a particular setting (Bateson 1972, Rogers 2003).

We have approached our working group with the intention of preparing K-State’s ENVD curriculum for innovation. ENVD is long established and well structured. Although there is occasional pleading from faculty for greater freedom in teaching the common curriculum there is a general consensus about the appropriateness of our pedagogical objectives for beginning design. Implementation of the present curriculum in the nineties was a revolutionary act, built from the ground up having been brought in from outside our university. Our work, in contrast, is more evolutionary, demanding not just development of creative ideas but the stitching of innovation into an already present system.

Reflective analysis of NCBDS proceedings has been instructive. Recognition of threads of a bigger conversation between cultures of seeing and making within a vibrantely diverse patchwork of NCBDS scholarship has helped us situate both the substance and historical trajectory of our own curriculum. Viewing NCBDS as a community of practice has helped us to appreciate the subjective and contextual nature of knowledge required to act wisely in problem settings like our working group. Here the practice story genre typical of NCBDS scholarship is constructive for it illuminates the background, dilemmas, motivations, objectives, actions, and reactions that peers have faced in similar problem settings. We are particularly appreciative of papers that explicitly connect creative activity to these contexts as well as scholarship that addresses, through either formal outcomes assessment or careful reflection, the challenges as well as successes of developing creative ideas to teaching beginning design.

In implementing, assessing and refining a new curriculum along with additional related activity since 2012, K-State has made progress in opening our ENVD program to innovation without wholly throwing out the culture and institutional material that we have worked hard to develop over twenty years. Our most recent step has been to use a new summer bridge studio, taught by working group faculty to a single section of students pursuing a nontraditional pathway into our professional disciplines, as a proving grounds that enables us to develop and test new ideas without the destabilizing uncertainty inherent in experimenting across the ten sections and 180 students of our common beginning design curriculum. NCBDS has been a helpful community as we engage in this work, and we have completed the exploratory discussions for focus group and survey research that would further deepen our engagement in NCBDS in the next stages of our ENVD working group activity and beginning design research agenda.

Notes


2. (Brody, Belanger and Hahn, 2013) Looking back, we attribute this more to our lack of experience in the world of beginning design scholarship and our failure to appreciate the power of practice stories rather than a deficit of scientific rigor.


Designing for difference: lessons from a cross-disciplinary implementation of Universal Design for Learning

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Introduction

Universal Design for Learning (UDL) is a pedagogical framework that seeks to provide students with flexible ways of learning, flexible study resources, and flexible ways of testing learning. Just as Universal Design (UD) provides for difference of physical ability amongst users, UDL provides for difference of learning styles amongst students. Like UD, UDL assumes that learner difference, not commonality, is the norm.¹

De Montfort University (DMU) is a public teaching and research university located in the city of Leicester in the East Midlands of England. In 2016, DMU adopted UDL as part of a university-wide program to offset the consequences of changes to central government support for students with disabilities. Alongside a significant investment in lecture capture and replay technology, DMU’s adoption of the principles of UDL has challenged faculty members teaching at all levels and in all disciplines to re-appraise the accessibility and inclusivity of their teaching.

This paper discusses research-in-progress from a cross-discipline survey of the implementation of the principles of UDL at DMU.¹ The project examines the perceptions and feelings of freshman students from a range of different backgrounds and in a range of subjects about the impact of UDL on their experience of higher education. When complete, the project will evaluate how the implementation of the principles and ideas of UDL are interpreted and applied by students, alongside their recommendations for the academic practice of staff.

A changing context of higher education

In the UK over the last decade, higher education in general and architectural education in particular have been subject to a series of profound environmental changes.² For students with disclosed learning differences, these changes have been particularly acute. From the start of the 2016/17 academic year, central government support for students in higher education has been reduced, with universities rather than government now responsible for the provision of non-medical support staff, such as classroom scribes. Central government funds have also been reduced.³ Undergraduate students with long-term physical or mental health conditions or specific learning difficulties such as dyslexia are eligible for up to £5,358 for specialist equipment, up to £21,305 for a non-medical helper, and up to £1,790 for other costs. However, these figures are maxima and the majority of students receive much less.⁴ During a period of sustained fiscal austerity in government, the financial burden of supporting these students’ particular needs is being shifted to higher education providers. This is in keeping with the current government’s desire to regard universities as businesses, legally obliged by the 2010 Equality Act to make reasonable accommodation for customer difference.

From Universal Design to Universal Design for Learning

Universal Design (UD) provides for difference of physical ability amongst users. In the late nineteen-seventies, architect Michael Bednar described UD as an appreciation that the elimination of physical barriers in the built environment enhanced everyone’s functional capacity. For example, drop curbs were initially introduced to aid the mobility of those in wheelchairs, but they were soon found to benefit many others, such as physically able persons pushing prams and strollers.⁵

¹ As this paper presents an ongoing piece of research, the version delivered verbally at the conference will present additional findings and outcomes.
Just as the principles of UD demonstrate that the physical environment should be designed from the outset to accommodate different kinds of users, the principles of UDL prompt teachers to design curricula from the outset to accommodate different kinds of learners. UDL was first defined by David Rose at the Harvard Graduate School of Education in the late 1990s as a means of removing physical, cognitive and structural barriers to learning. There exists a unique opportunity for design disciplines - and especially architecture - to critically examine the parallels between UD and UDL. Architects' engagement with the principles of UD can range from (at best) holistic and inclusive built environments that accommodate rather than accentuate physical difference to (at worst) the piecemeal application of ramps, handrails and high contrast materials.

The aims and ideas of UDL

As implemented at DMU UDL is arranged around three aims, and six ideas. The three aims are to provide students with flexible ways of learning, flexible study resources, and flexible ways of testing learning, and the six ideas provide instructors with constructive prompts for the enhancement of their teaching. These ideas are as follows.

1. Teachers should make learning materials available to students in a modifiable format 48 hours before each teaching session.

Like most universities, DMU uses a proprietary Virtual Learning Environment (VLE), version 9.1 (April 2014) of Blackboard, produced by Blackboard Inc. of Washington, DC. All undergraduate and taught postgraduate courses at DMU are delivered through discrete modules, and each module is provided with a dedicated module ‘shell’ on Blackboard through which Module Leaders and Instructors can undertake assessments, receive assignments, and most importantly disseminate information. While academic staff at DMU have been using Blackboard since 2003 (with a minimum threshold use required since 2011), the implementation of UDL has established a benchmark for good academic practice, namely the advance dissemination of learning materials at least 48 hours in advance of each teaching session, and in a modifiable format (for example .doc instead of .pdf) so that students may edit and re-format such information.

2. Self-directed learning is signposted in each teaching session.

This idea prompts instructors to ensure that every teaching session, whether it be a lecture, seminar, workshop or tutorial is planned in such a way to include periodic references towards self-directed learning opportunities. These may include traditional reading lists of books, chapters and articles, but they can also include hyperlinks to videos, podcasts, or online resources.

3. Students are provided with opportunities for active learning and knowledge checks.

The third idea sets a benchmark expectation for educators at DMU, encouraging the routine provision of opportunities for active learning and knowledge checks in teaching sessions. This is especially encouraged with regard to activities and tasks that can be disseminated via the VLE, providing students with opportunities for active engagement in learning material both in and out of class.

4. Students able to review replay or revisit teaching sessions in the Virtual Learning Environment.

Beginning in autumn 2016, DMU has implemented a staged roll out of DMU Replay, a proprietary web-based lecture capture, storage and replay system developed by the Seattle, Washington based Panopto Inc. This roll began with year 0 (foundation), first year undergraduate, and first year taught postgraduate cohorts. This element of the six UDL ideas has been the source of continuing discord between university management some academic staff. While faculty staff teaching modules to these cohorts have been encouraged to take advantage of DMU Replay, staff cannot be contractually obliged to do so, and as of the time of writing 19 weeks into the academic year, not a single teaching session in BA (Hons) Architecture year one has been thus recorded.

The DMU branch of the University and College Union (UCU) currently advises its members not to engage with DMU Replay, and if challenged to declare that they are exercising their rights under the 1988 Copyright, Designs and Patents Act and 1998 Data Protection Act. While this paper does not attempt to summarize the disagreement between DMU and UCU, the recommendation not to engage with lecture capture is made in response to two broad areas of concern. Firstly, whereas for instance a PDF file of an instructor’s lecture slides - including copyrighted images of works of art - can be distributed to students via a VLE under legitimate fair use terms, distributing a video of that lecture in which the teacher speaks over these images could potentially reclassify it as a performance, and a very different interpretation of UK and EU copyright law might apply. Secondly, in the absence of any specific agreement that material recorded by lecture capture may not be used for such purposes, the Union has expressed concerns that material produced by lecture capture may later be used by the University either for commercial purposes or for disciplinary action against
the staff member. While it is the stated position of the Union to support reasonable adjustments for individual students who wish to record teaching sessions on their own personal devices, it will only endorse the use of lecture capture “as long as the rights of staff are protected and such system is used for educational purposes only.”

5. Do modes of assessment provide the opportunity for all students to demonstrate knowledge and understanding?

The fifth idea of the UDL framework prompts teachers at DMU to consider whether their modes of assessment can be adjusted in any reasonable way to better accommodate different learning styles. Whereas reasonable accommodations can be made for dyslexic students in the completion of timed examinations (such as with the use of computers or granting of additional time), this UDL idea prompts instructors to consider whether traditional modes of assessment are necessarily appropriate for both the course and the students. Could presentations of video submission replace certain written submissions, for instance?

6. Do module VLE shells meet the DMU Threshold for the use of technologies in the curriculum?

Finally, DMU has agreed four university-wide minimum criteria for the use of technologies to support curricula and students. Firstly, websites and VLE pages must be easy to navigate and provide access to core information. Secondly, all communication between staff and students must be consistent and meet the expectations set by the course. Thirdly, assessments and feedback are clearly presented, including consistent deployment of Turnitin plagiarism detection and anonymous marking of all summative assessment. Fourthly, consistent monitoring processes must be in place to ensure a comparable on-line learning experience for all students across all platforms. This is particularly relevant for students with different learning needs.

Student perceptions of UDL

In order to assess student perceptions of the roll out of UDL at DMU, during the 2016/17 academic year a team of academics from across DMU’s four faculties made a successful bid to the University’s Teaching Innovation Project fund. The resultant research project, Towards Equitable Engagement: the Impact of UDL on Student Perceptions of Learning engages with students from a wide range of backgrounds in order to understand whether there are differential impacts of UDL. This research represents the first university-wide evaluation of the implementation of UDL, and will inform the evaluations that are planned as part of the implementation of what is informally referred to as UDL-2, starting in the 2017/18 academic year. It is a matter of importance that this pilot project captures how the UDL principles are interpreted and applied by students, alongside their recommendations for the academic practice of staff. The intention is to include students affected directly by the changes to DSA, as well as those who are not.

The project team and this paper’s authors represent all four of DMU’s Faculties. James Benedict Brown is Senior Lecturer in Architecture in the Faculty of Arts, Design and Humanities. Richard Hall is Professor of Education and Technology in the Faculty of Health and Life Sciences. Ros Lishman is Senior Lecturer in the the Department of Politics & Public Policy in the Faculty of Business and Law. Jo Rushworth is Senior Lecturer in the the School of Allied Health Sciences in the Faculty of Health and Life Sciences. Richard Snape is Research Fellow in the Institute of Energy and Sustainable Development in the Faculty of Technology.

Four of the team members (Brown, Lishman, Rushworth, & Snape) are undertaking small scale research projects in their respective subject areas, representing the four Faculties of DMU. Each has recruited six first year undergraduate students from within their Faculty as partners. In the Faculty of Technology, the research will focus on the particular experience of learning difference for students with autism through a first year undergraduate mathematics for engineering module. In the Faculty of Health and Life Sciences, the research is examining the impact of UDL on a programme with large cohorts, and will provide a comparative analysis between first and second year undergraduate students, the latter who did not benefit from UDL in their first year. In the Faculty of Business and Law, the research will undertake a latitudinal study of student perceptions from across a range of different programmes. Small focus group workshops will course programme student representatives. In each case, the methodology and outputs of the research will be defined in partnership with the students through small scale participative action research.

This paper will focus on the research being undertaken in the Leicester School of Architecture, part of the Faculty of Arts, Design and Humanities.
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<th>Age</th>
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<td>Dyslexia</td>
</tr>
</tbody>
</table>

Figure 1: Sample of BA (Hons) Architecture undergraduate students.

**Student perceptions of UDL in Architecture**

A focus group formed of a representative sample of six students on the first year of the BA (Hons) Architecture course has been formed to collect detailed student feedback on the implementation of UDL. Of the four disciplinary areas being examined in this university-wide study, this is the only in a design discipline, and the only in a programme that is validated externally by the respective professional bodies of the discipline.13

Six first year undergraduate students on the BA (Hons) Architecture programme were recruited via an open call for volunteers (see figure 1). The students will meet regularly through the spring and summer terms of the 2016/17 academic year, and will be remunerated for sixteen hours of their time at the UK National Minimum Wage of £7.20 (approx. $9.00) per hour. From a cohort of 162 full-time students, 8 volunteers presented themselves and 6 were selected based on a very approximate demographic representation of the cohort’s gender and background. Two of the students had completed a one year foundation course at DMU prior to beginning their undergraduate studies, and as such had some experience of the institution before the start of their undergraduate studies. Three students had declared disabilities: two are diagnosed dyslexia and one has profound physical disabilities affecting her personal mobility.

With no elective options, all students on the programme are enrolled on the same modules in year one: Architectural Design 1 & 2 (15 & 30 credits, delivered sequentially), Architectural Communications (15 credits), Architectural History and Theory (30 credits), and Building Performance and Technology (30 credits). All modules involve some degree of lecture-based teaching; and Communications and Building Performance and Technology are both largely delivered through small group workshops. The signature pedagogy of architectural education at DMU remains studio tuition in Architectural Design 1 & 2, which with six hours of tuition per week throughout the academic year remains the single biggest element of the students’ teaching calendar.

As an ice breaker exercise at the first focus group, and to prompt initial conversations about learner differences, the student volunteers were invited to complete a learning style questionnaire based on that of Peter Honey and Alan Mumford, itself derived from the work of David A. Kolb.14 Recognizing the limitations of any such exercise, students were then invited to
discuss whether or not they agreed with the classifications generated by the questionnaire. Perhaps pleasingly for a subject that prides itself on the intersecting skillsets of design, technology and the humanities, few students found that they were clearly characterized by any one of Honey and Mumford’s learning styles, with all students reporting that they represented variety of combinations of activists, reflectors, theorists, and pragmatists. Having prompted a discussion about the potential limitations of such classifications, the focus group turned its attention to four of the six UDL ideas, which were introduced to the students in turn. Students were prompted to respond to the following questions, and the researcher transcribed responses on screen. The transcription was then coded to generate the following summative statements.

**Does it help you to be able to download, view and/or edit learning materials before a teaching session?**

When questioned about the value of reading learning materials before a class, the focus group revealed itself to be composed of a remarkable diversity of learning styles. Only one of the four students present declared that he would usually read learning materials distributed online before a class, and this practice was informed by the difficulty he had experienced processing learning materials in secondary education. All four students reported very different combinations of engagement with lectures, from active note taking to passive listening. One student regularly makes his own audio recordings of lectures to clarify details later.

Of the DMU UDL requirement that instructors distribute editable versions of learning materials before classes, only one student supported the ability to open, edit and re-format documents. Of the two students with dyslexia, the one in receipt of DSA reported the usefulness of specialist software purchases using the funding, notably text-to-speech software that was capable of reading PDFs composed of scanned pages of books.

All students reported an awareness of the different attitudes to UDL demonstrated by different instructors, including instructors who make it clear that they will not distribute full lecture notes online as a means of encouraging active listening and engagement.

**During a teaching session, does it help you to be directed towards other independent learning opportunities?**

The focus group unanimously reported a universal disdain for the traditional bibliography, explicitly referring to the recommended reading list of more than thirty titles in one Module as particularly unhelpful. Regardless of learning style, the academic profile of students enrolling on BA (Hons) Architecture is highly diverse, with students beginning the programme with very different experiences of literate subjects. Regardless of academic background, students reported that in year one it was difficult to approach a long bibliography or an eight hundred page book on the history of architecture with confidence. Instructors who distributed PDF scans of individual chapters were praised.

**During a teaching session, does it help you to be provided with opportunities for checking your learning?**

For written work, one student with dyslexia expressed the benefits of being able to share drafts of written work with a specialist tutor provided for by DSA support funds. Students were generally unfamiliar with the possibilities afforded for knowledge checks, tests, and quizzes by VLE software, and expressed only mild enthusiasm for the benefits of such tools.

**Would it help you to be able to replay, rewind, pause, and skip through a video of a teaching session online?**

While no Instructor in year one of the BA (Hons) Architecture course currently engages with DMU Replay, students were aware that the technology existed and was being used by some instructors in other programmes. Not having directly experienced lecture capture, the students’ responses were entirely hypothetical, but nonetheless recognized the relative applicability of the technology across the different modes of teaching in their programme. All students agreed that there might be value in being able to replay lectures, as it would afford students the opportunity to revisit not only the narrative being delivered by the lecturer, but also the images that illustrate it. Two students acknowledged – unprompted by the researcher – that the reassurance of lecture capture being available would make attendance at lectures in person less desirable.

Perhaps most significantly, there was agreement amongst the students that as the core element of their curriculum (both in terms of credit weight and study hours) the design studio was not an appropriate environment for lecture capture. This was attributed in part given to the practicalities of recording group tutorials in open plan studio spaces, and in part to concerns about student privacy in an environment in which one to one
and small group tutorials are generally structured around the constructive criticism of individual student’s work.

Discussion

At the time of writing, the research project this paper describes is ongoing, and as such it is not yet possible to present summative conclusions. However, it would be apposite to make the following statements with regard to how one university’s engagement with UDL has been experienced through the eyes of beginning architecture students.

Firstly, it should be noted that the authors are aware of the limitations of the questions we are posing. UDL is being deployed at DMU in order to broaden academic opportunity to the widest possible range of learner styles. Student perceptions of its appropriateness as a learning and teaching framework are naturally going to be constrained by their own limited appreciation of others’ learning styles.

It is difficult to ascertain whether implementing the aims and ideas of UDL across all of DMU’s programmes is helping to recruit and retain students with a wider range of learning styles, or whether current students feel that it is practically enhancing their student experience. A much wider qualitative survey is recommended, and it is the intention of this research project to inform such research as and when DMU formally introduces the second phase of its UDL programme in the 2017/18 academic year.

UDL has been introduced at DMU in response to cutbacks in government support for students with disabilities. It is unclear whether students of architecture perceive whether the stated benefits of UDL are in alignment with the University’s ambitions for the programme. However from their varied past experiences of secondary education and their initial experiences of higher education, it is clear that implementing UDL is unable to replace the dedicated learning support some of our students clearly benefit from, such as the specialist feedback provided by learning support tutors. Our initial findings suggest, however, that there is no difference between the perceptions of UDL by those with declared learning differences and those without. While even our students who have not had direct experience of lecture capture at DMU report enthusiasm for the adoption of the technology, especially if it allows for different degrees of engagement with scheduled teaching sessions, it is self-evident that an audio described playback of a lecture is of little use to a deaf student who might still rely on a scribe or sign language interpreter. So while these technologies and these pedagogical principles are being heralded as a response to changing financial support for students with the most extreme learning differences, they are in fact more appropriately considered here as radical opportunities for all students to interact differently with both learning materials and the institution that delivers them.

While lecture capture technology is rolled out in classrooms and lecture theatres across the DMU campus, its usefulness at the core of a design discipline such as architecture remains potentially limited. The introduction of DMU Replay at the start of the 2016/17 academic year just so happens to have been concurrent with the opening of brand new teaching spaces for art and design subjects in the multi-million pound Vijay Patel Building. However the hardware that is required for lecture capture – fixed digital video cameras, lectern microphones, classroom microphones, and preloaded software on lectern computers – remains extremely expensive to deploy and seemingly incompatible with studio tuition. Given that the signature pedagogy and teaching space of architectural education is proving to be both practically and pedagogically incompatible with lecture capture, the potential impact of this element of DMU’s interpretation of UDL remains limited to the traditional mode of teaching by lecture.
Notes


2 See James Brown & Eileen McGonigal (2016). One to one to one: a triumvirate of interpersonal relationships in beginning architecture education. NCBDS 32, Cal Poly San Luis Obispo, CA.


9 UCU DMU Branch Committee email to members, September 2, 2016.

10 UCU DMU Branch Committee email to members, September 30, 2016.

11 For further discussion of the legal issues surrounding lecture capture in the UK Higher Education context, see JISC Legal, 2010. Recording Lectures: Legal Considerations. Glasgow: University of Strathclyde.

12 DMU offers a variety of one year foundation courses for applicants who are not eligible for direct entry to an undergraduate course. These include a Business and Technology Education Council (BTEC) Diploma in Art and Design, and in collaboration with Leicester International Pathway College an International Foundation Certificate in Art and Design. For more information see http://www.dmu.ac.uk/study/courses/foundation-courses/foundation-courses.aspx and http://www.dmu.ac.uk/dmu-leicester-international-pathway-college/dmu-leicester-international-pathway-college.aspx

13 The Royal Institute of British Architects, the Architects Registration Board, and the Commonwealth Association of Architects.

Designing Anticipation: experimenting with dynamic change

Simon M. Bussiere, University of Hawai‘i at Mānoa

Abstract

Our students know that dynamic change is natural, constant, and that understanding change in the context of the built environment is a key mandate of theirs as inheritors of the design disciplines. While they easily recognize that change is happening all around, they often struggle to understand how and more importantly why such dramatic change materializes in the environment. And so, in order to better understand the complex nature of accruing and perpetually “self-modifying” landscapes, it can be useful to simplify and simulate the generation of certain patterns and processes into controlled constituent parts.

It is with that organized and reductive approach to learning in mind that students in my first year studios experiment with dynamic change through a series of non-representational studies. First, they are given ingredients: flour, salt, water, oil and yeast as media for an experiment. Then I ask them to create a replicable dough assemblage. They make a series of static containers for the dough based on formal parameters, then they observe - over the course of an afternoon - as the yeast devours complex sugars and forms organic volumes within the space they provide. (Fig. 1) Then in visual reproductions at a finer scale, they study and formally diagram stages of the newly created assemblage as it grows. Bubbling gases and soft inflated forms are produced at first; the dough becomes massive and it is eventually swallows the now clearly too-small static container they made for it. Eventually the form deflates and is reduced and hardened into a distinct structure.

Next, to extend the duration of the living experiment, the students are given alfalfa seeds to germinate. They create a small hydroponic terrarium for the sprouts to live, and over the next two weeks, they observe and document the growth patterns in plan and section, taking care to diagram root morphologies and spatial distribution. When their sprouts have developed and are thriving, they introduce an ecological disturbance of their choice. Students initiate a process of dynamic change through a simulation of their selected disturbance. Flooding, extreme heat, cold, wind, drought, acute pollution or herbicides, etc., occur at a simulated scale within their terrarium. During the disturbance, they are able to trace the material and temporal effects through a time-based graphic analysis. Following the abrupt introduction of the disturbance, they are able to observe either a partial rebound of the resilient plant-life, or an irreversible and degradation of conditions needed to support life. In both cases, learning is evident.

This paper will evidence that students gain a conceptual appreciation for anticipation as a critical design tool through these two exercises. Taken together with other formal experimentation and foundational composition work, it will be argued that students are better able to address issues of adaptation, intention vs. reality, material limitations and unintended consequences when living media and tangible dynamic forces are present in the design studio.
Introduction

Breaking out of a deterministic mindset can be a challenge. After all, Newtonian physics governs much of contemporary science and engineering, and most conventional wisdom about how the natural world is governed generally, through a deterministic and predictable view made possible by human measurement and technological invention. From early in our education, we learn to locate a problem, interrogate it from alternative angles, synthesize information about it, and eventually attempt to solve it by predicting the outcomes of a set of predetermined actions we engage in a deliberate manner. This is how we solve most problems in design, and how we tend to think we can achieve improvement on otherwise uncontrolled systems all around us. While the determinist world view is common, and not without merit, its inherent oversimplification of complex environmental processes in the context of environmental design is more common than we like to admit as educators. In the west, we tend to see the natural world as wild, chaotic and needing human ordered governance; requiring management and cautious, methodical human tending.

Joan Nassauer aptly describes this dilemma in a 1995 article in Landscape journal entitled Messy Ecosystems, Orderly Frames. “The distinction between function and appearance may distress idealists who regard presentation as dissembling, but it is intrinsic to the concept of design, in which each landscape is recognized as one of any number of possible designs for a particular place.” She elaborates with a contradictory point, “However, even designers may become strangely submissive in the face of nature’s genius, sharing in a common popular delusion that nature will speak for itself, if only human beings will quit interrupting. A belief that nature needs no presentation and that presentation is essentially sinister in its intent leaves ecosystems highly susceptible to misunderstanding.” (Nassauer 1995) Achieving balance between prescribed order on one hand, and embracing natural indeterminacy on the other, is at the core of the contemporary struggle of landscape architects.

Through an examination of the two projects in the following pages, this paper will argue that simply because the determinist view creates a limited bias and makes us struggle to wrap our minds around complex natural changes that occur in small increments, over stretches of time, that does not mean that nature is fundamentally ‘chaotic’. It means that we must study this phenomenon further to better understand how nature is framed – how the ideal or pastoral landscape is either deliberately shaped or left to its own devices. These two projects in foundational landscape materials emphasize this cognitive dissonance.

Projects in Foundational Landscape Materials

Students who have studied design fundamentals at any level are familiar with that process of inquiry, and the subsequent evolution of making, including models, sketching and drawing,
among other media used to visualize ideas. Students are often proficient in a range of skills suited for making and representing objects through deliberate craft to reflect their visions. Crafting static entities such as drawings and physical models is an enjoyable and rewarding process as well as an essential part of design and design education. As a landscape architect teaching in an interdisciplinary common first-year program that included students and faculty from architecture and urban planning, it became necessary for me to continue that evolution of craft into a studio method that could simulate landscapes and generate physical and non-representational work and instead, as this paper will illustrate, visualize change over time – a critical lens into issues pertaining to not only landscape architecture, but more broadly into issue of ecological resilience, and a means of visually studying how simulated landscapes exhibit change that can be extrapolated to larger scales.

_Yeast assemblages_

In a first project that focuses on change and material dynamics, students are instructed to build a replicable container, to include a floor plate, and several walls to define a path of travel. Next they create a living dough assemblage using simple cooking ingredients, flour, warm water, oil, salt, sugar and yeast. The assemblage is essentially an unbaked bread recipe. Next before the dough has a chance to rise, students set up cameras and introduce the dough to the container/context. Over a period of thirty minutes to two hours, as the dough develops, doubling or tripling in size, it bubbles and spills over those previously sturdy walls and built edges, filling up void spaces, collapsing flimsy constructions, and making students first aware of unintended consequences and reinforcing that nothing they create is permanent. As the dough accretes and simulates an element of landscape, students study their assemblage through video, time-lapse and still-photography to extract patterns for later reinterpretation in diagrams and modeling materials. (Fig. 2) Through new models, the students attempt to abstract and synthesize key structural features of the dough assemblage, with a focus on gaining greater understanding into how the living material accrues over time.

At this stage, students look for traces of the ingredients they previously mixed together – sugars being consumed by yeast to form bubbles, watching as undulating surfaces of contiguous dough dries and cracks at weak points and intersections. Here they can also introduce reinforcing materials such as bent wire to provide an armature for the dough to grow on. (Fig 3.)

_Sprouts and environmental disturbances_

While yeast is fast-acting, and the dough assemblages are able to quickly yield new information about change-over-time, some environments change more gradually. To explore a slightly steadier and slower transition of living materials, next, students construct a hydroponic terrarium to germinate and establish a field of alfalfa sprouts. They are given a fixed number of seeds to use in their terrarium, and they’re given freedom to determine...
the size and shape of their growing space. Terrariums range from more typical rectangular water-tanks, to highly sophisticated tube systems, to more flimsy versions that might fail in a variety of ways. (Fig 4.) The range of terrarium styles is remarkable, and can possibly provide a window into students’ individual cultural and geographical bias, revealing where the students come from - how urban, suburban or rural the student’s lifestyle and background has been to this point. This opportunity for a high degree of self expression is deliberate. I want the first-year students to design their own environment based on something familiar or suitable to them so they feel somewhat confident and familiar with the context, and so that they feel a sense of accountability for its success. They all share in a common material – the sprouts – but they will individually be dictating how their sprouts establish and ultimately survive or fail.

While the sprouts accrue, students keep visual records, documenting both plant material above the root line, and closely studying the sprout’s root architecture below a simulated grade at the water line. They are looking again as they did before with their dough assemblages for spatial patterns in the living materials, and drawing out the indispensable spatial arrangements within for further study. With sprouts however, those changes are more gradual, and due in part to the textural and green material, more literal. In plan-view, students can observe how their seeds expand, open and spread out in a horizontally organizational manner, depending on the surfaces they designed to hold them. And in section, they can observe structural frameworks at a macro and micro scale – new roots searching downward for a source of water, and green leaf matter above competing heliotropically for sunlight. (Fig. 4) After a week, when the sprouts have established in their new environment on a studio desktop near a window, and the students are satisfied with the distribution and new formation of their vegetation, we start the next phase – the introduction of an environmental disturbance.

In this phase, we emphasize through non-representational media – the actual growth of plants – that nothing is permanent, and that the only constant in nature is change. My hope is that by focusing on temporal change, through environmental dynamics, that students of architecture, landscape architecture and urban planning and design will be better able to assume risk in their later work. They will also be armed with the knowledge that despite the best of intentions, that sometimes their work will fail, and at the very least, be subject to unintended consequences. In this project, we study landscapes as biological, living things and we ready ourselves for surprises. We examine landscapes as self-regulating and incrementally accruing frameworks for life, then we interrupt their natural cycles with an introduced phenomenon.

Fig. 4 Terrarium profile photograph. Alfalfa sprouts were germinated in a shallow tank, so roots and plant material above the root line could be observed as their structures accrue incrementally.

Fig. 5 Spatial patterns are observed in a plan view diagram of this student’s terrarium. These patterns will be abstracted and reinterpreted in a series of fixed media in later stages of the project.

Once the terrarium has grown fully and has been studied carefully, it has achieved a nominal utility. Next it will become even more useful as a learning tool, as students consider what else its physical change can teach us. Depending on the terrarium, students are next required to determine what type of landscape theirs can best simulate, prairie, farmland, river basin, etc. That rectangular water-tank terrarium could simulate an agricultural field for example. That intricate tangle of tubes could simulate an urban environment of impermeable surfaces, an overgrown terrarium can simulate a rainforest or tropical environment. With a simulated site in mind, students are next directed to research environmental disturbances for their site.
As a class we research and discuss possible environmental disturbances generally, and then make selections for further integration and experimentation based on context. A terrarium that simulates an agricultural environment would be an ideal space to introduce and study the effects of pesticide or herbicide runoff. In that case, we would spray an herbicide in certain doses on the surface of the plant material. Or for that matter, the flat terrarium could be used to simulate a tornado or major wind event that would allow a student to learn about the impacts of erosion and deposition. In that instance, the student would be advised to use an air compressor to make controlled bursts of air that might uproot portions of the terrarium. Fire, would use controlled fire, flood would inundate the terrarium with contaminated water, drought would entail the chronic removal of water, and so on. Depending on context, the type of terrarium, and the desires of the student to learn about that specific form of episodic or chronic disturbance, the experiment could transpire in numerous forms. In many ways, the design of the experiment itself is perhaps the most rewarding part of the process for students.

As a disturbance in introduced, students follow its impact closely through video, time-lapse and still photography. Using a fixed position for their cameras in section view, they track the disruption to an otherwise calm stasis within their simulated world as it - in very specific ways - interrupts and unsettles the plants they had previously grown from seeds. Once the disturbance is over, there is a period of natural reiteration, wherein plants attempt to restore themselves and regenerate. This regeneration is observed to varying degrees, and depending on how substantial the episodic disturbance was. In the case of a chronic disturbance such as sea level rise, or atmospheric deposits such as acid rain, the simulation would be more difficult to reproduce and follow.

At this stage, the studio researches and discusses concepts of ecological resilience. “Resilience is the capacity of a social-ecological system to absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and functions. It describes the degree to which the system is capable of self-organization, learning and adaptation” (Holling 1973, Gunderson & Holling 2002, Walker et al. 2004). Students next produce a layered transparent collage to hang in the studio gallery that indexes the key stages of the experiment and raises more questions about how one edits the process of understanding dynamic change-over-time. (Fig. 5)

Fig. 5 Terrarium profile photograph. Alfalfa sprouts were germinated in a shallow tank, so roots and plant material above the root line could be observed as their structures accrue incrementally.

Conclusion

According to James Corner, “Meaning, as embodied in landscape, is also experienced temporally. There is a duration of experience, a serial and unfolding flow of befores and afters. Just as landscape cannot spatially be reduced to a single point of view, it cannot be frozen as a single moment in time.” (Corner 1992) He goes on to describe the limitations of traditional static monofunctional drawing and modeling methods. “Today’s fascination with the visual image, the pictorial, makes it all the more important to recall how the greater part of the landscape experience belongs to the sensorium of the tactile, the poetries of material and touch.” He describes the monotony of some landscapes, where the site feels somehow singular, as a space to receive objects, rather than the living biota we know it to be, full of nuance and mystery. This is caused in his summation, by the borrowing of conventional methods from the field of architecture, the plan, section, elevation, etc.

The representation and by natural extension the learning methods of landscape architecture instead requires a broader lens, and one which dwells in the tactile and the temporal. A drawing is easily decoded - it is static - it can be scanned by the eye and measured easily. An environment which we are attempting to understand and that which is fraught with complexity and disorder, is not so easily replicated or simply visualized. This dilemma – how to draw out and design with temporal change, how to anticipate that change, and how to best become alert to the consequences of “good intentions”
Simon M. Bussiere

are among many challenges in beginning design pedagogy, and
certainly worthy of deeper study.

Notes

Corner, J., “Representation and landscape: Drawing and making in the
landscape medium.” Pages 243-275 Word & Image Vol. 8 , Iss. 3,1992

Nassauer, J. “Messy ecosystems, orderly frames “. 1995. Landscape

Waldheim, C., “Strategies of Indeterminacy in Recent Landscape Prac-
30088/27649

Transformations in Systems of Humans and Nature. Island Press,
Washington DC.

bility and Transformability in Social-Ecological Systems. Ecology and
Society 9:5.
An Examination of Beginning Design Studios Through the Lens of Behavioral Economics

C. A. Debelius, Associate Professor, Appalachian State University

Introduction

This paper offers a brief description of the field of behavioral economics, its fundamental concepts, and the relevance of the field to design studio instruction.

In response to a call for a renewed emphasis on the development of integrative thinkers in design curricula, it must be noted with considerable skepticism that integrative thinking presumes rational human decision-making. The work of the leading researchers and theoreticians in the relatively new field of behavioral economics has successfully challenged the model of rational human decision-making advocated by the adherents of neoclassical economic theory. What is critical to the understanding and appreciation of behavioral economics is that “these irrational behaviors of ours are neither random nor senseless” but systematic and predictable (Ariely, 2008; Kahneman, 2011; Thaler, 2015).

While good design requires well-honed cognitive abilities as well as different types of thinking, it is also true that design thinking in beginning design studios is often messy, inconsistent, and flawed in a variety of ways.

Daniel Kahneman, Amos Tversky, and other researchers have found that human beings have a multitude of cognitive biases: these unconscious errors of judgment may lead to decisions that are inconsistent with logic, probability, or reason. The biases include the tendencies of most people to (a) overrate their analytical and decision-making skills (“overconfidence”); (b) overweight the possibility of a loss, or the factors that might lead to a loss, when making a decision (“loss aversion”); (c) believe that they are less at risk of experiencing a negative event compared to others (“optimism-bias”); (d) over-value immediate rewards relative to long-term rewards (“present-bias,” also referred to as “time-inconsistency behavior”); (e) avoid a task which needs to be accomplished and, in particular, doing more pleasurable things in place of less pleasurable ones, or carrying out less urgent tasks instead of more urgent ones, thus putting off impending tasks to a later time (“procrastination”); and (f) prefer the current state of affairs such that any change from the baseline of the current state is perceived as a loss (“status quo bias” or “default bias”).

Design Instruction Through the Lens of Behavioral Economics

Critics will, quite correctly, be quick to note that not all thinking in design studios falls under the rubric of Rational Thinking. [One might recall, for example, the description of 19th century American transcendentalism as a practice where the world of facts and the categories of common sense are temporarily exchanged for the world of ideas and the categories of imagination. In a number of respects, it is an apt description of a beginning design studio.] On the other hand, rational thought occupies a significant portion of the modes of thinking most prevalent in design studios and, for that reason alone, commands our attention.

Consider two modes of rational thinking in the design studio, one concerned with matters of organization, logistics, and deadlines (in general, activities focused on the production of design products) and the other concerned with formulating and developing a design concept (in general, activities focused on design process).
Design Products

The successful completion of refined 2D and 3D products requires careful consideration of available material resources, project deadlines, and the proficiency of the maker. Failure to complete the construction of design products prior to the beginning of a scheduled review is easily explained by the biases posited by behavioral economics (e.g., overconfidence, procrastination, and optimism-bias).

Design Process

Design investigations in beginning design studios often require a leap of faith, a willingness to take risks in the effort to develop an innovative design proposal. Conversely, students in beginning design studios are often risk adverse and are inclined to stay close to a safe harbor.

In the case of design process, risk aversion puts the student designer at a disadvantage. While risk aversion is understandable in students who are accustomed to success, a reluctance to take risks (sometimes based on the fear of a low grade) is an impediment to growth and development. Yet, for the majority of beginning design students, a normative solution—a safe
What Precipitates Change in Cultural Diversity Awareness in Multicultural Design Studio Practice?

Maya Desai, Angelika Seeschaaf Veres, Nancy Snow, OCAD University

“Diversity has become a code word for ‘all those other folks’. The problem with code words is that they’re lazy: They’re broad rather than specific, and can provide cover for inaction — the “I don’t know how to do this or what it means, so can someone else please do the work for me?” maneuver.”

Overview

The authors of this paper hold the belief that design — no matter it’s specific discipline — works simultaneously in cultural contexts and produces culture. This preliminary study set out to identify what current efforts and design-specific pedagogical approaches — that connect to “cultural diversity” in studio-based classrooms — were being used at OCAD University, a Canadian-urban art and design university. In order to consider broad questions — What is “culture diversity”? How does “cultural diversity” manifest (or not manifest) itself within educational aspects of design education? — the authors sought out to identify and critique current phenomena in the studio classrooms of three of the six design disciplines at OCAD University: environmental design (ED), graphic design (GD), and industrial design (ID).

Methods

Semi-structured interviews were conducted with a small sample of participants, self-identified as working with beginning design students and who engage with notions of “cultural diversity,” inclusion, and/or accessibility in their studio-based classrooms. The participants include: Dr. Peter Coppin, Assistant Professor in Industrial and Inclusive Design; Bruce Hinds, Associate Professor and Chair of Environmental Design; Howard Gerry, Associate Professor in Environmental Design; Howard Munroe, Assistant Professor in Industrial Design; Sheila Sampath, Assistant Professor in Graphic Design; and Ali Qadeer, Assistant Professor in Graphic and Industrial Design. Using approaches from grounded theory (Strauss and Corbin, 1990) interview transcripts were analyzed to identify categories and subcategories found within the phenomena.

Starting in Assumption: “Cultural Diversity”

In the OCAD University classroom half of learners identify as non-white and from a range of different ethnicities. This, however, is not currently reflected in the faculty complement nor in established design education teaching practices. This study questions design culture on two fronts: one of ethics — what value does the succession of a dominant design culture have to a contemporary learner — and one of enhancing design practice — learners enact that which they learn, therefore perpetuating a design culture that is no longer reflective of contemporary Canadian society, hinders the advancement of design practice, and limits the opportunity to create new knowledge.

Therefore the authors wished to assess and critique current classroom practices of studio-based learning — assignment structure, design process, the setting of the learning space, critique, and the assignment outcome(s) — considered through a lens of “cultural diversity.”

In order to establish a common starting point for each participant’s interview, the UNESCO definition of “cultural diversity” was provided specifically because it emphasized “cultural diversity” as “opportunities for dialogue.” The authors found this meaningful to the design education context where design should be permeable and provide fluidity between art, technology, and society.

“Cultural diversity is a dynamic process whereby cultures change while remaining themselves, in a state of
permanent openness to one another. At the individual level, this is reflected in multiple and changing cultural identities, which are not easily reducible to definite categories and which represent opportunities for dialogue.” (Koichiro Matsuura, 2009)

The participants responded to various aspects of the definition of “cultural diversity” in context to their experiences as educators in the classroom, design practitioners, and individuals. What emerged was a very rich contextual landscape of individual definitions on what cultural diversity could mean in the context of first-year design studios:

Sheila Sampath (GD) spoke from the perspective of positionality and analysis of power structures: “My issue with “cultural diversity” and “multiculturalism” [I tend not to use terms like cultural diversity, and I definitely don’t use terms like multiculturalism] is that it assumes an exchange void of power, and so my acceptance as a person of colour, of white-dominant culture is...first of all it’s not consensual...that’s the nature of colonialism, but the lack of acceptance for my culture is political violence.”

Ali Qadeer (GD) spoke from the perspective of design in context to its origins, “[Design] comes from a very culturally located place. I think that there’s an impossibility towards creating a completely diverse and inclusive classroom in these fields in the same way that I think that diversity in something like English [literature] isn’t necessarily entirely a possibility... permanent openness to one another: I think that’s a very accurate utopian vision of diversity.”

Howard Gerry (ED) spoke in context to the complexities of culture and heritage, “[I have] observed that often culture and heritage are intertwined and confused and/or separated. There are many people who have strong ties to their heritage, but don’t practice [it’s] cultural norms. So, the question of culture, heritage, practice, I think it’s always in flux...There’s a culture within a given workplace or within an institution, there’s a peer culture when, for instance, our students come together. There is a private culture at home that may be at varying odds with say the work culture”.

Howard Munroe (ID) also argues definitions of culture as heritage and asks students the question: what is your history? “Maybe you need to be going and interviewing your grandma about those histories that they’ve lived, so [students] get an understanding of that and then [students] can start to pass that information along ...[and] blend this knowledge [about heritage] into their design process. I tell my students not to be afraid of doing that.”

Bruce Hinds (ED) spoke from a perspective that favoured embodying cultural behaviour, habits and perspectives in environmental design over cultural pastiche, “I do think that the idea of cultural diversity ... [is] necessarily a direct representation of a cultural identity imposed on say a project. But there may be ways of discussing space [and] the use of space.”

Peter Coppin (ID) frames industrial design as “a highly universal practice. Because it’s dealing with issues to cut across the globe that every culture faces”... “each body is different, but they’re different relative to certain similarities [a human body].”

While UNESCO’s definition of cultural diversity could serve as a bridge to individual interpretations of the concepts of “cultural diversity” offered by the study participants, it has become apparent that “cultural diversity” cannot be absolute in its definition. Its contextual nuances need to be explicitly stated for it to be rendered actionable in a given environment. Across the disciplines, multiple meanings of “diversity” were revealed during the analysis of participant discussions and predominant areas of focus emerged:

A) **Lived experience**: Valuing lived experience as expertise and honouring individual learning processes.

B) **Language**: Opportunities and limitations of language as a tool for understanding and articulating design intent.

C) **Discipline-specific dominant design practices**: Addressing the challenges of embedded disciplinary practices that limit the inclusion of varied cultural perspectives and practices.

**Levels of Engagement**

As showcased in the variety of perspectives on “cultural diversity” offered by participants at the onset of their interviews, analysis of discussions on educational aspects of studio-based classrooms—assignment structure, design process, the setting of the learning space, critique, and the assignment outcome(s)—led to the consideration of the means by which “cultural diversity” is made tangible in the studio classroom.

“Anything that moves the individual towards a more inclusive, differentiated permeable (open to other points of view), and integrated meaning perspective, the validity
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of which has been established through rational discourse, aids an adult’s development.”

The following matrix diagram (fig.1) plots levels of engagement as offered by each study participant.

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<td>Final Presentation/Assignment Evaluation</td>
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|                      |     |     |     |     |     |     |
| **LANGUAGE**         |     |     |     |     |     |     |
| Assignment Structure | P   | P   | P   | P   | P   | P   |
| Process              | P   | P   | P   | P   | P   | P   |
| Space                | P   | P   | P   | P   | P   | P   |
| Critique             | P   | P   | P   | P   | P   | P   |
| Final Presentation/Assignment Evaluation | R/P | R/P | R   | R   | R   | R   |

|                      |     |     |     |     |     |     |
| **DOMINANT PRACTICE**|     |     |     |     |     |     |
| Assignment Structure | P   | P   | P   | P   | P   | P   |
| Process              | P   | P   | P   | P   | P   | P   |
| Space                | P   | P   | P   | P   | P   | P   |
| Critique             | P   | P   | P   | P   | P   | P   |
| Final Presentation/Assignment Evaluation | C/R | R/P | C/R | R/R | C/R | R/R |

**Fig. 1 Levels of Engagement Matrix**

In order to expand on the matrix, the following sections offer a detailed insights into the tools and pedagogies used across the three most prevalent areas of focus: (A) lived experience, (B) language and (C) discipline-specific dominant practices.

**A) Lived Experience**

Value of lived experience and individual learning processes of students was mentioned at multiple points in most participant study discussions within each educational aspect of studio-based classrooms. This included actions such as attempts to channel students interests outside their field of study (i.e. creative writing, mathematics) into their design methods/ process/practices, uncovering heritage through peer-to-peer interviews, disruption of dominant design practices through positionality, analysis of power structures, and coping skills for anxiety.

The following two examples provide specific details of lived experiences being made actionable in the studio classroom through the sharing of heritage and accommodation for public speaking.

**A1) Sharing Heritage**

Howard Munro (ID) provides an example of an information gathering method that he uses in the “Metaphor chair” assignment which has a student create a physical chair that represents a fellow student. Through the use of interviews, students—as part of their inquiry and discovery within the research phase—learn about particular behaviours, habits, and cultural practices which is then embodied in form of a chair.

Howard Munroe (ID) explains the process as follows:

“The way the assignment is set up is that the student has to interview another student to learn about, interpret, and synthesize key points about their peer. “[So for example] you might have a student that’s from Peru and a student that’s from Canada, and the student from Canada is trying to understand key points about the Peruvian student and vice versa. Then they’re trying to synthesize, interpret, and embody these findings into a “metaphor chair”. What the student is intending to do is trying to fill in those gaps because you only have a certain amount of time to interview the student, so it forces them to do a little bit of research on their own, what more do I need to know about my peer’s culture that I can only find out through an interview. The student has to actually try to interpret the culture of this person and that forces them to learn about somebody else.”

Through a facilitated intercultural dialogue, students are challenged to confront and overcome cultural stereotypes and understand cultural practices on a personal level through peer interviews.

**A2) Accommodation through Critique**

Howard Gerry (ED) uses group presentations as a tool to support those who are not confident in public speaking. He states in group settings the individual student feels supported by their peers—when each member has to cover some aspect of the presentation—and they can practice their particular component and present it in context to the group instead of being singled out to deliver the presentation on their own.

When critiquing an individual project, Howard offers students the option to present publicly or individually during office hours, as well as provide the possibility of gaining feedback inside or outside the classroom from the instructor. In the case where a student is really challenged by the idea of presenting to the class, the instructor offers to present on the student’s behalf, “I will present the
work, I’ll put the work up and so the students can see it and gain feedback from their peers without the individual having to actually present their work. That seems to work well for individuals that have problems with presenting.”

By gradually integrating students into the critique environment, Howard creates a safe space for students to improve their public speaking skills and slowly gain confidence when speaking in front of a class.

**B) Language**

Many of our participants identified language as critical to design but also a challenge in the classroom. Language (oral and acquisition) as opportunity and/or limitation in reference to understanding of assignment intent, articulation of a concept or idea, and discussion in a critique setting was a predominant occurring area of focus with most study participants. This included actions such as peer translation of oral presentations, faculty presentation of student work, clearly written assignments further augmented in class for clarity, encouragement of process work developed in native languages, providing support through group presentations and on-on-one meetings to target specific areas of skill development (public speaking) and written transcripts of class proceedings for clarity and accommodation.

The following two examples provide specific details of how supports for language comprehension, articulation and deconstruction are being made actionable in the studio classroom.

**B1) Modes of Communication**

Sheila Sampath (GD), states that she emphasizes the value of clearly written assignment instructions to support understanding, “[I use] clear written instructions, going through those [written instructions] really thoughtfully in class, explaining them, using different types of words. I might communicate it in academic language, or in professional terms, but also in conversational terms to make sure that different kinds of people can understand the instructions. And also just being available to answer questions, showing [visual] examples.” Struggles with language are not limited to the language learner and language is cannot be reduced to simply understanding words. Sheila acknowledges that students have various experiences with the use of language and therefore consciously uses multiple modes of communication to ensure her intent for an assignment is clear for a variety of learners. In doing so, she facilitates a student’s understanding and learning of design.

**B1) Deconstructing Typologies through Language**

Bruce Hinds encourages students “to use language in a much more sensitive way.” When presented with a project brief, students are asked to deconstruct and reconstruct the intent of the project through the conscious use of language (oral and written). Students are encouraged to question established typologies, and culturally and contextually examine “defined and definable key words so that we understand if we are talking about something like a market, what is a market, what does that actually mean? I think that opens the opportunity to bring cultural diversity certainly into the conversation and it puts the studio and the brief on a level playing field.” For Bruce, language not only serves to communicate intent or idea, but is a means to discuss and explore the significance, use, meaning, and behaviour within a given space across many cultures. In this studio classroom practice, language becomes a creative driver.

**C) Discipline-specific Dominant Practice**

The analysis of the participant discussions revealed the challenges and limitations of embedded disciplinary practices within a “culturally diverse” classroom context. Discussions with study participants exposed that embedded practices have become naturalized and being critical of those practices creates a paradox between an academic mandate (critical engagement with embedded practice) and being prepared for current professional design practice and culture. This included a limited range of actions from study participants such as the investigation and challenging of established typologies, recognition of risk-taking that challenges the prioritization of exquisite form-making in evaluation, and shifting critique from a master-apprentice model to one of dialogue in a safe space.

The following three examples provide insights into how the discipline-specific dominant culture is being challenged through actions in the studio classroom.

**C1) Creating Consensual Spaces**

Sheila Sampath informs her approach to in-class critique by first unpacking the dominant critique practice and questioning how and if it should be part of the learning environment. She creates a consensual agreement among students and herself in the classroom and asks students to explicitly express the ways in which they would like to be critiqued and motivated. “I think that critiques are just something that we do because we do them, and so being
really clear about what you want from it and then in terms of those presentations I often ask students ... because what I’m trying to do is build collaborative classroom environments as opposed to competitive classroom environments. In terms of the structure for critiques—it tends to be informed by conversation. So yesterday, as an example, we came up with a respect agreement... ‘I need to be challenged in my critiques, I want you to tell me what’s not working’ ... ‘if that’s your first and last sentence—this isn’t working—that actually doesn’t motivate me, it just shuts me down’” So as a class we came up with a rule for, critique as a place of support, and also give suggestions and next steps for how to move forward. [For example] if you tear someone down in that class it is okay. They all seem to want that, surprisingly, which is going to be a challenge for me because that’s not my style. But after you tear someone down, here’s how you can reassemble those pieces.”

In building a consensual space, the unexpected challenge that Sheila faced was that some students requested the dominant form of critique, a form of critique that is not congruent with their practice of creating a safe space in the classroom. However, the student’s intent is respected by providing ways in which the practice of critique can be beneficial to all participants.

C2) Dominant Voices in Critique

Ali Qadeer (GO) is very aware of certain dynamics—often gendered—in the critique environment, in which a limited number of students dominate the space of discussion and feedback.

In the following example he explains how these power dynamics presents itself in the classroom:

“What do I [as the instructor] is not talk too much, [and] I’m trying to figure out how to neutralize the voice of eager men. I’ve noticed there’s a dynamic in my classroom, which are 80 percent female usually, that there are male students who are good students, intelligent people, but who start to dominate the conversation in the classroom... I am trying to find ways to, not shut that down, and not make them feel like their voices are unheard, but to make sure that this is a classroom environment where everyone should feel comfortable to be able to respond and talk and dialogue and the other thing is that, and sometimes this isn’t even gendered. Like sometimes this archetype can be female as well.”

Although challenged to experiment with ways in which this dynamic can be changed systemically, he does respond circumstantially in the classroom when the situation presents itself.

C3) Collaborative Knowledge-building Practices

Peter Coppin (ID) runs a “three-part assignment in which the first part they [students] come in with their ideas, then in the second part we cluster them [ideas] on the wall and everybody does a model of the diversity of their ideas, it’s like periodic table. [This is called an infinity map]. And it’s important for them to understand how to make a [conceptual] model. The great thing about a model or a periodic table is that the gaps are just as important as the parts that are identified”... “it helps you figure out what that element might be. And so, this process, it’s called infinity mapping, it leads to each student then producing a model of how they think the ideas fit together in the class, that’s the second part, and then the third part, they design teams. This allows students to come up with ideas that they’re passionate about, it also allows them to come up with ideas that are meaningful to them. And by that I mean in a technical way where if you imagine that knowledge is like a tree, the more it interconnects with the tree that’s emerging from someone’s background and experience, I think the more the knowledge is retained, the more it interconnects.”

Through the practice of infinity mapping, the master/apprentice model is challenged with the intent of creating new knowledge through the integration of diverse student ideas and expertise.

Conceptual Model: Levels of Engagement

In reviewing the interview analysis, the authors observed the levels of engagement to be cyclical in nature. Often the focus of the answer to a question included a prompt (e.g. some students dominating in-class discussion), with faculty identifying a type of confrontation (e.g. faculty observes the same students contributing to in-class discussions while other students are not, even though it is known [body language, one-on-one discussion] that a student has an interest in contributing) and reacts with a circumstantial response (e.g. does not always pick the person with their hand up first). The faculty might then reflect on the confrontation (e.g. how do I balance eager participant engagement in class) to make a purposeful response or what the authors call an “action” (e.g. offer a variety of discussion styles that allow for more varied participation in class.) This might then create a new situation (e.g. greater in-class participation from more variety of students) that could generate a new prompt (e.g. eager student starts talking to friends in-class because they do not want to wait to share ideas) which
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could either lead to an evaluation of the situation, resulting in a new prompt, or it might go unacknowledged by the instructor. The focus of this paper was to reveal the varied responses from faculty in addressing “cultural diversity”. The conceptual model visualizes these findings in form of a flowchart (fig.2).

The findings of the study reveal how current classroom practices of studio-based learning at OCAD University are challenging dominant design culture, addressing the value of lived experience (student and faculty), and recognizing the key role language plays in classroom communication and the design process.

![Fig. 2 Levels of Engagement Conceptual Model.](image)

**Limitations**

The authors of this paper are aware that this study is limited to a small sample size and focuses on the faculty perspective. As this study progresses, additional design disciplines will be examined (Material Art & Design, Illustration and Advertising) along with greater sample sizes across all six disciplines. As the study uses procedures from grounded theory, interviewing will take place until saturation has been determined. A similar pilot study will investigate the crucial student perspective.

**Conclusion**

“‘Diversity’ sounds polite and hopeful... However much it might feel good, though, diversity talk is not enough.”

The findings also revealed many situations where faculty were addressing certain challenges as they occur or through one-on-one interactions. Even though faculty reflected upon the need to build in tangible components for their studio classrooms that address larger systemic issues, they were hesitant as to how they might be addressed. In light of these discoveries there are two key outcomes from the study. First, “cultural diversity” has multiple simultaneous meanings. The findings have made it apparent to the authors that “cultural diversity” cannot have an absolute definition as contextual nuances need to be explicitly discussed and determined, otherwise there is risk of hollow words (coded words). Secondly, in light of this awareness, it is also apparent that “diversity” can only happen when it is made actionable. Design education must respond critically to the cultural and contextual realities of contemporary Canadian society and a climate of increasing globalization, by exposing students to multiple ways of seeing, knowing, and engaging with the world. In doing so, we can have confidence that emerging
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practitioners and educators will come together to question embedded practices and create a more sincere future for design.

Notes


ii Wood, L. (2016) Student data presentation to Academic Planning Committee, OCAD University (particular image: Ethnicity Undergraduate students, OCAD U 2014 NSSE)


iv Ellen Berrey, Diversity is for white people: The big lie behind a well-intended word. October 26, 2015, Salon.com
The Existing Condition

Undergraduate Studies includes a broad range of offices that impact undergraduate education including first year programs, undergraduate research, civic engagement and capstone programs, and the Center for Teaching and Learning among others. In 2011, the leadership team included a diverse group of good hearted, talented people, too many of whom had fallen into the habit of starting with why they couldn’t do something or why we couldn’t do something rather than generating fresh innovative ideas. They went straight to problems, walls, obstacles and had become stuck, badly. That year, Undergraduate Studies had new leadership. Martha Bradley-Evans became the Senior Associate Vice President for Undergraduate Affairs and Dean of Undergraduate Studies and Ann Darling became the Senior Associate Dean for Undergraduate Studies. We knew we needed to create a sea change or at the very least a culture change that valued innovation and what we have over time called imagination. Our colleague Jim Agutter, a faculty member and leader of the Multi-Disciplinary Design program showed us a way through. He recommended we read Tim Brown’s piece, “Design Thinking” published in Harvard Business Review in 2008.

The Approach

Brown describes design thinking as “a methodology that imbues the full spectrum of innovation activities with a human-centric design ethos” (Brown, 1). We were intrigued by the way design thinking might open up a world of possibilities, empathetic (student centric thinking) and a intentionality in moving from new ideas or innovations and action. Brown says, “The design process is best described metaphorically as a system of spaces rather than a predefined series of orderly steps” (Brown 3).

The simplicity of design thinking’s approach lent itself to infinite possibilities. Inspiration—ideation—implementation—and we could quickly imagine how we would operationalize this, how differently the world we were leading might look, and, importantly, how we would all feel about our work. Very early on we started calling our work: Imagine the Possibilities.

Brown defined the three key moments in this way: Inspiration—“a problem, an opportunity, or both” (3) Ideation—“the process of generating, developing, and testing ideas that may lead to solutions” (3) and, Implementation—“charting the path to market” (3).

As we began the process in August of 2011, we posed the question: what if we encourage the seeds of great ideas to grow into fruit bearing transformations.

What if each student had a transformational experience…every student was empowered to take control…they had an understanding of how the pieces fit together…they were motivated to learn…every student had a mentor to help them through the process…every student felt welcomed and not intimidated…every student was engaged in research…all students created a portfolio of their work…they felt that this was a small campus which supported them…all students knew their professors…every student had a guide to help them make decisions…all students did amazing and relevant work…..(UGS Survey)

What We Did

Our fall 2011 retreat became our launch (we had been in our jobs for two months). Two weeks before the retreat we began our pre-work, a questionnaire that helped us get a sense of where our staff were in terms of engaging in the work of redesigning the undergraduate experience, how receptive they would be to innovation and how student felt about our programs and interactions with them.

We gathered key words or characteristics that groups of students, faculty, and staff thought should describe a transformative education at the university of Utah.
Some overlapped—engaging, exciting, fun—and were consistent among faculty, students, and staff. We sent everyone a copy of Tim Brown’s design thinking article published in Harvard Business Review in 2008 and asked them to read it in advance of the event.

**Day of the Retreat.**

We began by reviewing the results of the survey, posing some key questions, and Agutter introduced the process we would move through over the next nine months.

We spent much of the day talking about the characteristics of a transformative undergraduate education, an ideal student timeline, and what the big topic areas were that we would work on that year. A graphic artist helped us design ideal timelines or the student journey.

General topics—mission, culture, curriculum, outreach, advisement/support, linkage—emerged from the discussions which we revisited during meetings over the next year. These big themes or topics evolved and were refined over time.

Next steps after the retreat were to build innovation support; refine process; refine ideas; pitch ideas to broader audience. And, over next three years—engage, inspire learning, build community, student success, integrate, and high impact (what we call deeply engaged learning)—became the key identifiers for clusters of projects and units in UGS. In 2014, we organized around these themes as portfolio teams which worked on definitions, shared goals, and eventually our strategic vision and plan.

From the first we have benefited by a partnership with the Design thinking class. Twenty students from this class joined us for our UGS retreat that first year. And most years we have given the instructor five potential projects we would like students to work on related to the work we are doing in UGS, usually wrapped around a particular theme. Here is an example:

**Design Thinking Class**

Proposed Projects from Undergraduate Studies

This year we are focusing on the theme of creating a sense of belonging. We know from the graduating senior survey that a sense of belonging is an important factor in both retention and completion. The UGS leadership team is reading the book, College Student’s Sense of Belonging by Terrell L. Strayhorn, a national expert on the topic. He writes:

> Belonging—with peers, in the classroom, or on campus—is a crucial part of the college experience. It can affect a student’s degree of academic achievement, or even whether they stay in school…Sense of belonging can come from peers, teachers or faculty, family members, social and academic groups, and living and learning environments. (n.p.)

The members of the UGS leadership team are Educators who empower students to imagine life’s possibilities, and the Undergraduate Studies Mission Statement is:

We provide students with a transformative undergraduate experience through the transition from high school to the university; integrated General Education and coursework before the major; advising, support and advocacy; and, signature experiences from global education, to community service, to research opportunities.
The senior survey suggests a sense of belonging is key to a student’s academic success at the university.

![Image: Survey results: students’ sense of belonging]

We propose projects that address the issue of sense of belonging from a range of points of view. Here are some ideas:

**Mini Documentaries, “My Story”**

Create a collection of mini documentaries of faculty and students describing their understanding of how a sense of belonging is created, experienced, nurtured, fractured, recovered. Once produced and collected, these mini documentaries could scroll on our UGS website.

**Making the Building Loud**

Recently, we have completed a renovation of the Sill Center—the home to the offices and student spaces of the Office of Undergraduate Studies. This project would devise and develop a concept around creating welcoming spaces for students that inspire a sense of belonging. We have created the physical spaces—large welcoming lobbies and sitting areas and now we need to create a rationale, invitation, and opportunities for students to come and hang out at the Sill Center. Answer the question: how do we attract and keep students in the building. What activities might draw students into the building and what resources might keep them here. How would a stronger and more regular student presence change our building? Change our work?

**Creating a Sense of Belonging in a Virtual Teaching Environment**

Each semester more than 15,000 students enroll in at least one online course, yet student feedback suggests that the experience is not always satisfying and certainly does not create a sense of belonging. How can we change this? What conditions, activities, approaches would make you feel you belong to the University of Utah or even your online classroom? What would you propose as an ideal online or virtual environment to enhance sense of belonging?

**Transfer Student Assimilation Project**

Almost half of all students who enroll at the University of Utah started somewhere else and transferred to the U with 12 credits as more. Transfer students often tell us in surveys or focus groups that once they arrive they are overwhelmed, lost, and disconnected. This project asks you to design an approach to helping transfer students find communities, spaces, or individuals who will help them feel welcomed, valued, accepted and celebrated.

**Campus Climate Project**

This project proposes the other point of view—what makes some students and faculty feel like they don’t belong? What situations, spaces, experiences, attitudes, comments and so forth make students feel devalued, disrespected and like they don’t belong? This project should also propose ways of improving campus climate. The client for this project will be Belinda Saltiban, the Director of the Office of Inclusive Excellence.

In 2013, the Design Thinking class and Jim Agutter designed the “Spark” website which was designed to gather ideas, vet them, and organize groups around big ideas.

**Observations**

Using design thinking as a change management strategy was incredibly helpful in working to change the culture of Undergraduate Studies, create a template or ideal framework for what we have called a transformative undergraduate education or the New U Student Experience, and importantly, it has created a culture of imagination, innovation and opportunity around undergraduate education on our campus.
The theme of, “Imagine the Possibilities,” and our primary focus on the imagination or the inspirational step in design thinking, gave us a powerful frame around our work. In our first year, we brought Eric Lui to our campus and gave 1,000 copies of his book, Imagination away across campus. We held town meetings and more than 500 individuals interacted with our word cloud—describing the characteristics of a transformative undergraduate education, we held focus groups with a broad range of students, we held sessions with faculty members and created a series of faculty learning communities around themes like integration, inspired teaching, empathy.

Each year we have focused on a theme but using the same processes of gathering input, valuing imagination and innovation (fresh ideas) and implementing pilots that help us develop and refine our thinking and approach. These themes have included such concepts as a sense of belonging, purpose to impact, to give our team and our consistencies something meaty to work with, to play with or develop. I think it has helped create meaning and relevancy to our work. It feels like it matters and is having an impact.

Benefits of this approach are many:

- It created new opportunities for colleagues across different units to work together on common themes or projects.
- It valued differently the ideas that individuals put into the mix. Fresh ideas were valued and acted upon regardless of where they originated.
- We created a culture of the engagement of students. Students come to our UGS retreats, serve on working groups, are engaged in the development and generation of ideas.
- It created and validated a feedback loop—engaging students through the Design Thinking classes; the Spark website; students serving on committees and on working groups.
- We have had great success piloting (or prototyping) ideas or new programs, there is an experimental sort of freedom that is built in when you are trying something new but you aren’t so wedded to the program yet that you can make adjustments or improvements.
- We have very efficiently moved from inspiration to implementation, ideas to action, in a way and at a pace that is significantly different from other parts of campus or through our state system.
- On-going challenges include communication and engagement of student affairs along with academic affairs. Design thinking embraces a sort of ambiguity when things aren’t as certain as they might be or will become. It seems to work best in finite cultures or divisions with a common mission or sense of purpose than the campus as a whole. The messiness that you sometimes experience can make some persons crazy or resistant.
“Push it. Examine all things intensely and relentlessly. Probe and search each object in a piece of art. Do not leave it, do not course over it, as if it were understood, but instead follow it down until you see it in the mystery of its own specificity and strength.”¹

_The Writing Life, Annie Dillard_¹

Positioned in the middle of our professional undergraduate architectural degree program at Virginia Tech, my role as a teacher is to introduce to students what I call architecture’s constructive realities. Whether in the design lab, the lecture hall, or the seminar room, I ask them:

“How do you find the magic of architecture from a stack of lumber or a palette of bricks?”

For many of the students, this is their first engagement with architecture’s constructive nature or what Louis Kahn would call ‘the hard edges of its’ inspiration.’ They often describe this part of their education and work as ‘technical.’ A shift in their mindset seems to occur where the rigor of intellectual inquiry and architectural play that is informing the spatial and formal conditions of their design propositions seems to give way to a ‘cut and paste’ approach of building materials and assemblies that often lack an understanding of the syntactic nature of their work.

The challenge for me is how to entice and at times provoke the student to penetrate the surface of their work; to immerse themselves within its physical and constructive depth and specificity with the goal of reemerging with a more informed and cultivated position on the making of architectural space.

With these thoughts in mind, I give a detailing exercise to students entitled ‘Fragments.’ The prompt for the exercise asks them to identify a constructive condition within their current project and construct it at 1:1. Building material selection, questions of joining, and the relationship of the desk and workbench are folded into their design work and practice with the intent of expanding both their physical and intellectual realm of architectural inquiry and constructive understanding.

Having given this exercise over the past eight years, I have recognized that there are certain relationships that have emerged from both the student’s work and how I approach and teach the fragment exercise. The following reflection seeks to articulate the importance of these relationships as way to continue the refinement of this exercise.

**FRAGMENTS**

The fragment exercise emerged out of a semester long project entitled Room + Garden that I give to my third year architecture undergraduate design lab during the fall semester. The students are asked to design a ninety-six square foot enclosed room situated within a garden. The scope is intentionally kept small in scale to allow the students time and the opportunity to delve deeper into the specificity and constructive nature of their work.

The project is paced so that the first third of the semester the students are developing their architectural propositions through drawings and models at various scales. During this time, they are also asked to select building materials and begin drawing out and speculating on the building details. It is towards the end of this period of the semester that I notice many of the stu-
When I first introduced the fragment exercise, I would use words such as full scale and detail to describe the scope of the exercise. My intent was to introduce another scale of specificity to their design decision making, giving them the time and opportunity to work with their hands in the shop and to test, challenge, and refine their drawn lines against the material edges and joints they were constructing. What I did not realize was how fixed and finite they saw this exercise. From building assembly courses, their own material research, and often experience gained from office internships, the students had already begun to form certain preconceived ideas about details and detailing. The play of iterative studies that were informing the formal and spatial development of their Room + Garden projects immediately gave way to a more deterministic approach to the detail. The students were immediately trying to solve the ‘technical’ aspects and conditions of the detail. While the technical was important, this exercise was not about ‘replicating a detail,’ but was seen as the means to expanding the depth, play, and specificity of their work.

Asking the students to build at full scale also became an issue. Depending on the specific condition they were studying, the physical size of the construction required to adequately convey the detail often proved too complex to realize. In addition, the costs to purchase the materials coupled with the logistics of having enough physical space to build full scale became at times unrealistic. I learned immediately that I had to reconsider how I presented this exercise and that word choice mattered.

In reconsidering these issues, I began using 1:1 and fragment as ways to describe the exercise. These words provided just the right amount of ambiguity to slow the students immediate rush to ‘solve the problem’ and assisted me in framing the larger intention of the exercise which was to provide a way for the student to tease out the essence of the constructive condition embedded within their work at an appropriate scale; not to replicate a ‘full scale detail.’ Through this approach I was able to engage in a different type of conversation with the students. For example, 1:1 was discussed as not solely a scalar question or a requirement to construct at full scale, but rather it first meant that the student was working directly with the materials that they were specifying. The direct engagement with the material and the resulting consequences of joining was more important than trying to realize or replicate a full scale building detail.

I would also work with them in identifying what parts of the fragment they thought were necessary to construct. This helped to bring a clarity and focus to their work. Often the overall complexity of the constructive condition they were studying proved too much to properly and accurately make. A degree of editing allowed them to understand and see the underlying structure of the
architectural idea embodied within the fragment. This relieved the student of trying to work out every condition and to focus on just a few they deemed pertinent to pursue.

Questions of scale were redirected to a discussion on the physical size of the fragment and the architectural idea that they were seeking to demonstrate. ‘Bigger is better’ was the general approach the students initially took, but through a bit of negotiation, they quickly found that smaller allowed for a more direct access and focus on the work. While the word fragment implies a state of incompleteness, I stressed to them it did not mean a lack of coherency; rather their fragment construction had both an identity and autonomy of its own that projected forward a guiding vision of the whole.

**from convention comes invention: learning from the big box store**

The major parameter governing the fragment was that it must be constructed out of building materials that could be obtained at any local building supply store. The translation of drawings into physical constructions is not an easy transition to bridge. With this exercise, I did not want them working through analogous means, but to deal directly with building materials, ways of joining, and where to obtain the building materials. I also wanted the drawings and models they had been developing at their desk to assist in providing a way to navigate the building material stores, allowing them to focus and on hone their skills on how to be a ‘good and discerning shopper;’ using their architectural vision emerging from their work to guide and question the material selection. These stores held the building blocks that formed building conventions.

A significant part of the fragment exercise was to first understand building conventions and then challenge these conventions. As I explained to the students, this was not about seeking novelty or being clever, but rather thoughtfully studying and understanding how the materials chosen could be elevated to reveal and reinforce the architectural idea through conventional means. The stores were also limited in specific types and sizes of materials they supplied. This situation was encountered most often when students would initially propose the use of a steel w-section or tube steel. Due to size and shape availability, often these stores did not carry those types of steel sections. It was these material procurement challenges that enhanced the fragment. When materials that were initially specified could not be obtained, the student had to often reexamine and make adjustments in both the design and material specifications to satisfy their vision. A selection that might have been a default choice now brings more attention to the potentials and possibilities of the particular joint being developed. The store itself provided a limitation and resistance requiring a rethinking and reconsideration of initial thoughts and decisions (figure 1).

**Fig 1: fragment - column base - 3rd Year Undergraduate Student**

**from desk to workbench to desk**

While the desk (or desk top) is inseparable from the architect’s work, what can be difficult for the student to grasp while working at their desk is architecture’s physical and constructive presence; to experience first-hand the weight and resistance of materials and assemblies and the impact they have on how the student draws out and engages these questions. There is a distance that separates the architect from the actual realization of the work. For architecture students this distance can be difficult to grasp and overcome which might explain their reluctance in engaging the questions and role construction plays in their work.

As the students started moving from the table, where they had been developing drawings and models of their project to the workbench, a change and shift in attitude occurred. Choice of materials and joining became a real and tangible thing. No longer were they working with analogous means, but they were now dealing with the actual building materials and tools required to realize their vision. A dialogue developed between the drawing table and the work bench where, for many, their initial
design assumptions and drawings were immediately put into question. The fragment exerted a presence and resistance that drew the student deep into the specificity of their work; slowing the pace to meet the time and effort demanded by the physical making of the fragment. For example, students learned about the tempo of concrete and quickly came to realize that constructing proper form work takes time. The planning and effort required to craft and erect form work is significant. This is in contrast to the quick pace that must be maintained in the mixing and placing of concrete, which is then followed by the time required for curing.

The dialogue of workbench and desk initiated unexpected moments for the student, where for many the fixed and finite way of thinking about the details yielded to a more playful engagement. Iterative material and assembly studies started to emerge allowing the shop and workbench to become an extension of the students search and practice (figure 2).

In addition to watching the fragment exercise play out in the moment, I have enjoyed watching over the past years how the fragment exercise has been carried over in student’s work. While not all students take to this exercise, I have had the opportunity to work with a few students as their fifth year undergraduate thesis advisor who have used their third year fragment exercise as the foundation for their thesis work. Whether it was a concrete form tie, a door handle, or a focused research on concrete, the ideas planted by the fragment exercise germinated (figure 3).

The Constructive Dance

In the book, The Aesthetics of Architecture, author Roger Scruton writes that:

“...detail may be the only thing which an architect can enforce. The ground plan and elevation of a building are usually affected (if not dictated) by factors beyond the architect’s control – by shape of a site or the needs of a client – while details remain within his jurisdiction.”

Fig 3: door handles - Undergraduate Thesis Student
What Scruton reveals is that within the practice of architecture the detail provides the architect a realm of inhabitation; a place to touch all aspects and conditions of the work. For the student, the fragment project offered them such a place. Materials and assemblies that form the details of a building are the way through which works of architecture are realized; embodying the architect’s imagination, knowledge, and sensitivity to material, space, and joining. These details are profound, significant, yet fragile. The challenge for me as a teacher is how to assist the student in cultivating an awareness, understanding, and appreciation of architecture’s constructive nature so that the student doesn’t lose hold of it while at the same time not grasping so tightly that its potency is lost. The searching that the fragment exercise demands requires an immersion into the work; a way of cultivating and crafting a practice that is vigilant of architecture’s making. It is with this hope that the student will come to see the constructive dance Juhani Pallasmaa writes of as necessary and integral to their practice as young architects:

“...collaborating with matter and gravity, balancing force with structures and connections, constitutes a primordial rite, the dance of construction. It is also a practice of alchemy that turns blocks of stones into a wall, a piece of wood into a pillar or beam, a hole in the wall into the eye of the window, an interval of the brickwork into a doorway, and a cavity in a masonry wall into a place for fire. Human will and the skill of the builder’s hand to reorganize matter into a constructed thought...”

Notes


The Lore of Building Experience: Deconstructing Design-Build

Shelby Doyle and Rob Whitehead, Iowa State University

Introduction

Architects do things. One of the most unquestioned mandates of architectural education is that of ‘doing’: building, acting, making, fabricating. Captured in Le Corbusier’s famous maxim: ‘architecture or revolution’, building is often considered not only the best solution to a problem, but one that gives urgency and legitimacy to architecture and architectural education. Yet the increasing awareness of intimate relations between capitalism and architecture, labor injustices and construction, environmental havoc and urban planning, corporate power and racial violence and much more has put architects in the uncomfortable position of having to confront the consequences of ‘doing’.

Design-build studios inherit a legacy of ‘doing’ that ranges from John Dewey’s theories of experiential learning (1938) ¹ to Alexandra Aravena’s Venice Biennale call to ‘make room for action’ (2016) ². A lore has developed about how design-build activities can simultaneously serve students, the community, and be an effective panacea for teaching ‘real-world’ lessons to beginning architecture students. Although hands-on learning has proven educational benefits for retention and visualization under certain circumstances, edification doesn’t inevitably follow every act of construction. Simply favoring the act of ‘building’ as a uniquely educational experience in its own right, and accepting the amorphous manner of lessons contained within these acts risk allowing certain undesirable educational circumstances to fester: design-build lore or myths.

MYTH #1: Learning by Building is Enough

Susan Sontag writes in On Photography: “The person who intervenes cannot record; the person who is recording cannot intervene.” ³ This is the conundrum of design-build: ‘doing’ re-inscribes familiar values of production. Can design-build studios ‘do’ and ‘critique’ simultaneously? If left unchallenged or unaddressed, these underlying issues contribute to missed opportunities for student learning and hinder the ability to develop a critical stance about the role of design-build in contemporary education and practice. If design-build courses are not intended to emulate ‘real-world’ experiences in design or construction, are the intended lessons still evident within these simulations? This paper presents cogent aspects of these claims while also presenting alternative methods for discussion.

Specifically, this paper is a reflection upon the Iowa State University design-build courses as they seek to transition into a more research-based curriculum. This paper is not a survey of common design-build approaches done by other programs and people, and it will not describe a unique process or project that others can use as a template for their programs. Rather, the project described here, the Urbandale Pavilion, is common in many ways—and by examining the common nature of this project, we hope to deconstruct lingering traditions (myths) of design-build pedagogy and speculate upon the future of design-build education at Iowa State’s Department of Architecture and beyond.

Design-Build Challenges

The deeply rooted challenges of design-build education are well documented. Vincent Canizaro offers a broad overview of these issues: collegial opposition, administrative and institutional friction, student resistance, limited equipment and facilities, and the quality of resulting work. ⁴ Criticism of design-build programs is primary directed toward: the lack of clear learning outcomes, the deficit of disseminated scholarly research, and the high use of institutional resources. ⁵

This recently completed project (Summer 2016), the Urbandale Pavilion, began with intentions to create a unique and instructive design project and educational experience. But it ultimately became mired in the inherent challenges of time, inexperienced labor, and unexpected difficulties to the degree that the project (and the design-build course activities) devolved...
into a competent and relatively conventional design-build project. This is not a reflection on the quality of the project, rather it is a different result than what was intended.

The process of designing a building, any building, no matter its scale, is complex and messy. In many ways, these common complications are not only related to the physical act of building, but they are microcosms of problems embedded in contemporary pedagogies, practices, and construction. It is not an easy situation for beginning designers—particularly when these process-based complications are not directly addressed as part of the coursework and become invisibilities.

None of the partnerships have lasted for more than a few years at a time—not because of dissatisfaction—but rather funding limitations or lack of demand for yearly projects that align with the teaching calendar. Until recently, there have been no dedicated facilities for tool storage or construction (e.g., the author’s truck and tools were used one year), and because it is a summer school class, the students have only eight weeks to complete their work (time they share with another summer studio).

The tactics for teaching this course are not uncommon. Students are presented with a project scope, introduced to the client and the site, then asked to develop and test their proposals. Eventually a final proposal is selected, prototyped and the built by the students and instructors. Students develop budgets, drawings, and work schedule and then build the design. The end goal has always been a built-artifact produced, to a certain degree, by students.

With the compressed time schedule (fewer than twenty-five required meeting days) and an impending deadline of construction completion, little time remains for original experimentation or meaningful community engagement. Design and technology lessons start at the remedial level and advance across the two months, but the focus is on acumen, not innovation and research. Unfortunately, the tight schedule and student inexperience also tends to diminish community engagement. The students meet with the clients and smaller user groups but the amount of time spent with community members is usually low. Instead of explicating teaching Service Learning tactics, instructors simply model the behavior of a project manager and mentor in a practice. Unsurprisingly, an effort that appears to be student-led must be led by experienced practitioners. It is a simple matter of professional and academic ethics and obligations to do so.

Despite these challenges, some well executed, and impactful, projects have emerged (e.g., a BMX track, a soap box derby starting gate, fishing docks, pavilions, and outdoor stages). As necessitated by the course, these projects have typically been

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**ISU Design-build**

**MYTH #2: Design-Build Pedagogy is Well-defined**

Many of the complications faced on this project are systemic. For the last ten years, the first-year graduate students in the first-professional Master of Architecture program at Iowa State have participated in a mandatory design-build course at the end of their first year in the program. The course is based on two foundational curricular objectives: to reinforce the curriculum’s technology sequence—one that integrates structures, environment, and material as one integrated curricular subject using hands-on learning labs, and as a way of directly engaging (and promoting) community engagement through Service Learning.\(^5\)

The studio generally enrolls 8-15 students each year—a small crew for any design-build project. As a result, the course offers the opportunity for each student, no matter their skill level, to participate. Perhaps naively (or perhaps as a result of institutional budget shortfalls) this course was established without any specific plan for soliciting funding or projects—it has been a yearly ad-hoc scramble initiated by the instructor(s). As a rule, the studio aspires to partner with local non-profits and towns; these groups have an interest in the type of work that is provided, they appreciate the ‘free’ labor of students and instructors (which they could otherwise not afford), and they sometimes have an ability to help with labor and material or financial resources.

None of the partnerships have lasted for more than a few years at a time—not because of dissatisfaction—but rather funding limitations or lack of demand for yearly projects that align with the teaching calendar. Until recently, there have been no dedicated facilities for tool storage or construction (e.g., the author’s truck and tools were used one year), and because it is a summer school class, the students have only eight weeks to complete their work (time they share with another summer studio).

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Despite these challenges, some well executed, and impactful, projects have emerged (e.g., a BMX track, a soap box derby starting gate, fishing docks, pavilions, and outdoor stages). As necessitated by the course, these projects have typically been
lightweight construction with conventional materials and methods, primarily wood. Experiments in the prototyping phase do occur but are rarely implemented into the project unless fully tested (e.g.,rammed earth benches). Student evaluations have remained high and student experiences have seemed overwhelmingly positive.\textsuperscript{7} From nearly any perspective it is a model design-build program for beginning design students.

\textbf{Urbandale Pavilion}

\textit{MYTH #3: Design-Build is a Good Match for Service Learning}

Iowa State is a land grant institution and the first state to adopt the Morrill Act. Therefore, there is an ingrained expectation that the design-build studios “support the mission of sharing knowledge beyond the campus borders” and “actively transfer research and expertise to the public.”\textsuperscript{8}

At first glance Urbandale Pavilion was to be an ideal design-build project for scaling-up the program. It was a well-funded, high-profile 16’ x 40’ park shelter, in a well-used arboretum. The client, Urbandale Parks & Recreation is a public entity,\textsuperscript{9} the site, the 12-acre Jackaline Baldwin Dunlap Park and Arboretum, is publicly accessible and made possible by a land donation,\textsuperscript{10} the program serves the public (Urbandale Population 41,776 and Des Moines Metro Population 599,789, 2013\textsuperscript{11}), and it was funded through a donation by ISU alum Chuck Bishop (BS 1980 Engineering), president of Bishop Engineering in Des Moines, in honor of his mother. Additionally, the client’s schedule aligned with the academic calendar.

However, the logistical and institutional pressures upon the studio eroded the original intention to pursue a research-based agenda. The following unpacks the challenges as a method for offering alternatives. The first contact was made in October, six months before the studio began, but the work for the authors began immediately. The project was too large and complicated for eight beginning architecture students to design and build (from foundations through steel fabrication) in such a short class schedule. The instructors had two choices: take on the project and attempt to scale up the existing program or turn down a well-funded project.

The project was accepted along with the large amount of work to be done ahead of time to define the scope, solicit consultant participation, secure permitting, and solicit bids for specialized construction methods unfit for beginning students (foundations, steel fabrication, steel erection, site grading, etc.). As a result, both authors took on the role of an unpaid architectural consultant to the client AND academic administrators in charge of soliciting and securing funding while negotiating issues of liability and contract requirements with university staff. Needless to say, an enormous amount of time, energy, and expertise went into the logistical set up of the project to make sure that the students would be able to ‘build’ and complete the ‘building’ in time. None of this work was paid or recognized as official teaching activities. By favoring the end
result over the process, the process skewed away from its original intentions.

Despite the known challenges, the project started with abundant aspirations. As the authors specialize in structural design, digital design and fabrication, the first research proposal was to create a lamella dome which connected digital modeling with construction sequencing. Lamella is an efficient structural form that looks difficult to construct, but is not if the connections and dimensions are well-defined. These details provide learning opportunities from parametric connection methods to designing for construction. Designing, documenting, and constructing the structure was intended to be an act of experimentation and research. How light would the structure be? How a construction system with movable bracing be employed? How could parametric modeling be used to anticipate the dimensions of each diagonal lamella so that a building skin could be cut to fit?

It became clear project was too big for this specific team and that existing teaching tactics may not be adequate without the inclusion of team-building exercises and more remedial construction training. At this point, as educators, the anticipated outcomes for the course should have been adjusted. But this is not always possible with a design-build studio. There was a contractual obligation to the client and a pedagogical obligation to the curriculum to produce a built project. Additionally, as students are not qualified architects, any instructor who is also a licensed architect has an obligation to the NCARB Rules of Conduct. The only available option was to adjust the scope of work from the students to the instructors as a way to keep moving forward. The project had to be viable. Walking away was not a realistic option. Although there would perhaps be profound lessons to be found by not finishing the project or having it fall down, these were not available or feasible options.

MYTH #4: Design-Build Tactics Scale Up

However, in the spring, as the summer semester neared, two things occurred that shifted the project’s direction. One, the design for the lamella was too ‘complete’ as proposed and the students would end up building the authors proposal, thereby missing out on the ‘design’ portion of the class and perhaps seeing the class as ‘only building’ or manual labor. Next, upon learning that among the eight incoming students, only two students had any construction experience and that there were relatively serious interpersonal conflicts between several of the students already.
By selecting a difficult project that had to be compliant with health, safety, and welfare standards the project aimed to expand the potential of the program but simultaneously exceeded student capabilities. A decision was made that to benefit student learning that the instructors would design a simple structural frame and then ask the students to design the things people ‘touched’: screens, benches, shelves, and tables. The structural frame itself had to be designed, permitted, and partially fabricated by the time the semester started (to keep on schedule) so it was done without student involvement or feedback (as the course had not begun yet). Further, due to time and expertise constraints specialty contractors were hired to do the site grading, concrete, and structural framing. For each contractor, students joined on-site to observe and ask questions as they were working; but they also had expectations for their schedule that the course needed to meet (i.e., The contractors would not be on site for longer than they had budgeted to train

students – that fell to the instructors). They were very professional and gracious with their time with students, but everyone knew the contractors had to do all the heavy lifting quickly. This was not ideal and it was not the originally intended process.

There were a few immediate consequences: it affected student commitment with the project and it limited student engagement with the community and enthusiasm for the design process. On the first day of class when the instructors presented the ‘completed’ frame design to the students, many expressed frustrations that they would not be giving input on the structure (some even commented upon this in student evaluations). Most students did join in with the construction crews, but only for a limited time—perhaps because they felt self-conscious of their limited skills.

As a group, they understood the schedule demands that required others to help build the heavy, specialized portions of the project, but by limiting their activity, it seems to have limited their engagement—a common side-effect in design-build when input is not seen as equitable or valued. When their work is seen as free manual labor, the other lessons about design and technical acumen are more obscured. Also, and quite unintended, this limited their design meetings with the client to a smaller scope of issues. The site location, project orientation, size, materials, and overall form were mostly established already—and although they were in charge of developing the design details for the screen and seating, there were fewer conversations with clients and user groups than usual. The students did meet with the clients and community members as part of the course, but not to the degree anticipated.

Once the students received tacit approval from the client for their design ideas, the class split into forewarned cliques. Although the instructors did not witness conflicts first-hand, there certain groups that did not talk to others at all. Their initial efforts to produce options for the screens, benches, shelves, and picnic tables reflected this lack of coordination and comradery. Eventually, a more focused teaching effort to encourage collaborative thinking and a shared language of materials and expression yielded a fine result.

Ultimately, the project turned out well. The project’s location on the site, the simple form of the cedar and galvanized steel structure, and the refined level of detail in the benches, shelves, and tables reflects a purposeful approach to design that sees elegance in the interplay of these basic and profound elements. The project was thoughtful, legible, competently assembled,
and accommodating. According to any official standard, the project was on-time and on-budget. It had a successful groundbreaking ceremony that was well-attended by praiseful community residents, and the project was featured on the local news and College of Design media.

This being said, the project was not finished when the semester ended. When the landscaping was not installed as intended, when the roof leaked, when the electrical lighting panels were installed in the wrong locations, and when the student-installed screen failed to meet the client’s expectation, it was not the students that were asked to fix the project. The semester was over and their educational obligations ended. As instructors and architects, the authors remained tied to finishing the build. The project was finally finished, by the authors, in a torrential downpour weeks later with the addition of rabbit-proof fencing along the back side of the screening to protect from the threat of someone climbing up the back of the screen before the landscaping grew to an adequate height.

This is the problem with design-build courses that favor the final product as the reflection of the relative success of the course. Questions like: Does it look good? Is it doing what it intended? are discussed. But what about measuring growth in the learning process? Did students learn what we intended? Did they do more than just ‘build’ something?

After years of trying to fit so many learning objectives into such a short amount of time (and mental ‘space’ for student learning), the authors have grown convinced that ‘building is not enough’. When a product or ‘a building’ is the goal for the class, then the means are altered as needed to meet the end. Certainly, this expectation can favor the larger project or more visible project, but this looks overlooks other types of ‘building’ activities that might not have such a visible final presence. Perhaps projects that challenge the typical perspective of design build, or ones that see design-build as a tool to explore other research questions. As a small design-build program is ISU doomed to pavilions and demountable low-risk structures? Perhaps, if the challenges of Urbandale are any indication.

It is a question of intent. Are those projects selected because that is what is needed or are they selected as projects because that is what students can safely build? If a studio begins with the assumption that it must be a building—or a viable occupied structure, then subsequent choices about the process and production may not align with intended learning outcomes.
Moving Forward

**MYTH #6: Design-build is Practice-Lite**

In its most ideal form design-build combines the strengths of the academy (critique, innovation, speculation) with the strengths of the profession (expertise, construction, public engagement). At its most compromised design-build combines the limitations of the academy (insular, self-referential, siloed) with the limitations of the profession (client-driven, conservative, underfunded).

When examined in this light Urbandale is not a success. It was neither a political practice, a critique of academia, nor a reconsideration of practice. It was a construction project. It was neither pure teaching nor pure research. It achieved the end goal of ‘building’ and ‘doing’ but fell short of other ambitions. There was a great deal of effort that went into this endeavor, and to have the final result miss its mark prompted a re-evaluation of the future of our design-build program. The following are three proposed strategies for the future of our design-build.

**Re-tooling Academic Recognition**

The first strategy is the re-valuing of design-build as a form or research. If design-build is going achieve academic recognition, then it must also establish the methods of acknowledgment. Projects must also be innovative or experimental rather than ‘just building’. Much of the work that goes into cultivating design-build projects is not acknowledged as part of the pedagogical or tenure and promotion process. It falls outside the scope of what beginning students can and should provide.

In recent years, design-build history, theory, and pedagogy has sought academic recognition through the development of a series of groups, colloquia, conferences, and symposia. Among these are networks such as the Design Build Exchange portal 14, the Design Build Exchange Europe 15, and the Live Projects Network 16 as well as a series of conferences such as the Association of Collegiate Schools of Architecture 2014 Fall Conference | WORKING OUT: Thinking While Building 17 and Architecture ‘Live Projects’ Pedagogy International Symposium 2012. 18 Research-driven design-build studios provide impact beyond a single project by addressing questions significant to the discipline rather than to a single client. When the work of design-build is measured by an expanded understanding of scholarship and research (e.g. Boyer 19) then institutions of higher education can better recognize faculty for fostering design-build projects.

**Re-employing History**

A second strategy is that design-build more boldly recalls its history of radicalism and political action. From the Bauhaus workshops of the early 20th century to Buckminster Fuller’s geodesic domes to the Yale Building Project, to the 1990s resurgence of design-build with the Rural Studio, the Jersey Devils, and Studio 804. 21 Each project is part of an intellectual and conceptual legacy of architecture’s relationship to building as a social and political project. As global challenges are intrinsically linked with construction’s modes of production design-build is a valuable tool for re-evaluating architecture’s relationship to its social project.

Rather than rely or resuscitating the modes and frameworks of the Modernist social project design-build searches for new characterizations of what it means to be ‘social’ in the twenty-first century. Positioned within its history, design-build becomes a meaningful vehicle for enacting a contemporary social project. To an extent this work is already underway at Iowa State in an upper level studio called ‘Structures in Service (Design for Disaster Relief)’ taught by one of the authors (Whitehead). Large-scale prototypes are created to test out new ideas for enclosures and assemblies used in relief and recovery efforts.

Figure 10: Prototypes for hay bale loft construction intended for remote Mongolian school design. R. Whitehead studio, Spring 2015.

**Re-defining Design-Build**

“The academy is not paradise. But learning is a place where paradise can be created. The classroom [studio], with all its limitations, remains a location of possibility. In that field of possibility, we have the opportunity to labor for freedom, to demand of ourselves and our comrades, an openness of mind and heart that allows us to face reality even as we collectively...”
imagine ways to move beyond boundaries, to transgress. This is education as the practice of freedom."

While the academy is not paradise, it is inspiring and energizing to pursue educational agendas that move beyond the constraints of architectural practice. The work presented here is not intended to discourage or dismiss the importance of design-build; rather, it is a call to clarify what specifically makes these studios valuable. Canizaro offers a useful list: to gain construction experience, as a form of community service, for a larger vision of professional practice, as a critique of academia, for enhanced awareness of place, to enhance collaborative skills, to explore new methods of project delivery, and to explore materials and materiality.23

In education, design-build is a pedagogical alternative to the theoretical, desk-based, and media-driven (drawings, models, digital models) design process commonly featured in design schools. Design-build studios, which have become popular in recent years at many schools, provide an excellent venue for the assimilation of technical knowledge. Architecture has always been a service profession, but it has traditionally served only those who can afford it. By working for clients who do not normally have access to architects, students are exposed to community outreach and to the notion of society as our real client. Alternatively, working in pursuit of research and on behalf of the discipline is a viable model of design-build.

As Iowa State develops a way forward, the goal is to create a research-based program which focuses on construction methods, fabrication technologies, and material practice. The first step in this re-tooling was to create an institutional and conceptual space for this work: the ISU Computation + Construction Lab (CCL) which aims to create from the existing framework of design-build a new framework of computation and construction. By linking computation to construction this pedagogic shift harnesses advances in computation as tools of improving construction (robotics, CNC) rather than as tools of representation (renderings, models). By freeing the design-build from the scope of site and client the studios are able to conduct research and focus more rigorously upon material and structural innovation and developing technologies. This is not an abandonment of Service-Learning rather a reconsideration of how architecture can be serve the public, the discipline of architecture, and educational agendas, simultaneously.

The ambition of the ISU CCL is to critically engage new digital fabrication technologies in the pursuit of public engagement, an exploration termed ‘insurgent architecture’ by Corser and Gore. In *Spaces of Hope*, David Harvey 24 describes a theoretical political actor called ‘the insurgent architect’, who, ‘in addition to the speculative imagination which he or she necessarily employs, has available some special resources for critique, resources from which to generate alternative visions as to what might be possible.’ 25 The promise of the ‘insurgent architect’ is the ability to simultaneously create tools for transformative action and to develop visions of new social realities.26 The CCL harnesses the energy of ‘insurgence’ though not all of its methods. As a research agenda, it advances and expands the possibility of public engagement, critique, and ‘doing’ through architecture at Iowa State.

The goal is to present architectural possibilities: not a retrenchment of existing conditions, but fragments of potential futures. Within these futures ‘not doing’ or new modes of ‘doing’ must remain viable options and equally powerful alternatives for design-build pedagogies.

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Notes

6 Canizaro, 2012.
21 Canizaro, 2012.
22 bell hooks, Teaching to Transgress: Education as a Practice of Freedom (New York: Routledge, 1994, p. 207)
Introduction

In the 21st century, technologies like the Internet are commonly regarded as an empowering and uplifting force. With the broad availability of low-cost distribution channels, software development tools, and rapid prototyping machines such as 3D printers, the potential exists for nearly anyone to disrupt industries and find success. This optimism is mirrored in architecture, where, over the last 25 years, technologies such as CAD (Computer Aided Design), parametric design, BIM (Building Information Modeling), digital fabrication, and robotics have been a critical site of innovation, as architects seek to challenge traditional methods of designing and delivering buildings.

While many believe that technology is a way to create equality and provide opportunities, in practice this is not always the case. Particularly in architecture, access to technology and knowledge about technology continues to be unevenly distributed, which can result in the perpetuation and intensification of existing inequalities. This paper highlights the issue of gender inequality with respect to technology in architecture. It identifies the current gaps in research, and proposes a series of methods for pursuing technological equality in architectural education: clearly measuring inequality of technology distribution, democratizing access to technology, and improving introductory teaching of technology. What follows in this paper is the beginning of a research agenda rather than its culmination.

Technology is a broad term but used here to indicate those digital technologies specific to architecture. Discussions about technology in architecture are often concerned with its potentials and hindered by a constructed polarity between manual and digital, an outdated and futile fiction. This focus on technique and media has distracted from a more politically and socially relevant dialogue about inequalities in beginning architectural education and its relationship to technology. While many types of inequality exist with respect to technology and architecture, such as race and class, this paper will focus on the problem of gender inequality. As technology is now essential to the practice and discipline of architecture, the ability to create with and shape technology is critical. In some respect, the lack of women specializing in design technology is unsurprising given that the practice combines fields that have historically been lacking in gender equity: management, information technology, computer science, and architecture. The goal of this paper is to reveal this dimension of gender inequality in architecture and architectural education and to begin to address it by moving beyond the anecdotal and into a constructive research agenda. This is not to ignore the history of intersectionality in feminist discourse but rather to create a well-scoped and focused analysis that can provide methodologies for future research.

Who Counts?

Architecture as a discipline, has been slow to fully acknowledge, incorporate, and integrate women into architectural practice and discourse. These past and present inequalities appear to be at work in the under-representation of women in technology. However, acknowledging the scope of the problem is difficult because, presently, specific data are not being collected about it in practice or in academia. To successfully argue for gender equality, detailed and accurate statistics are needed to move beyond anecdotal evidence. The current understanding of gender in architecture remains limited, as does our understanding of how women access and influence technology. One reason for this is the challenge of determining whom to study and how to measure. With regards to technology, how should participation be defined? As Gill Matthewson of Parlour writes, “It is easy to slip into anecdote and colloquial understandings of gender discrimination in architecture...
and much more difficult to parse out ‘who counts’.\textsuperscript{16}

The field of architecture recognizes its problems with gender equity, but accurately measuring the nuances of women’s participation has remained elusive. The question of who is an architect and the extent of one’s influence is not easily determined but is nevertheless crucial to combatting the lingering gender inequality in the discipline. For example, in 2013, 43\% of students enrolled in NAAB-accredited architecture programs were female; 45\% of architecture graduates were female.\textsuperscript{7} NCARB’s “By the Numbers” report reveals that 42\% of ‘record holders’ are women,\textsuperscript{8} indicating an intention to pursue licensure, while the number of licensed women hovers around 18\% in 2016 up from 9\% in 2000,\textsuperscript{9} but still far from parity as indicated by the ‘The Missing 32\% Project’.\textsuperscript{10} These numbers differ from those of the US Bureau of Labor Statistics (BLS) which reported in 2013 that 25\% of ‘architects, except naval’ were women.\textsuperscript{11} The BLS data would also seem to indicate a dramatic loss of women in architecture, post-graduation, and low representation in the workforce, but the calculation of that total is complicated. Architecture is more than the profession and those who strictly practice within the profession. Many professionals who identify as architects are not counted in the BLS report: university instructors, urban designers, writers and critics, for example.\textsuperscript{12} Taken-together, these numbers illustrate the complexity of the questions being asked about gender equality and the need to collect a breadth of data in order to paint a complete picture.
While, anecdotally, there seem to be fewer women than men in architecture, exactly how few is difficult to say with certainty. Once again, it depends upon how one counts. The averages of graduation rates and licensure only tell part of the story. At AIA firms, just 17% of principals and partners are women.\textsuperscript{13} The percentages of women awarded the Pritzker Prize for Architecture and the Topaz Medallion for architectural education is even lower: both 5%.\textsuperscript{14} These numbers indicate further inequality in the influence and recognition of women, which is disproportionate to their representation. Counting women is an important step in acknowledging and reducing inequality, but as a methodology, it has its problems and its limits. There are lessons to be learned and further questions to be asked.

As of this writing, there is very little data on the participation of women in technology within architecture. However, data from other fields suggest that women in technology is a broader issue and there is bias inherited from these disciplines when they are absorbed into architecture. In Science Technology Engineering & Mathematics (STEM) disciplines, gender inequality is a recognized and quantified problem. The problem is most acute in computing fields, and it is mentioned here for two reasons. First, the field of computing bears many similarities to the ways that technology is used in architecture. Developing and modifying computational software and systems for design has many parallels in computer science research and practices. Indeed, some of the training (learning programming, for example) is the same. Second, there is significant data collected by computing academics and professionals on the issue of gender diversity as well as research into how to address the problem. STEM data indicate that women are significantly underrepresented in computing. A 2013 report found that just 26% of computing professionals were women -- a percentage which is about the same as it was in 1960.\textsuperscript{15} Women currently earn only 18% of all Computer Science degrees.\textsuperscript{16} Indeed, it is the only STEM major to report declining representation of women over the last decade. This gender gap extends to academia and industry where research has found that 70% of authors on published technology papers are men.\textsuperscript{17} At the same time, women represent only about 30% of the workforce in Silicon Valley.\textsuperscript{18} Collection of this data has been an important step in helping to highlight and address this issue, though it has not led to gender parity in STEM.

Unlike the STEM fields, architecture has yet to acknowledge that its gender equity problem also extends to those who engage with technology. A reason for this could be that there is no direct evidence that such a gap exists; it remains an anecdotal circumstance. One metric that exists is the representation of women in technology publications in architecture. The authors’ study of the Association for Computer Aided Design in Architecture (ACADIA) papers from 2013-16 found that 26% of authors were women. (This percentage is strikingly similar to that of STEM computing fields and professionals.) But only 8% of papers had women as the first or sole author. In academia, gender participation in technology is more difficult to determine. At our institution, while 49% of our architecture students are women, on average they make up only 19% of the students in digital technology electives and seminars. While the number of women participating in architecture is not at parity, the number of women participating in technology in architecture appears to be lower still.

The establishment of legitimate scholarship requires a problem first to have a name and, second, to be defined.\textsuperscript{19} While many can share a story about women’s work in architecture being disregarded, underpaid, or dismissed, it is presently much more difficult to quantify the use of technology by women in the practice of architecture. In this case, technology is used as a proxy for power in the architectural discipline and by measuring technology use the aim is to better understand the grain of women’s participation in developing technologies.\textsuperscript{20}

Gender Gap

Why are women under-represented in digital technology? Why does a technology gender gap exist? Once again, there is not much specific data available for architectural technology, but research in STEM fields has identified several possible causes which may parallel those in design and which may have been inherited by architecture in the transfer of knowledge and technique. In a speech given at the Grace Hopper Celebration of Women in Computing Conference, Susan Wojcicki (CEO of YouTube), summarized two important reasons women choose not to study computing: they think it is boring and they do not think they would perform well at it.\textsuperscript{21} From the outside, working with technology can seem unexciting, but if one is actually making things with it, technology can be creative and empowering. Unfortunately, because they lack access to mentoring, clubs, courses, etc. many young women have not had the opportunity to see for themselves the opportunities of technology before they enter a beginning design program. Women who are exposed to technology in K-12 education are three times much more likely to participate in STEM majors in college.\textsuperscript{22} The second reason, concern about performance, may be due, at least in part, to what is known as ‘stereotype threat,’
which is when an individual fears that they will confirm a stereotype about a group to which they belong. This has been shown to affect performance and to impact decisions. In this manner, negative stereotypes about women’s performance in math and science are thought to be a factor in the inequality found in computing fields. A further reason reported is that women choose not to study technology because they believe technology to be insular and antisocial. With respect to computing, they do not feel that a job in this field entails working with other people or making things which create social good. Another aspect of this is the male-centered gamer culture of today emerged out of early personal computing, which can appear inaccessible to women ‘outsiders’. Simply put, when it comes to technology, many women today feel that they do not belong, and because of this, they do not want to belong.

Research has shown that women perform well in STEM-related subjects and have the grades and test scores to join in these majors. Furthermore, history is filled with great pioneers of computing such as Ada Lovelace, Joan Clark, and Margaret Hamilton who clearly demonstrate women’s capabilities in the field. The ability and potential of women in technology are not in question. The problems discouraging women from participating in technology are cultural and institutional. Education, which has traditionally held the power to shape culture and produce equality, is part of the solution.

Why does it matter?

The gender gap in technology is harmful not only to women, but to everyone. Too often, women are relegated to being users or consumers of technology, rather than its creators. Today, in architecture, being left behind in technology can mean being left out of the design process. A common argument for diversity in design is that inclusiveness invites more experience and perspectives. While true, the importance of diversity goes further than this. When women are underrepresented, there is a risk of their needs being overlooked as design decisions are based upon the experience and opinions of only men. In the past, this has resulted in costly problems such as voice-recognition systems that do not recognize women’s voices because they were calibrated for male voices. Worse still, early airbags, designed for adult men, resulted in the deaths of women and children who were not considered as end-users. The development of technology is too important to exclude half of the population, particularly as technology trends like automation threaten more of women’s jobs than men. The risks of being excluded are not only lost job opportunities, but declining societal influence. The Global Fund for Women argues that without full participation in the global technology revolution, women’s human rights could be violated. The stakes for democratizing access are high. Digital design education is one site of potential inequality which impacts everything from why, how, and what students are taught and has far reaching implications for the discipline and beginning design education. Within the building profession, design technology is an emerging locus of architectural power: those who control the process of design through technology control architectural practice.

Methods

The following are premised on the assumption that further research will define and scope the specifics of technological inequality in architecture and architectural education: how, what, and why. The methods presented here are built upon the supposition that these inequalities are human and not technological constructs and therefore they can be reconfigured through human intervention in technological production, distribution, and education. The methods presented here will focus explicitly upon educational methods as the authors have agency and experience in this realm.

Method 1: Democratizing Access

Democratizing access is the core principle underlying the pedagogy of technology in beginning design at Iowa State University – the method behind the methods in the following sections. Simply put, democratizing access to technology means increasing accessibility: ensuring that there is equal representation among those who use technology and reducing barriers to access, such as cost and education. When the authors develop their courses and curricular policies, they consider whether these actions work in favor of democratizing access.

Method 2: Increasing Digital Literacy

One of the first steps towards democratizing access is to ensure that all Iowa State architecture students – of all genders and backgrounds – possess digital literacy early in their education. To be clear, this is not the same as computer literacy, the outdated notion that students must know basic skills such as how to turn on a computer or how to type. It is also not the same as merely knowing how to use a set of software programs – Adobe Suite, AutoCAD, and the like (although our students also learn this). In the curriculum, digital literacy is the critical understanding of how these tools work and work together.
Courses establish the basic principles of computing such as how drawings and models are represented as data and symbol systems and computing ‘powers’ like dependencies and automation. These are critical ideas for working productively and creatively with digital media which are not intuitive nor apparent from the superficial characteristics of tools and so are often not discovered by ‘digital natives.’ Furthermore, the authors teach good technology habits: ‘soft skills’ for working efficiently and effectively. While many courses focus on learning how to use technology, the philosophy at Iowa State is that this is a low bar and not enough, particularly when equality is a concern. Instead, using technology well is the objective and it is important for everyone, not only important for some students.

Teaching digital literacy is necessary because students arrive with different levels of exposure to and comfort towards computing and other technologies. In architectural education, these inequalities can manifest as unequal learning and engagement when students are told to learn or use, for example, a new piece of software. Furthermore, as mentioned earlier, stereotypes about women in math and science can affect their level of engagement. Ensuring that all students are exposed to technology can help. Establishing a common introduction for all of our students, particularly one that approaches technology differently than even the experienced students expect, helps to correct some of the inherited biases that students might have about themselves and about each other.

At the same time, the introductory course uses a combination of online tutorials, peer learning, and peer programming to create a more social environment where students can learn digital and computational design. Online tutorials help students learn at their own pace instead of in a lab where they might be embarrassed about stopping class to ask a question or having other students look over their shoulders. The tutorials help students to self-remediate and mitigate some of the stratification of higher aptitude and novice students. Students work on small projects in peer teams. These are small groups -- usually only two or three students -- who self-select. The advantage of peer teams is that they tend to align with gender; studies show that women often prefer to work together and when they work with other women, they are often less self-conscious about asking questions and asserting technical knowledge. In their teams, students complete their assignments using peer programming, which is a practice where one student uses the software or writes code and the other student observes and discusses. This helps students to focus on smaller parts of a complex task (i.e. learning technology while learning design) and enables them to externalize their thought process with technology. Studies have shown that peer learning and peer programming help reduce the gender gap in student participation and achievement in STEM.

![Fig. 2 Flipped classroom at Iowa State University. Photo by authors.](image)

The intention of teaching digital literacy is to give all students a common set of skills and outlooks to serve as a foundation for further learning. The goal of this pedagogy is not to necessitate that all students learn the same requirements and design the same way, but rather to help ensure that students’ preconceptions about their abilities and interests do not interfere with their potential for creating and creating with technology. It is this kind of equality the authors’ pedagogy pursues. Digital literacy, like ‘book’ literacy, is not a goal in and of itself. It is the key to learning from and participating within a literate culture.

**Method 3:** Computational Foundations / Computational Integration

Another form of democratizing access is to ensure that computation is introduced to students early and integrated throughout the curriculum. In contrast to computerization (i.e. using the computer to perform tasks, such as drafting; the majority of computing courses teach computerization), computation involves the authorship of instructions for the computer to perform. This is the basis of parametric design, generative scripting, and other developing technologies. In recent years, there has been growing appreciation for the importance of computation in architecture, both in practice and academia.
Today, new technologies, created by architects are the cutting-edge of design and widely seen as its future. Computational knowledge and skills are an integral part of this practice. However, computation continues to be seen as an esoteric and advanced subject, suitable only for electives and graduate study. Moreover, it is often isolated unto itself, as reflected in curricula which tend to accommodate technologies as electives with limited enrollments, a pedagogy which can be non-inclusive and non-empowering. Because computation courses are specialized and involve programming and programming-like activities, the representation of women in them is often low – even lower than in other digital technology courses such as computer modeling, animation, and digital fabrication. This is due to many of the same reasons why there are so few women in Computer Science: gender bias, concerns about personal abilities, and a perceived lack of social value.38

The authors believe that teaching computation to all beginning design students is an important step towards improving gender equality. One year after adding computational content to the required foundations course, enrollment of women in elective digital technology seminars improved by 15%. At the time of this writing, Iowa State University is also seeking ways to integrate computation in other required seminars and studios, to show how these methods apply to interests beyond a single required course. An example of this is how computation and digital fabrication are integrated into a required design-build project in the second-year studio. All beginning design students in the program, regardless of background, now experience writing code, operating tools, and using digital fabrication equipment and experience its connection to construction. Introducing computation to the curriculum in this way communicates its importance and makes it a part of the shared culture of the students. Normalizing computation, adding it to students’ design vocabulary, and demonstrating its relevance to social and environmental concerns are also ways to increase women’s participation.

Method 4: Computation + Construction

Harvey Mudd University increased their enrollment of women in Computer Science by offering all female students research opportunities after their first year in college.39 This had the effect of helping connect students with significant issues within the field and contributing to projects with meaningful outcomes. Providing research opportunities is one way to help students appreciate the relevance of what they are studying and encourage them to enter into the field. ISU aims to repeat the successes of Harvey Mudd. Beginning by creating an institutional and conceptual space for this work: the ISU Computation + Construction Lab (CCL) which was co-founded by the authors and creates from the existing framework of design-build and digital fabrication a new framework of computation and construction. By linking computation to construction this pedagogic shift harnesses advances in computation as tools for improving construction (robotics, CNC) rather than as tools of representation (renderings, models).

At the CCL, the authors attempt to bridge the gender gap in technology by actively recruiting female students to undergraduate and graduate research positions within the Lab and by providing projects with tangible outcomes that engage the intersection of computing, building, and outreach. As a conscious attempt to normalize technology in the program, the authors select their research assistants on the basis of their studio performance and work ethic, rather than their ability or interest in technology.

At the time of this writing, 65% of past and present research assistants are women (49% of CCL students, overall, are women).40 Few former assistants have graduated, so the impact of this policy upon their careers is unknown, but within the school, students tell the authors that the visibility of women in the CCL has encouraged them to pursue more technology in their studio work and to seek out their own opportunities for research with the Lab. In the coming years, this is something to be monitored.
Unplugging Inequality

Method 5: Dissemination & Critique

To receive peer feedback on the success of these pedagogic shifts the authors are hosting a Computational Foundations Colloquium in Spring 2017 as a means for exchanging information and establishing terms of evaluation for what constitutes a rigorous computational foundation curriculum in architecture. One of the topics of this colloquium will be the issue of gender equity in technology and increasing the participation and agency of women.

Conclusion

While technology has rapidly become more accessible to more people, its benefits are not always evenly shared. Despite appearances, access to advanced design technologies such as computational design and digital fabrication in architectural education are not as equal or open as it may seem. Latent inequalities exist which limit participation with technology and threaten an egalitarian pedagogy that empowers all students with the skills and thinking needed to participate in a globalizing economy. This paper searches for methods to define these inequalities, with an emphasis on gender inequality, and proposes ways to democratize access to new technologies in beginning design so that the technology in architecture becomes more diverse and the gender divide is lessened.

An agenda for ‘unplugging’ inequality begins here. First, architects must start by collecting data on participation in technology – relevant and nuanced data. Next, methodologies for evaluating this data are needed. Last, architecture educators must prioritize technological equity and establish methods for fostering it in schools. In all of these instances, the field may look to the efforts of other disciplines and professions, such as STEM.

The promise of technology as a medium is that it can allow for an individual to be empowered in ways that are not pre-ordained by an institution – the state, the university, the discipline – and as such creates space for a multiplicity of voices to resonate within the architectural profession. Technology can help produce equality, but only if access and participation in technology are equal. At the moment, technology is re-entrenching existing hierarchies, but this can be corrected. Through awareness and conscious effort, human constructs can be undone and retooled to produce greater equality in education and, consequently, the built environment.

Notes

1 “The future is already here. It’s just not evenly distributed yet” — this quote is often attributed to Gibson, though no one seems to be able to pin down when or if he actually said it. http://www.nytimes.com/2012/01/15/books/review/distrust-that-particular-flavor-by-william-gibson-book-review.html Accessed January 2017.


Architecture as Frame: Addressing New Challenges in Architectural Education

Firat Erdim, Iowa State University; Laura Martínez de Guereñu, IE University; Olivia Valentine, Iowa State University; José Vela Castillo, IE University.

Tags: Engagement, Context, Discipline.

This paper presents the theoretical base and work developed in the Idea and Form I and II courses, which constitute the foundation architectural design studio sequence of the School of Architecture and Design at IE University. IE University is a young higher education institution that has emerged in response to challenges posed by the contemporary world. Although located in Segovia, Spain, the programs are taught in English and attract students from across five continents, providing a multi-national and multi-cultural forum unique in both the Spanish and larger European Union contexts. The undergraduate architecture program addresses strict licensing requirements that enable students, upon graduation after five years, to practice in the EU as architects. Students in the program arrive with an expectation of having to be geographically mobile throughout their careers, and weave together diverse scales of design to develop unique, relevant practices. These conditions and expectations situate the curriculum at the intersection of intra- and extra-disciplinary pressures: between the need to train students as technically proficient professionals, and the need to educate them as engaged global citizens within an uncertain, multicultural and complex world.

This dual obligation is addressed throughout the larger curriculum of the five-year undergraduate program. From their second through fourth year of study, students take part in diverse design practices in various parts of the world, for four months out of each academic year, while simultaneously pursuing their academic studies through a carefully developed online program.1 This multi-disciplinary, international internship program gives them a broad base of understanding in the challenges and opportunities of design practice within different cultural and geographic contexts throughout the world. To address these challenges and opportunities successfully as professionals, they need a high level of competency in their own field of architecture and an understanding of related design disciplines, that together enable them to craft a unique design practice specific to each context they may find themselves in. The rigorous technical courses, architectural design and theory classes, and alternative practices studios that they take throughout the curriculum support a broad base for this approach. At the end of their undergraduate course of study, students produce a thesis project that requires them to bring together the global perspectives they’ve gained with the technical knowledge and ability required for architectural licensing in Spain and in the EU.2

As the design studio of the first year, Idea and Form establishes the trajectory of this entire program. Rather than a Bauhaus-like, general foundation in art and design, students are immersed immediately in architectural production. In designing this curriculum, we have sought to introduce design tools as framing an “architectural gaze” through which to engage the world. The frame produced is a complex one, simultaneously an instrument of sight and a place of negotiation, a response to the given and a retooling of this given. Henceforth the engagement that must exist in a program that is simultaneously intra- and extra-disciplinary, site-specific and cross-cultural is made explicit in the way the internal and external components of architecture - Space/Landscape, Program/Culture - are addressed across an architectural frame.

The studio extends across the Fall and Spring semesters and is divided into IF1 and IF2; both parts are understood in continuity but nevertheless each one retains its own personality and addresses different but complementary topics. In the first semester, IF1 explores the relationship between domestic space and...
landscape. Architectural fragments and framed landscapes form a hybrid, decontextualized threshold, which is then unfolded into interior and exterior environments that must address a given program. In this way, the role of architecture in accommodating individual lives is interrogated across the frame. In the second semester, IF2 explores the relationship between program and culture in a broader context. Students are asked to propose experimental programs that address specific urban sites in Spain. In this way, cultural fragments and new social spaces are negotiated across civic frameworks. While in IF1 architecture is presented mainly as a material response to human activity in the private sphere, in IF2 architecture is presented primarily as a cultural production, developed to address the collective of the public domain.

The understanding of architecture as frame allows students to navigate the different “worlds” in which they are immersed simultaneously, from the local backgrounds that accompany them from “home,” the redefinition of their new home in Segovia, and up to the wider frame of the multilayered societies in which they will live and practice in the future. In the process, they challenge the notion of common architectural notation, being compelled to design their own set of tools to cope with a world that exceeds the frame through which it is usually described. In that sense, the students are not just doing exercises, but they are immersed in the process of designing the means through which architecture, and by extension the world, is understood.

Idea and Form I – Space and Landscape

Fig. 1 Student work (Jorde Díez), Threshold Model, Idea and Form I (2014).

Idea and Form I has the task of situating first year students within the discipline of architecture – to give them an understanding of the vocabulary of architectural elements, a sense of architectural syntax and grammar, literacy in representational conventions and techniques, and introduce them to basic architectural concepts and design processes. In a sense, they have to learn a new language, in a physical and cultural environment that is also new to many of them. The key architectural concept that the course focuses on is the boundary between inside and outside, between the domestic space and landscape. Articulating and constructing such a boundary—the architectural frame—is approached with an understanding that has larger cultural and disciplinary implications. The questions of what is in and what is out, what is designed and what is existing or “found,” have an ethical dimension that beginning design pedagogy must address.

Fig. 2 Student work (Manuela Paláez Hernández), Threshold Model re-contextualized with two views, Idea and Form I (2015).

A single project, with discrete analytical and design phases, is developed over the course of the semester. The design project is usually a one-room house, for two inhabitants, situated in the landscape of Castilla-Leon, where IE University is located. Avoiding the conventional distribution of program into discrete rooms, IF1 fosters the discovery of new spatial relationships between the interior and the exterior, and challenges traditional notions about the domestic sphere. The size of the house is limited to that of a small shelter so that students have to be inventive in extending space across the architectural frame.

The analytical phase of the project involves the study of several iconic, modern houses. A unique, three-dimensional threshold is derived through a sequence of analytical operations. This sequence starts with plan, section, and axonometric diagrams that analyze the main spatial and architectural ideas of each house. From films featuring the houses they are studying, the students are asked to select a still that frames a threshold between inside and outside. This still is used to make a set of
orthographic drawings of the threshold that represent elements of the landscape, furniture, light and shadow, and domestic objects with as much concreteness as architectural elements defining the frame. These drawings collapse all of these constituent elements into a paper-thin, composite plane. Students are then asked to re-expand this plane into a model of a “thickened threshold,” where the inherent relationships between interior, exterior, architectural, and non-architectural elements are redefined.

During the design phase, site and program are engaged in an innovative way. The site for the project is not given as a plot of land, so that it is not taken for granted as a passive background for the work of architecture. Instead, students choose two views out of a particular selection of photographs. They then re-contextualize their “thickened threshold” model in relation to these two “views,” anticipating the unfolding of the activities of the house across the architectural frame, and actively participate in the generation of a landscape that is concrete and specific, but not geo-locatable. The project is actually developed through the negotiation of the relationships of architectural elements/furniture – landscape elements. Likewise, the program for the project is not given as a set of rooms and square meters, but as a description of the activities performed by two inhabitants, both over the course of their everyday lives and during particular times of celebration during the year. This description still allows a high degree of interpretation, so that the specificities of different cultural understandings of uses of assigned spaces are studied and discussed. Additionally, analyzing which parts of the activities need to be performed outside and inside, students are invited to think how the unfolding and the overlapping of two particular routines inform the construction of specific architectural boundaries.

Over the last two years, the program of the house has been generated with the description of the lives and routines of two different pairs of inhabitants, which make active use of the landscape in the immediate environment of their home. The first year, they were two professionals in their mid-forties: a food critic and writer of culinary books and a landscape painter. The food critic needed a garden to grow his own special ingredients, a kitchen/laboratory for his culinary experiments, and a place to read and write in peace. The painter needed the house to be a base-camp from which to venture out into the landscape with her tubes of paint and box easel. The second year, they were a retired botanist and a writer. The botanist took care of an experimental orchard and went to collect wild plants on long hikes. He used his knowledge about plants to create fragrances in a part of the kitchen. The writer had one of the most extensive collections of historical literature in Europe. Her 5000 volumes were housed in perfectly ordered library. Besides writing at home, she also strolled down her routine path with an old tape recorder where she stored her ideas.

Making the program for two specific inhabitants challenged the notion that a house is the projection of a single individual’s psyche or habits. Mirroring the dialogues between interior and exterior, and landscape and domestic space, the architecture of the one-room house must address a dialogue between two distinct individuals, with their own priorities and daily rituals. Thus, the program is not understood as a list of provisions for the building to contain, but as a woven set of relationships between subjectivities, space and landscape across the architectural frame.
One of the challenges of this approach is to de-familiarize conventions around activities in the quotidian sphere. Elements that are usually conceived as secondary in the construction of spaces of habitation, such as pieces of furniture, everyday objects (even works of art) and elements of landscape, can acquire symbolic weight and become as important as architectural elements in their own right. Another challenge of this approach is that it reveals some of the inherent biases of the architect’s traditional representational tools. Whether working with mechanical drafting, 2D or 3D CAD software, or through physical models, students find that it is often easier to represent and manipulate architectural elements than it is elements of landscape, which often have complex geometries, indefinite edges, and fluctuating forms, and are more detached from the environments they think they know well. To visualize the elements of landscape with as much concreteness and to work with them with as much facility as those of architecture, they find that they have to challenge the notion of common architectural notation, being compelled to design their own set of representational means in addition to the traditional ones they are in the process of learning. This sequence of exercises, from the analytic to the design phase, provides a grounding for students within their new discipline, as well as their immediate context in the landscape where the school sits. Rather than presenting these contexts as fixed, it instead immerses them in designing the means through which architecture, and by extension the world, is understood.

Idea and Form II - Program and Culture

In Idea and Form II (IF2) students continue to employ and develop the representational concepts and tools introduced in Idea and Form I (IF1), but also create new ones, widening the scope to engage social and cultural narratives from the larger world. IF2 foregrounds the political dimension of architecture and its ability to construct inhabitable conditions for a community in a social environment that is under constant change. This movement from the individual to the intersubjective is also reflected in the urban nature of the selected sites.

If in IF1 students negotiate the relationship between space and landscape across an individual frame, in IF2 the big question is to explore relationship between program and cultures across a collective frame, developing the ability of architecture to recognize, transform and create a different set of relationships between individuals, society and culture, beyond the naturalized realm of ossified economic, political and cultural relations. Accordingly, IF2 expands the frame from the individual towards the collective. Moving from the subjective phenomenological perception of the world to its intersubjective counterpart, the cultural dimension of architecture is brought forth: its capacity to communicate, to construct social meaning, and to gather people into communities are addressed. Departing from the focus on individual and personal acts that shape the architecture of the domestic sphere, IF2 concentrates on larger cultural traits that provide communities with specific ways of living and understanding the world, within the complex frame of the city. The focus in IF2 is in architecture as a means to negotiate different cultural, social, and political conditions. The questions about how architecture is culturally construed, how it is used, and the meanings that are projected in the public sphere become relevant as architecture becomes understood as an agent of social negotiation.

The cultural dimension of architecture and its capacity to signify are paramount. Its ability to voice concepts and meanings within a social context frames the relationship between the individual and the collective. Through the investigation of their own cultural backgrounds the students create pathways to explore their new surroundings. By working with both the social and formal ends of architecture, the students become familiar with a range of subjects, such as urban geography, sociology, and anthropology. The proposed theme each year creates a conceptual link between these subjects and provides a conceptual and pragmatic frame. This establishes a complex dialogue between the different agents and addresses global issues that deal with both the specific (site, materials, the given, local particularities, the present, the subjective) and the generic (the city, the relations of production, the unexpected, constructions of past and future, the objective).
During IF2 the site condition is concrete and provides a specific context in which the student projects are developed. This means that students need to develop their own programmatic ideas that will reconfigure the site with new potentialities and meanings. Consequently, an important part of the work in IF2 is site-analysis, close surveying and active mapping, both to detect hidden latencies in the site, and as a way of suggesting unexpected programmatic connections that can reconfigure the existing and obvious ones. In much the same way, the students were confronted in IF1 with the necessity of developing specific tools to visualize and understand elements of landscape not directly revealed in conventional drawing; in IF2 they also practice with personal and inventive ways of understanding and revealing the complex net of physical relations that they discover in the city, establishing a fruitful dialogue with the physical mapping they produce. Even if the analytical and design phases are not as strictly separated as in IF1, nevertheless both aspects are clearly addressed in the design sequence that leads from the production of the site to the production of a program. Being confronted with the necessity of creating new programs instead of assuming the existing ones is another of the main challenges in IF2. This allows the student to realize the way in which human activity is preconfigured through imposed architectural programs and of the necessity of deconstructing the underlying naturalized assumptions.

During the last academic year, IF2 explored the topic of “the architecture of food.” The conceptual frame for this course was established on two levels: the cultural context of food and its physical infrastructure. This global topic of “food” opened a door to the different traditions and understandings that permeate each student subjectively, and at the same time, to a global perspective where the standardization of consumer habits, including food, seems to obliterate all possible differences.

As an introductory exercise, the students worked in pairs spanning continents, teaching their partner how to make a favorite recipe from “home.” They also created a series of drawings describing and analyzing the markets from their home countries. This food and these drawings became the frame with which the students approached the local site to work with for the rest of the course. The local site for the project was the San Fernando Market, a traditional food market in Madrid, located in a historic neighborhood that has been transformed from a working-class quarter to a multinational immigrant neighborhood, and is now in the process of gentrification.

The students began by mapping the area around the market to gain an understanding of the complexities of the site, and surveyed the actual building of the market, focusing on taking detailed measurements of the various market stalls. This process allowed the students to confront their earlier study of food markets in a critical way, coming to understand the architectural logic that lies behind food distribution and sale, changing consumer habits, the technical demands in services, mechanics, and so on.

Working in pairs, they produced detailed plans and sections of the different stalls inside the market, and personal accounts of how the market and the process of buying-selling food was
experienced. These drawings were then shared and combined to produce a collective and comprehensive map of the market. This map included both technical specifications and intersubjective approaches, producing a multilayered document that became the basis for subsequent phases of the project.

The final phase involved reprogramming the façade of the existing market building, an austere, almost dictatorial skin built in the 1940s that relied on old concepts of power and authority as embodied in the Spanish political regime of that time. This phase asked students to create a new program for this skin as well as a new physical architecture, which hand in hand would create a new functional and ideological public façade for the building. Although a first-year studio project, this phase also confronted the students with a high level of technical challenges in understanding and resolving the relationship between structure and envelope, questions of materiality, and circulation needs of a public, urban building.

**Architecture as Frame and Dialogue**

IE School of Architecture and Design implemented the current study plan, accredited by the “Agency for the Quality of the University System of Castilla y León” (ACSUCYL) as part of the European Higher Education Area (EHEA) in the academic year 2008-09, with sections both in Spanish and English. Since its inception, the aim of the Idea and Form sequence was to address the needs of students looking for an approach to architectural education better aligned with the conditions of the contemporary, globalized world. The cross-cultural dimension of education was very soon brought to the fore, and in only three academic years, a decision was made to have all the sections taught in English. Diversity on the country of origin of the incoming students have exponentially increased since then: in the last two years more than 70% of the beginning students have been non-Spanish citizens from as many as 30 other nationalities from 5 continents. The Idea and Form sequence has responded to that circumstance to provide, first of all, the foundations for a common language in which all the students can communicate. This language is not other than the language of architecture, however the cross-cultural condition of the incoming students allowed the Idea and Form to take a specific stance. Thus, Idea and Form understands architectural language as a continuous dialogue between different traditions and cultural backgrounds and a desired common means of inter-

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**Fig. 7 Student work (Aaron Hesse), Grocer’s Stall, Idea and Form II (2016).**

In the following phase, each student used the information collected during the mapping process to reinvent the program and design of a particular stall. The goal was to reprogram the market through the construction of new architectures. These mobile and transformative objects had to be capable of being repositioned occasionally in a nearby plaza, intervening directly in the adjacent public spaces of the city. In this phase, the spatial conventions about social, private, and public spheres are challenged in a similar way as the conventional distinctions between landscape and domestic space are in IF1.

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**Fig. 8 Student work (Tomomi Dambara), Reprogramming San Fernando: Blind Restaurant, Idea and Form II (2016).**
interpreting, designing and transforming reality through architecture. Over the years, the great challenge has been, and still is, to allow cultural and individual particularities of students coming from so many different places flourish within the open boundaries of a global world and to establish a shared language of technical proficiency, capable of fostering innovative design practices.

Today, whether from Spain and choosing to pursue an architectural education in English, or from elsewhere and choosing to pursue an architectural education in Spain, the students enrolling in this program arrive with a keen awareness that they may have to be geographically mobile in the pursuit of their careers. They also know that they may have to weave together architecture with other scales and forms of design to create unique practices relevant to their individual concerns, as well as ever-changing contexts and pressing societal demands. They don’t assume to have a set place or professional path, but understand the need to be effective advocates for their practice, ideas, and ideals, wherever they may be in the world.

These contemporary concerns are addressed in various ways in the larger curriculum of the IE School of Architecture and Design: through rigorous technical courses toward licensure; an international, multi-disciplinary internship program; studios in alternative practices; and a thesis year where students are required to bring together the global perspectives and technical knowledge they've gained within a single project. The first year, Idea and Form studio sequence provides the foundation for this trajectory by introducing architecture as frame, one that is simultaneously an instrument of sight, a place of negotiation, and a means of transformation. It orients fresh architecture students in the discipline while also framing it as a dialogue with what lies always just outside. Accordingly, understanding architecture as a dialogue and not a form implies that students are constantly negotiating not only the particular content of a design, but also the boundaries of the architectural discipline as such, its frame. It also means that students as future practitioners are compelled to take a critical stance, continuously questioning disciplinary axioms and biases, to engage the world anew with imagination, resourcefulness, and empathy. Asking students to constantly reevaluate and reframe architecture in this way provides them with the tools to navigate the complexities of what is to come in their education and practice. Far from any maximalist approach, the students come to understand architecture as a dialogic practice that establishes a coherent narrative relevant to collective, pluralistic life.

Notes

1 IE University is a leading institution in the world in developing and using online teaching techniques. Since the students spend four out of six months of the second semester far from the university in their professional practices in offices all around the world, the classes are taught online, including design studio, applying the know-how developed by the institution along many years of research and practice in online and blended programs at the Business School. Results of this methodology are as good as the on-site ones, and the students profit of both the professional and the academic environments in the best possible way.

2 The Spanish and the Castilla y Leon (the Spanish region in which the School is based) equivalents to the American “National Architectural Accrediting Board” (NAAB) are the “Agencia Nacional de Evaluación de la Calidad y Acreditación” (National Agency of Quality and Accreditation Evaluation) (ANECA) and the “Agencia para la Calidad del Sistema Universitario de Castilla y Léon” (Agency for the Quality of the University System of Castilla y Leon) (ACSUCYL), which both –nationally and regionally– evaluate proposals of study programs that must be originally designed to meet the goals established by the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). The European Higher Education Area (EHEA) is the result of the political will of 48 countries, which, since 1999, has implemented reforms on higher education on the basis of common key values. The fact that Spain is part of the EHEA and its study programs meet the standards dictated by it, grants the students graduated in Spain to be able to register as architects in the EU as soon as they finish their degrees.

The study plan of IE School of Architecture and Design is accredited by the ACSUCYL and recognized by the Spanish Government as an official one. After five years, which includes a final thesis, the students graduated from IE School of Architecture and Design can be registered as practicing architects in Spain and the other 47 countries of the EHEA. This means that, by the time students have finished their degrees, their technical and professional expertise is able to comply with Spanish construction and urban regulations, which implies a significant amount of credits of the program devoted to structural calculation, mechanical systems, building technology and legal aspects. Another fact that may explain the high technical requirements of the Spanish architecture programs (comparing to other countries) is that the field-area in which it is evaluated is the broader one of “architecture, civil engineering, construction, urban design.” Neither ACSUCYL (nor ANECA) are agencies specific to architecture, but have the overall goal to contribute to the improvement of the quality of the entire system of higher education across 14 field-areas, as opposed to the NAAB, which is specifically oriented to architects.

The good reputation of the technical proficiency of Spanish architecture programs and the fact that the completion of a five year program already allows the students to register as architects, not only in Spain, but in the broader EHEA, make the program particularly enticing and attract students from many different places over the world.

3 During the last 2 years, we have relied on the work of Le Corbusier to develop the analytical part of the project. During the fall of 2014, students were able to see locally the exhibition Le Corbusier: An Atlas of Modern Landscapes (Caixa Forum, Madrid, June 11-October 12,
During the Fall 2015, students could participate on many of the events celebrating the 50th anniversary of Le Corbusier’s death, including, the international conference and exhibition Le Corbusier: 50 years later, which took place in Valencia (November 18–20, 2015 - January 7 2016). Over these two years, students analyzed Le Corbusier’s Villa Le Lac, Villa La Roche, Villa Stein, Villa Savoye, Maison Cook, the music pavilion of Villa Church, and Casa Curutchet as well as the films L’Architecture d’aujourd'hui (Chenal), El Hombre de al Lado (Cohn/Duprat) and A Visit to the Petite Maison (Gigon & Guyer).

The sites for the project were generated by means of local and regional photographs of the Spanish photographer José Manuel Ballester. In the first year, the photographs were selected from a series of hidden spaces and landscapes of Segovia that had been on view on the exhibition José Manuel Ballester: Umbrales del Silencio (Museo Esteban Vicente, Segovia, April 10–September 14, 2014). In the second year, the selection of photographs came from a series of different landscapes of Castilla y León (Pancorbo, Quintanilla de las Viñas, Monasterio de San Pedro de Azara, Santo Domingo de Silos, Atapuerca), also photographed by Ballester, which Le Corbusier himself had visited in August 1930.

The full title of the course was “Global Dishes, Local Markets: The Architecture of Food”. This main frame is specifically designed to enhance cross-cultural understandings of both world and architecture, and make the students interact from the very beginning of the course with the double coded condition of present day and near future architectural practice: addressing local specificities while maintaining global perspectives.

17 different countries from five continents were represented: Azerbaijan, Canada, Colombia, Germany, India, Italy, Japan, Morocco, Nigeria, Panama, Peru, Russia, Spain, Thailand, Turkey, Venezuela, and Vietnam.
Communicating Ethics

Margaret Fletcher, Auburn University

Introduction

The design portfolio is one of the most important design exercises of a student’s career. It is the document that not only represents all of the hard work they’ve accomplished but also serves as an indicator of how they consider the world around them. The design problem of the portfolio embodies both the act of planning and the act of doing. To design and produce a successful portfolio, there needs to be an understanding of the complex design systems at work in order to properly structure a portfolio to be able to visually communicate the ideas that have formed and shaped the work included within the portfolio. Through the portfolio the student is not only being evaluated on their formal design work, but also on the design of the portfolio and how they’ve used this opportunity to frame their ideas.

A significant factor of being a successful designer is having the ability to parse through an incredible amount of information and discover interrelated themes. It is a skill unique to design culture and exists in the realm of design thinking and design knowledge. It is important for each student to understand how they, themselves, think so that they can demonstrate it to others. The portfolio should be designed to display this design thinking. If the complexities of how one thinks is understood, then one can begin to understand and define how they might represent and explain all of the diverse knowledge that has gone into each design project.

The First Year Architecture Program at Auburn University focuses on the practice of the visual communication of architectural ideas or the art of defining, describing, presenting, representing and re-representing. This paper seeks to discuss a pedagogy predicated on the understanding that effective communication of architectural ideas is firmly embedded in the design of the representational artifact and not only in the act of architectural design. The primary goal of the course sequence is to foster a learning process where both strains of design (representation and artifact) are intertwined and constantly and consistently evolving.

In such a complex and ambitious project, the students naturally must learn the essential skills of architectural representation but they must also develop fundamental skills related to documentation and reflection. The portfolio design project ultimately becomes a multi-year project defined by broad, graphic, systems thinking. It is an organizational system that has to be re-focused and re-tooled as the student progresses.
through their academic (and professional) career. If comprehensive systems thinking regarding the reflection of their own work is taught in the beginning of design education, students are better prepared to develop successful habits of reconsideration and re-positioning of their respective design challenges. This paper presents a method of system thinking developed to organize the complex reflective relationships needed for successful portfolio design and are defined as: the visual narrative, content narrative and project narrative.

The Design Narratives

One of the easiest ways to coordinate the different necessary systems within the portfolio is to categorize systems into narratives, understand them separately and then capitalize on their overlaps. There are three specific types of narrative systems that need to be strengthened and made apparent throughout the design of the portfolio. The three types of narratives are: visual narrative, content narrative and project narrative. All three of these systems should be considered as organization systems for the portfolio. Visual narrative and content narrative consider broad issues that bridge across the design of the entire portfolio. Project narrative specifically refers to the narrative within individual projects. However, there must be a conscious attitude toward the idea of project narrative across all projects in the portfolio. In other words, for project narrative focus at the individual project level as well as at a larger context across all projects in the portfolio. It’s important to work on all three narratives—visual, content, project—simultaneously as the design progresses. It might seem like the portfolio process is linear, but it is really a back and forth design effort between the interrelationships of these three narratives. To better understand the three types of narratives, let’s look at the basic definition of a narrative. A narrative—in this context—is a purposeful and designed relationship between elements that are constructed to be understood together.

Visual Narrative: Goals and Purpose

Keeping the definition of narrative in mind and incorporating the definition of visual—all things seen—think of the visual narrative as the deliberate, designed visual relationships between elements in the portfolio composed to be understood together and considered across the entire portfolio. The following elements fall under the purview of the visual narrative: visual organization cues, headers and footers, parallel use of project introduction pages, grid and alignment systems, consistent graphic indicators, consistent visual order, consistent visual hierarchy, consistent typeface usage, etc.

Content Narrative: Goals and Purpose

The content narrative for a portfolio is the thoughtful, purposeful inclusion of projects, project types and project themes that best convey the designer’s position relative to both meaning and skill and is to be considered across the entire portfolio. Resolving the content narrative early in the design process will readily help determine the content focus of the portfolio and will automatically help determine which projects should be included, emphasized, or left out altogether. All content should support the content narrative.

Project Narrative: Goals and Purpose

First and foremost, the project narrative in the portfolio relates to each individual project. It is the specific visual and written material required to convey the thinking behind the work. Projects assigned for coursework are assigned with a specific pedagogical agenda. When constructing the project narrative for use in the portfolio, it does not need to be the same as what was assigned in class. A student’s specific project narrative should be authentic to what they found interesting through the experience of their own design work. The focus should be on the conveyance of this thinking behind the work; nothing should be left unsaid and assumed it will be obvious to the reviewer. To do this, students need to make a list of all the ideas to be conveyed for each project and they should make sure each of these ideas can be represented with a visual artifact. Once there are visual artifacts to represent all of the ideas in the project narrative, use text elements to support the ideas conveyed through the visual artifacts.
Designing the Content and Designing the Container

When thinking of all the material that needs to be included in the portfolio, it is a daunting task to understand everything that should be accomplished. One way to tackle such a large project is to understand all of the different components required to design the portfolio and how those components ultimately fit together. Recognize that each of these different components requires a slightly different design attitude.

There is a range of design tasks when beginning the design of the portfolio and there are clear distinctions between these tasks. The largest of these is the distinction between designing the contents of the portfolio and designing the system of the portfolio itself, known as the “container.” Both of these tasks require an attitude toward design that will ultimately affect the look and feel of the portfolio. It can actually be a little confusing to try to separate these very distinctive design tasks at the beginning. But these ideas will become clearer as the work progresses through the design of the portfolio. Just remember these two different design tasks: design the content—this is the content narrative and the project narrative, representational work associated with architectural projects—and design the container for the content—the visual narrative that is the entire system of the portfolio.

Organizing Systems

Thinking though several large-scale organizational strategies at the beginning of the portfolio design project will help in making decisions about the focus of the design work all the way down to the project-scale. Making some big decisions up front will allow informed, detailed decisions to be made regarding issues of individual project representation.

The organization of material in the portfolio ultimately determines how all of the work is understood as a collective body of work. It is important to recognize that the understanding of the design work is completely dependent upon how it is presented. There are numerous opportunities to convey meaning beyond just the display of project work. How the material is organized in the portfolio is one of the largest factors in this conveyance of information.

Organizing the Visual Narrative: Using Visual Components of Graphic Layout as Organizational Structure

Topics related to the visual organization systems in a portfolio are just that—visual clues that organize material. Successful visual organization systems don’t necessarily need to be completely understood to be valuable visual tools. They just need to appear in a similar fashion again and again so that the visual system becomes legible over the space of the entire portfolio.

The list below outlines areas to focus on to develop the visual narrative through a variety of organization systems. Additional visual organization systems will likely be developed in the process of designing the portfolio. It should be noted that there are different scales of visual organization systems within the portfolio itself: some systems are portfolio-wide systems and relate to the overall visual narrative of main portfolio components—page numbers, headers, footers—and some systems are project specific and relate to the visual aspect of the content narrative for project components—parallel visual use of images and text.

Table of Contents: The table of contents can be used as a visual strategy for portfolio organization and sets the tone of the portfolio organization from the very beginning of the portfolio. While it is not always completely necessary to include a table of contents in the portfolio, it is a good plan to make a first impression on the reviewer regarding the contents they are about to review.

At the bare minimum, a table of contents lists project names and page numbers. However, there is an organizational opportunity available that can change the table of contents from just a list or a page finder to another clue regarding the way the designer defines the body of work. One of the visual goals with the table of contents is to make obviously legible a subset of information about the work. For instance, it may be important to convey how many years the designer has been studying architecture or working in the profession. To convey this point, make the dates of the work one of the most visibly legible parts of the table of contents.

Section Divider Spreads: Section divider spreads are another visual organization tool that is a portfolio-wide decision. The purpose of a section divider spread is to clearly and visually begin a new section within the portfolio. It offers the reviewer a moment of pause when transitioning from one topic to another. Section divider spreads reinforce any sections that have been developed as part of the organization or categorization strategy developed in the table of contents. They should be used to cause the reviewer to stop, pause, shift gears and clearly understand the over-arching theme of the section they are about to view.
These pages work to separate large categories within the portfolio. They must work visually together as a set so they are legible together but they must also convey the individuality of each section they are defining.

Section divider pages can be graphically quite simple—such as a full spread color block with a simple section title—or quite complex with sample images of each project that will be included in that particular section. In order for the section divider pages to be read as a separate set of pages within the portfolio, there does need to be some graphic difference from the way more normative project content pages read against the section divider pages. Usually this is achieved through a change of visual pace—often with less visual clutter found on the divider pages.

Headers and Footers: The header and footer material is an often overlooked but vitally important aspect of a portfolio. It acts as the primary visual way-finding system and provides clear access to all of the sections found in a portfolio. It is important to understand how to use headers and footers visually and how to use them in meaningful ways.

Headers and footers are one of the single most important organizing components to add to the portfolio. They are very easy to implement and should be considered at the beginning of the design process so their location can be accommodated within each spread.

Visually, headers and footers work with the margins to establish the active area of the page. They provide a visual edge adjacent to the actual page edge of each layout. It is not necessary to include both a header and footer if there isn’t content to support them.

Page Numbers: Page numbers are included within the header and footer system. Since some portfolios have only page numbers as their header and footer, page numbers warrant a separate discussion.

Page numbers start with the first real page of content, typically this is after the table of contents. The first real page of content is always numbered “1” and is always on the right-hand page. Odd numbered pages are always the right-hand page of a spread and even numbered pages are always the left-hand page of a spread. If there is a reason to start pagination at the table of contents page, set it up as page “1” and hide the page number. There is typically not a page number visible on the table of contents page. However, now the first left-hand page will be numbered “2” and the subsequent right-hand page will be numbered “3.”

Typically in the table of contents, page numbers reference actual content pages instead of the section divider spreads. But remember that the pages that do not actually receive visible page numbers are still counted as pages when the pagination is entered in the table of contents.

Typeface Use Consistency: Maintaining typeface consistency throughout the portfolio is of the utmost and primary importance. Once typeface styles have been assigned to each type of text—titles, subtitles, body text, captions, diagram titles and call-outs, header and footer—stay spectacularly consistent throughout the entire portfolio. If a part of the typeface system has to be changed to fit a particular need on one project, it actually means that the system does not work and it needs to be rethought and reworked throughout the entire portfolio.

Graphic Icon Systems: Graphic icons are symbol signs designed to convey common principles throughout the portfolio—these could be related to the organization and / or categorization systems established through the table of contents or begin to relate conceptual ideas from project type to project type. These icons must be designed so their meaning is obvious.

Graphic icon systems can be tricky—there are some significant pitfalls that should be avoided. First and foremost, the graphic icon must add value to the conveyance of information. It cannot be visually distracting to the content on the page. Weigh these two things against one another when designing graphic icons and determine whether or not to include them.

Reflection and Determination of Content Narrative

It is important to convey design thinking; in a portfolio nothing should be left out and assumed it will be obvious to the reviewer. For each and every project under consideration for inclusion in the portfolio, students should make a list of the types of artifacts that should exist for that project. This is a list of artifacts that just covers the basics: site plan, plans, elevations, sections, descriptive diagrams, etc. For each and every project under consideration for inclusion in the portfolio, students should make a basic list of artifacts that are missing for that project. On this list, include things such as: “I never finished that exploded axonometric,” or “What was that model my professor was always telling me to think about?” This should be a robust and complete list. This list is not a task list of things to be produced, but this list should contain any ideas of things never completed while working on the project.
The next exercise is a hierarchy exercise to determine what are the most important ideas to convey. Start by describing in a concise manner the main ideas about a project, then from this description create a list that identifies the single most important idea to convey along with three or so secondary ideas that are also important to explain.

Now it’s time to make some decisions. It is always better to communicate a few ideas and communicate them well than to throw everything at the project and hope something sticks. In the case of a portfolio, the reviewer spends a relatively short amount of time with the work in the portfolio and it is critical that the thinking behind the work has been clearly conveyed. It is not enough to show just drawing skills or model-building skills or even computer rendering skills. There is an assumption if a person has graduated from an accredited school of architecture, they will have these skills.

Remember, project work in a portfolio is not just a representation of what was accomplished during studio (or similar situation). Project work in a portfolio has a new life of its own. The portfolio is a new presentation of the work and therefore can and should have a new layer of attention placed on its representation. Don’t think that the only items that can be included are the items that were previously accomplished. The portfolio offers new opportunities to think through and produce what is needed for a project in this new presentation format.

Students should cross-reference their list of ideas with the list of design artifacts created earlier in the process and literally assign artifacts to ideas. Determine which drawings, images or diagrams do the best job of visually describing these ideas. It is quite possible that additional material will need to be generated or a section drawing has to be improved or a model re-photographed. In fact, it is not only possible . . . it is very likely. It is imperative that the portfolio demonstrates abilities to think through and solve complex problems. Students should be aware that the evaluation of the portfolio is based on the clarity and conveyance of ideas through the portfolio design as well as on the work presented within the portfolio.

Order of Content Narrative

There are actually many ways to organize the project material in a portfolio. Think about this organization in two ways: an order to things—literally a linear progression of some sort: chronological, reverse chronological or placement of strongest work—or a categorization of projects: project type, design theme, academic work versus professional work. It is probable that more than one of these ordering systems needs to be incorporated. If that is the case, make sure to prioritize decisions based on a primary ordering system and a secondary ordering system. For example, it could be decided to catalog projects by project type, and then, within each project type, the projects are ordered in a chronological fashion.

Project Narrative Visual Representation

The project narrative in a portfolio relates to each individual project. This is the specific visual and written project representation material required to convey the thinking behind the work. When beginning the artifact collection for a portfolio, usually the first thing done is simply to start dropping images into the design layout to see what happens. As crazy as it may seem from someone who has written an entire book on portfolio design, this is not actually that bad of an idea! Sometimes, just seeing what material is available, and putting it in the new context of a portfolio, will trigger some significant ideas about how to visually display a project. After all, as designers, we know that all the planning in the world can’t actually solve a design problem; one has to act and react and then do something again to move through the design process. However, putting energy and forethought into what to do will make better use of your efforts and will ultimately result in a better portfolio. A little bit of work on the front end will make better use of time on the back end.

Part of the struggle of visually organizing a portfolio is having a cohesive strategy that works for the entire portfolio and also works for the individual projects. Here’s the problem that comes up frequently, and luckily, it is a relatively easy one to solve. Here it is: “I’ve got all the projects that I want to include in my portfolio in the layouts, but they look sort of messy and it’s hard to tell what’s what.” To answer this question through the lens of visual organization strategies for an entire portfolio, there are a couple of simple ideas to apply that will solve this issue of project legibility.

Parallel Use of Project Introduction Material: Project introduction pages work on two different scales; they act as a way-finding system related to all projects included in the portfolio and they provide vital, pertinent information for each individual project. With that in mind, it is important to make sure that whatever system is developed for the project introduction pages works for both the overall portfolio visual narrative as well as the individual project narratives.

Project introduction pages contain all of the important statistical information needed to convey the most pertinent facts about each project included in the portfolio. Visually the information
needs to be organized so that it appears similarly again and again throughout the portfolio so the reviewer can instantly recognize it as the beginning of a new project section. This instant project-start recognition can and should be achieved through both the visual nature of the imagery and the organization and styling of the typography.

Image Components: Each time a new project spread begins, use the imagery with the greatest amount of visual impact to launch the project section. This imagery could be a model image, or an incredibly explanatory diagram, or an atmospheric rendering—anything is possible. The goal is to grab the viewer’s attention immediately from the beginning and pique their curiosity about the work accomplished on that particular project. Gone are the days when each project needs to begin with precedent studies and a site plan; these are not necessarily the best tools available to convey design ideas with the greatest amount of impact.

Text Components: There are common descriptive components of each project that can be used to organize a set of introductory material to visually start a project spread. These descriptive components are usually at a minimum: project title, location and a brief description. But it can include much, much more. Writing everything out in paragraph form will generate an essay that few reviewers will find the time to read.

The best strategy is to make an incredibly informative and pointed list of facts about the project that can be used as a visual information system and apply this system across all of the projects in the portfolio. This list is very effective because it is brief and easy to read and becomes part of the system of information available about each project.

This descriptive material should be visually organized in a way that is recognizable as the start of a new project and flexible enough to be used with all of the projects. Here are some ideas to help think about the possibilities: title, location, project type with brief description, main programmatic components; organizing principles of the design (basically telling the reviewer in a couple of words how to review the project), size (square feet or square meters), year of completion—this could literally be the year or perhaps the year level in school or both, your role on the team if it was a team project, brief project description.

Conclusion

Applying systems thinking as part of the reflective exercise of designing a portfolio reinforces the general lexicon of architectural education and expands students’ understanding of how systems can be used to develop information, organize information and synthesize information.

Notes

1. Fletcher, Margaret. *Constructing the Persuasive Portfolio: the only primer you’ll ever need*. Routledge Publishers. New York and London. 2016. This essay is derived and adapted from content developed in *Constructing the Persuasive Portfolio*. 
Contemporary Foundation: The Relevance of Projection

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Why Projection?

In Western Civilization, projection is associated with the acquisition of knowledge through light. In “The Allegory of the Cave,” Plato establishes a foundational distinction between accessible and inaccessible forms of knowledge—between appearance and reality—rooted in projection. The cave is essentially a shadow-puppet theater for an audience of prisoners, who represent our being-in-the-world. The prisoners are born into the cave and chained in a position that limits their field of vision to the innermost wall of the cave, on which they perceive shadows generated by the projection of light through solid forms of “men and other things” operated by puppeteers behind them. The light source is a fire situated between the prisoners and the puppeteers. The shadows in the allegory represent the world-as-we-know-it, and they are distortions of the solid forms that generate them, which in turn are mere surrogates for embodiments of similar forms existing outside of the cave altogether.

Our perception of the world is thereby a deeply mediated form of knowledge, ascertained through acts of projection that manifest distorted appearances of a reality from which we are twice removed. Reality is not only beyond our perception, but also external to our immediate environment. In the allegory, a prisoner given an opportunity to leave the cave resists, as the sunlight at the end of the entrance tunnel is initially too bright for the eyes of a man who has lived only in a dark cave illuminated by the soft light of a fire. When dragged outside against his will, the prisoner eventually adjusts to the reality of the world in the sunlight and ultimately sees the beauty of true knowledge by staring directly into the sun. Returning to the cave to enlighten the prisoners left behind, he is initially blinded in a different way, by the relative darkness of the fire-lit space, causing the other prisoners to assume that he has been permanently injured by whatever journey he had taken. They decide that death would be preferable to leaving the cave by will or force, and the projection of shadows onto the wall of the cave remains their only connection to reality.

The discovery of linear perspective in the early fifteenth century upholds but also reinterprets the disparity between appearance and reality established in Plato’s allegory. Projection is still the engine of our knowledge, and it again results in a distortion of something understood as an absolute; however, the distinction between appearance and reality in linear perspective is different from the shadows in the cave in three ways. First, the double removal from reality is now a single removal—projection occurs through real forms within our immediate environment, not through a surrogate of the real. Second, the projection of light through objects is metaphorical, not actual—the presence of real light and objects is not necessary to produce projections of those objects. The laws of optics allow for that absence. Projection lines drawn by an artist represent some of the infinite number of rays of light that would pass through such an object if it were placed in front of a light source, and mathematical properties predict the behavior of those would-be rays exactly. A linear perspective, in a sense, is a shadow produced without the use of actual light and objects, and rendered to a degree of detail impossible to achieve in a shadow. Third, the metaphorical light source is analogous to the human eye and therefore actually a receptor of light rather than a generator of it. This inversion of the directionality of light transmission in linear perspective is easy to overlook, as lines are generally projected from the point in the drawing that represents the eye, not toward it. Again, the laws of optics enable our disregard of that reversal. Despite these three differences, the basic principal of knowledge acquisition is the same in linear perspective as in Plato’s cave—the projection of light through objects (either from a light source through objects, or through objects toward an eye) generates our distorted perception of the “real” world.

Orthographic drawing is a type of projection that upholds both a distinction between appearance and reality and the premise that projections of light through objects generate our knowledge of the world; however, it presumes to give us a knowledge that overcomes distortion and attains absolute
truth. Orthographic projection obeys the same laws of optics underlying perspectival projection but also transcends the limitations of appearances. In orthographic projection, again metaphorically and not dependent on actual light and objects, rays of light are projected through all points of imagined objects perpendicularly with respect to the image surface and parallel with respect to each other. Those rays do not converge at a metaphorical eye or at any other point that may exist within the same environment as the objects. This raises a compelling question: is an orthographic projection constructed through an infinite number of projections, each of which consists of a single ray of light that converges to one of an infinite number of metaphorical eyes within the same environment as the objects, or does it occur through a single perspective-like projection in which an infinite number of rays converge to a single metaphorical eye that lies at an infinite distance from the objects? In other words, is the point-of-view from everywhere or nowhere? 

Either way, it is an un-embodied form of perception, which may lead to an assumption (both reasonable and logical) that it aligns with a privileged mode of perception (perhaps God-like) analogous to looking directly into the sun in Plato’s allegory.

In this paper, it is less important to place value judgments on appearance and reality than to acknowledge that both are modes of perception that generate knowledge through the vehicle of projection. In his treatise on architecture, Leon Battista Alberti addresses the difference between perspectival and orthographic projection, arguing that pictorial embellishments of architectural graphics hinder their ability to examine an assembly of parts in terms of proportion, tectonics, and cost:

“The difference between the drawings of a painter and those of an architect are this: the former takes pains to emphasize the relief of objects in painting with shading and diminishing lines and angles; the architect rejects shading, but takes his projections from the ground plane and, without altering the lines and by maintaining true angles, reveals the extent and shape of each elevation and side—he is one who desires his work to be judged not by deceptive appearances but according to certain calculated standards.”

The author understands architecture as a complex discipline of aesthetic and technical concerns that escape the limits of visual immediacy. Alberti values embodied sight as “the keenest of all senses” in the judgment of architectural integrity, but his notion of vision is nuanced and implies a distinction between appearance and reality. Whereas immediate appearances of a building may signal a deficiency, more measured practices of perception are required in order to avoid the realization of such deficiencies in the first place. The specific impression of a work of architecture is pleasing only when that work upholds underlying principles that cannot be perceived through pictorial means. At the same time, appearances are also valuable and are the concern of the painter. In On Painting, Alberti promotes visual immediacy as the ultimate objective of painting, and he codifies the so-called costruzione legittima (legitimate construction) of linear perspective as the means through which to achieve this goal. Painting is good when it looks good. Architecture, inversely, looks good when it is good.

A significant aspect of Alberti’s distinction is its appreciation of both appearance and reality as distinct but complementary forms of knowledge. The author, however, resists laying bare a mathematical reciprocity that underlies the two modes of projection. Linear perspective and orthographic drawing are two sides of the same coin. Each is embedded within the other, and each may be extracted from the other if the reciprocal processes of projection are understood mathematically. To acknowledge that reciprocity is to appreciate the alleged distinction between appearance and reality as a continuum as opposed to a dichotomy. Unlike in Plato’s allegory, projection in the Modern era delivers us to both the real and the apparent. It is the generator of multiple and compatible types of knowledge, not merely a derivative type. This paper ask if it still matters.

**Contemporary Relevance**

Architecture is a discipline founded on projection. According to a paradigm established in the Renaissance, architects use scaled drawings and models to resolve all aesthetic and technological matters concerning a building prior to its construction. The built work is considered to be a full-scale copy of its reduced-scale projection—a derivative of an ideal vision. Design and construction are distinct, and the builder constructs that which the architect projects. In reality, projection has limitations, and most practitioners expect a built work, for better or worse, to be something other than an exact copy of its projection. The inevitable gap between projection and reality typically causes a mixture of frustration and appreciation. Visions of architects are always compromised, but construction-related changes may enhance built works in ways that would be impossible to project in advance. Design-build practices overcome the gap by resisting the authority of projection; however, even design-build practitioners leverage the virtues of drawing and modeling in certain ways, not unlike the master builders of the late medieval era. Projection is amenable to different spheres of influence. It may command a privileged position within a projection-based method, or it may operate in the manner of a rapid-response
force, appearing when needed and then receding until needed again in a construction-based method. Regardless, it is never expendable.

The relevance of projection to contemporary architecture is evolving toward what seems to be a hybrid of the Renaissance paradigm and the design-build model. Digital and computational modeling, in one sense, optimizes the paradigm, as comprehensive sets of drawings may be extracted from models, and as software operations have the capacity to scrutinize a wide range of architectural concerns, from formal composition to technological performance. The construction of an immaterial model and the effortless extraction of immaterial drawings from it undoubtedly affect the design process, but new technologies of projection do not threaten the underlying logic of the paradigm, at least not necessarily. Computer environments enable certain bad habits, but architects committed to a traditional notion of projection may easily overcome the potential pitfalls of an immaterial process. A deeper (and perhaps welcome) threat to the paradigm is an emerging model of collective authorship in architectural practice that aligns more with the master builder culture of the late medieval era than with the heroic individualism of the modern era. Also enabled by computers, this new model of authorship counters the assumption that projection is conclusive.

According to the Renaissance paradigm, individuals author architecture through projection, and the authoring process begins and ends in clear ways. The term “individual” usually means a group of people working collaboratively under a common banner, and this sort of traditional model of collaboration does not compromise the assumption of the paradigm that architecture is scripted by one source and executed by another. The emerging model of collective authorship, associated with the so-called post-critical approach to architectural practice, is altogether different. Post-critical architects work on an increasingly broad range of matters, only some of which are amenable to projection as it is traditionally understood. Practice is interdisciplinary, and the processes with which architects engage begin earlier and end later than a traditional design-and-construction process. The computational model is an ever-evolving projection, subjected not only to multiple authors, but also to streams of data that continually reimagine both the static morphology of a built work and the contingent forces that act upon it.

In the contemporary era, to summarize, projection has become immaterial, and “individual” architects have surrendered their claim to absolute control over the realization of built works through projection. Even more consequential to the fate of projection, however, is the post-critical tendency to attribute the derivation of architectural form to different types of performance and data, and to reject theoretical inquires into form and aesthetics. Post-critical architects strive to engage the lived reality of the built environment—its social, economic, and technological contexts. Projection, while not incompatible with the post-critical agenda, is historically associated primarily with the composition of architectural form. In a culture of practice that marginalizes, if not eliminates, composition for its own sake, projection is difficult to defend on its traditional terms. Projection is most valuable when it is an act of inquiry, not merely a resulting representation of a work whose morphology has been determined through other means.

The challenge facing the contemporary architect is to identify the aesthetic meaning, if any, of architectural form in the contemporary era. In this context, “aesthetic” means the cultural significance of spatial composition, as opposed to some notion of beauty, truth, or goodness, which are the defining aims of the Renaissance paradigm. To abdicate responsibility for an aesthetic intent behind the derivation of architectural form is a radical departure from the Renaissance paradigm. In most cases, post-critical denials of form-finding agency are disingenuous, and aesthetic inquiry still plays a role in the design process; however, data-driven design is increasingly ubiquitous in contemporary practice, and the lack of respect toward composition is leading to an unnecessary demonization of aesthetic inquiry, as has happened before. Throughout the modern era since the emergence of the Renaissance paradigm of the architect, architecture has passed through cycles in which form and composition are first upheld as vehicles of aesthetic significance and then derided as meaningless distractions to deeper forms of real-world engagement. In every instance of the cycle, reactionary assaults against architectural composition for its own sake demonstrate a lack of awareness of its deep significance to culture. Beyond trends and styles, spatial composition regulates social interaction, and to consider it something that can be solved through analysis, as opposed to provoked through design, is to renounce architecture as it has been understood for millennia. Spatial composition is a driver of culture, and it must find its place in the contemporary discourse.

**A Pedagogical Experiment**

An initial project devised to explore the relevance of projection to a contemporary design process was conducted in a studio for first-year students in a three-year Master of Architecture program at University of North Carolina at Charlotte. It was seen as a model for how to introduce contemporary students at the
foundation level to questions of geometry in architecture. The project was rooted in a traditional notion of orthographic drawing as a design generator and a celebration of orthographic projection as an art of the line. Lines not only compose the final drawings, but also drive the construction of the drawings. In the spirit of Alberti’s understanding of the architectural design process, construction lines were included in final drawings in order to demonstrate relationships that elude the naked eye. Students were encouraged to consider when it might be more effective to draw what cannot be seen and not to draw what can be seen, always for an analytical intent. They constructed drawing sets—groups of drawings that are drawn together, not one-after-the-other, but rather in tandem with each other. While designers tend to reorient drawings in the “proper” manner for presentation reasons, the relationship between different views during the process was meant to have a significant impact on the resulting architecture.

The program of the project was spaces of repose and movement—a space in which people meet and interact, and a space through which people move. Those definitions were open to interpretation, as was the extent to which these two types of spaces are discreet from or integrated into each other. The sizes of spaces were open to interpretation, and the scale of spaces had to be calibrated to accommodate human occupation. Measure, proportion, and scale were critical, though there were no “right” answers. The site was fictional and abstract, though it had a solar orientation, topography, boundaries, and a designated side for access.

The design of the spaces of repose and movement occurred within this exercise a digital drafting environment. Hand sketching was used to generate ideas, but the digital environment was engaged early and was the primary venue of the design process. An important was that digital does not follow analog. The precision and nature of the digital environment opened (and closed) certain opportunities, and the point was to explore how those potentials and limitations steer the process. Line colors in the digital environment were seen as analogous to line weights in analog drawing—coding devices that distinguish different types of lines and regulate how the drawings are read. Copying/pasting and layer management are other tools of the digital venue that were exploited for analytical effect.

In the first phase of the project involved students deploying ideas about movement, repose, and site as vehicles through which to derive systematic geometric compositions—geometry followed ideas. In the second phase, the process was inverted—ideas followed geometry. In response to the loss literacy toward geometry in the post-critical era, this phase asked students, how do we speak of geometric compositions in ways that 1) acknowledge that the built environment is inherently composed of geometric spatial systems, 2) honor the potential of geometric spatial systems to articulate culture, and 3) resist fetishizing form for form’s sake? As geometry becomes less and less ideological, it becomes more imperative to value the construction of geometric systems over shape-making in architecture. Whatever architecture becomes, it must be systematic, not object-like.

Students confronted geometry and embraced critically for the sake of experimentation and exploration. They used projective drawings to make complex and compelling geometric compositions, temporarily without regard to how they may (or may not) operate as architecture. Instead of trying to find a geometric system that fulfills an architectural idea, students looked for potential ideas within complex geometric spatial systems. In the end, architectural design is always a negotiation between an intent and a geometry, and to privilege one side of that equation (as we do when we resist the notion that geometry generates spatial systems) is to bias the process in an unproductive manner. Here, students attempted to discover how geometry catalyzes architectural ideas. A point-based construction method of linear perspective introduced by the instructor encouraged the navigation of Euclidean space and, by implication, the exploration of its potential. The reciprocity between orthographic and perspectival projection was laid bare, and the optical bias of linear perspective was replaced by a geometric bias. The construction of drawings was arbitrary, and their evaluation and translation into architecture was critical.

The orthographic drawings from Phase 1 provided the “base drawings” for point-based projections between orthographic and perspectival views. The process began with the assignment of a plan view and an elevation view that were used to construct a perspectival view. However, because this phase of the project was about the construction of geometric systems, as opposed to perspectival views of a previously designed form, the drawings assigned to be “plan” and “elevation” did not necessarily have to be a plan and an elevation from the previous phase. In fact, students could use any fragment of the Phase 1 drawing for either view, cropping and combining views in any manner. Furthermore, the resulting perspective was not necessarily a predefined perspectival view of a project, but rather could be reinterpreted as a geometric system as seen from an orthographic view or as a perspective taken from a different viewing point.
In other words, no rules or limitations other than the mathematical laws of point-based projection regulated the process. The goal was to “dive into” the drawing surface and to generate rich geometries without preconceptions or hesitations. Like many classical models of foundational design education, this phase was meant to undermine assumptions and expectations. Students were encouraged to follow the geometric explorations further than feels comfortable.

Primary considerations were: 1) the selection of initial base drawings, 2) the management of the parameters of the linear perspective construction process, and 3) the ways in which lines move between and create new drawings. At every moment of the process, decisions were intentional and critical, but no decision limited the trajectory of the process. Paths of inquiry were pursued in order to avoid randomness, but students were encouraged to willingly change direction for the sake of productive arbitrariness. They also strove to undermine the optical bias of linear perspective. Alberti was right when he warned architects against judging architecture by merely “looking at it,” but he was wrong when he regulated linear perspective to embodied vision. Linear perspective is geometry, and the “viewing” point is that of a point in space, not a human in a space. Students inscribed the location of the viewing point in plan and elevation into the geometry of the base drawings, and they did not value a lack of distortion as an attribute. Geometric distortions were seen as potentially productive, overcoming their association with “bad views” of a “building.” Students strove to create compelling compositions of geometry, not realistic views of a form.

The final phase of the project involved a return to more conventional architectural intention. Students evaluated their geometric explorations and extracted ideas for new spaces of movement and repose on the original site, unrelated to their initial designs. No limitations or rules were placed upon the extraction process. Students could interpret any part of their drawing as any type of view at any scale, and then return to the drawing and reimagine it in order to extract a different geometry to be deployed in a different way on the site. Herein lies the heart of the project—the productive ambiguity of line drawing. Students were encouraged to reveal the various ways in which lines may be interpreted as projections of architecture, as well as their inherent resistance to scale. The indeterminacy of the “meaning” of lines guided the process interpretation and reinterpretaion. As a final exercise, students were asked to evaluate in writing how their intentions to derive geometry from ideas and to derive ideas from geometry led to different “styles” or types of architecture.

Moving Forward

In fall 2017, a new course based on the lessons of this experiment will begin with a set of exercises, complemented by readings, that lay bare the geometric laws and cultural assumptions of projection as understood in Western Civilization, beginning with Plato’s allegory and continuing through various philosophies that attribute projection as the source of all knowledge in the world. Within the history of architecture, Brunelleschi and Alberti’s codification of the modern disciplines of architecture and painting will be foregrounded, exposing students to the significance of the philosophical distinction between reality and appearance to architecture and art. Simultaneously, students will learn the mathematical methods and theories behind orthographic and perspectival projection, including the mathematically reciprocity between them. An understanding of that reciprocity leads to an introduction to the mathematical discipline of projective geometry, as discovered by Desargues and codified by Poncelet. The objective of this first phase is to develop a deep level of skill and awareness regarding various interrelated practices of projection, so that students can execute complex drawings with the agility that will be necessary for the next phase of the course.

Once students absorb the practices and theories of projection, the course begins its experiments toward the development of a foundational design methodology. Using complex drawings constructed through various arbitrary methods of projection, students and instructors then interpret architectural compositions within the drawings. The process of interpretation is where art becomes architecture, where compelling graphics become provocative architecture. At first, students follow relatively scripted procedures based on themes identified by the instructors as central to representation of all types, including digital and computational methods. Theese themes include: the resonance between plan and section; the resonance between different scales within an architectural composition; and the use of a kit-of-parts to devise complex architectural compositions.

For the sake of the experiments, architecture here is defined with respect to scale, proportion, hierarchy, and movement, not function or program. Emphasis is placed on human occupation and movement in order to encourage students to explore the premise of the course without the burden of their preconceptions about buildings. Emphasis is also placed on the relationship of building and context. The interpretation of architecture from the complex drawings always includes an interpretation of the ground in which the building is embedded. The goal is to
Thomas Forget

develop a habitual understanding of the integral relationship between architecture and site.

The course then will proceed to experiments on the diagram vis-à-vis projection. Given the contemporary emphasis on the diagram as a generator of architectural and urban space, it is essential to revisit the historical role of the diagram and its current usage in post-critical practices, which tend to use the terms “projective” and “diagrammatic” to mean the same thing. Emphasis will be placed on the relationship between the morphology of a diagram and the morphology of a resulting architecture, tracing that relationship from the Beaux-arts notion of the “parti” rooted in the plan to the BIG-esque “idea” rooted in the digital model.

The formal structure of the class ends with exercises that strive to distill the qualities of projection that are transferable to digital and computational media, either explicitly or through some sort of reintegration and re-contextualization. Throughout the experiments, students will work individually and collaboratively. An interest in the emerging culture of multi-authorship in contemporary practice leads to experiments in co-authoring designs between students at different levels of experience. Depending on the progression of the course, students will conduct a final project based on their developing interests and the lessons learned during the semester. While structured, the course is envisioned as a workshop in which student help to define the trajectory of the experiments.

Notes


2 The extent to which the allegory represents an epistemological model and/or a political model is debatable, though it is widely understood as a model of knowledge acquisition.


Fig. 2 Phase 2 drawing by Richard Cottrell

Fig. 3 Phase 3 drawing by Richard Cottrell
Understanding Beginning Design Education: A Survey of Current Practice
Michael Frazier, University of Utah

Introduction – Toward a More Sustainable Education Foundation

The practice of building is millennia old and parallels the development of modern society in both creating and addressing environmental and social issues. The challenges of contemporary practice require efficient use of historic precedents and innovative strategies in order to successfully address current environmental, economic, technological, and societal issues. Technological innovation has too long sustained lackadaisical comfort at the expense of precious resources: both those of the planet and of communities. A new approach is needed.

As it has throughout its history, today’s architectural practice must continue to push for the research, development, and implementation of cutting-edge technology in the built environment in order to help move society forward while creating as little negative impact on the environment as possible. While such technology is often new, it can also be based on an understanding of successful approaches (often passive) from the past, translated into a contemporary context. Similarly, contemporary practitioners must address fundamental issues of equity in order to achieve social sustainability. The built environment has a tremendous impact on the daily lives of every member of a community, and every member must have access to resources in order for the whole to flourish. As architects, it is our ethical responsibility to work towards the improvement of society even when focused on a single building project.

One of the largest hurdles that designers face with when incorporating any new approach in practice is to communicate its value to both the client and to the community in order to justify its cost and enlist the active commitment of the end users to enable long-term success. Architects must be able to both identify and communicate the value of environmental and social sustainability in order for a building to thrive over its lifetime. In the same way that contemporary practitioners can learn economically and environmentally effective strategies from traditional, vernacular buildings, today’s educators can learn strategic practices through an examination of forces that shaped historic models of architecture education and critically examine how to translate or transplant these in contemporary times.

The Need for New Models of Education

The formalized education of architects in North America has a relatively short history that has undergone many changes based on developments in society over the past three hundred years. The traditional master-apprentice model was formalized at that time into universitites, primarily in the French École des Beaux-Arts and the German polytechnic models. These influences and others shaped the first modern architecture school with the advent of the multi-disciplinary design program at the Bauhaus in 1919.

Despite the drivers of changes that have occurred in the past century brought about by many factors including the rise of...
advanced digital technologies and the increasing diversification of the design professions, most contemporary North American architecture schools are still based in Bauhaus foundations almost 100 years later. Pedagogical and curricular changes often happen within individual schools, and there is little understanding of what has proven most effective at the national scale.

If the assumption is that architects have both the unique ability and responsibility to affect positive change in people’s lives through the built environment, architecture education must again reconsider the forces that are shaping society, examine its historical practices, and anticipate future modes of educating young designers to enter a practice environment that will be much more fluid and fluctuating than ever before.

**Analysis of Architecture Education Foundations**

Architecture education, as we are familiar with it today, has only been a formal model since about the eighteenth century. Before that time, architects were craftsmen that lead the design process. They were trained through apprenticeship, not formalized schooling. As early as 1724, the master carpenters of Philadelphia organized an association called “Carpenters’ Company,” which was intended to facilitate the instruction of architecture as a science. This was the first step toward the contemporary educational model of architecture as a professional discipline. Following the Philadelphia program, a few other “schools” opened that taught classes on weekday evenings.

“With the rise of industrialism and public education in the nineteenth century, and the coalescence of architecture into a more defined professional institution, the locus of architectural apprenticeship shifted from the workshop into the firm.” Soon, two other education systems became popular: the French École des Beaux-Arts and the German polytechnic school. The former being based in the arts and using a short, fast-paced design charrette and studio model as a foundation, and the later based in engineering and mathematics with multiple years of science education before introducing students to design coursework. These models quickly became popular due to their structured approach with a specific direction of foundations in either the arts or engineering. American schools quickly adopted both of these approaches. Britain, on the other hand, held on to the idea of apprenticeship as the primary method of architectural education. This style was also favored by a few American architects like Louis Sullivan due to its ability to instill the genius and poetics of architecture by example in young aspirants working under masters in firms.

By the mid-19th Century in the U.S., the Beaux-Arts style of education had taken a dominant lead over the polytechnic approach. After the Morrill Land Grant Act was signed by Abraham Lincoln in 1862, an emphasis was placed on investment in engineering schools across the country to align with the “American” trait of practicality. This ignited a surge of polytechnic-based architecture programs. In 1876, Victor Della Vos, Director of the Moscow Imperial Technical School, demonstrated a new method of tool-based education, which showed that it was possible to offer systematic instruction in mechanical skills within a school setting as an effective alternative to on-the-job training. The “Russian Tool System” taught hand-craft to students through the education of craftsman skills such as carpentry, masonry, and cabinetry. Craftsmanship was often a sought-after skill in architects because it increased their ability to understand the construction process. This vocational approach, though not as popular as the British (pupillage), French (arts), and German (science) education foundations, become popular particularly due to John Dewey, an influential educational philosopher at the time.

Dewey was the father of the progressive education movement in America who believed that education is based on the experience of the student. This “learning by doing” approach helped to scale material to the individual student so it could be understood by each child in his or her own way. Dewey states, “How shall the young become acquainted with the past in such a way that the acquainted is a potent agent in appreciation of the living present?” He wanted to create the kinds of open-ended problems that support impactful learning experiences that result in students being more likely to creatively approach future problems or contexts that are somewhat but not entirely similar. Contemporary education scholars refer to this concept as “transfer.”

The Association of Collegiate Schools of Architecture (ACSA) was founded in 1912 by 10 charter member schools. One of the early actions of the ACSA was to commission a comprehensive survey of architectural education in North America, similar to the Flexner Report.

In 1932, Francke Huntington Bosworth, Jr., a professor and former architecture dean at Cornell, and Roy Childs Jones, head of the architecture department at the University of Minnesota, coauthored “A Study of Architectural Schools.” They summarized the history of architectural education and then examined in detail the curricula and organization of all fifty-eight degree-granting schools in North America at that time. The report expressed their optimistic outlook on the future of the educational
practices. However, they did scold a few programs that needed to better prepare their students for practical application in the field.

During the 1920s, news of experimental pedagogical approaches being formed in Germany at the Bauhaus began spreading throughout North America. Despite its short period of formal operation — it closed after only 14 years due to the rise of fascism in Europe — the program had a profound impact on American architecture programs. American students who had studied at the Bauhaus as well as leading faculty members from the school who immigrated during WWII brought the ideals of the program’s anti-academic pedagogy to US schools in a moment when the industrializing society and Depression-era realities were corroding the foundation of the Beaux-Arts and polytechnic systems. However, this movement was not a direct transplant from Germany; its fundamentals of abstract research versus workshop-type training, scientific rationalism versus humanistic ideals, collaborative endeavor versus individual genius, and hierarchical versus democratic conceptions of organization were adapted in schools across North America in a variety of forms, such as Harvard with Walter Gropius and IIT with Mies van der Rohe.9

In 1967, the “Princeton Report” was released by Princeton’s architecture dean Robert L. Geddes and faculty member Bernard P. Spring. This comprehensive document recommended that more new 4-year BS and BA undergraduate programs paired with 2-year M.Arch programs (i.e. four-plus-two) rather than five-year B.Arch degrees be supported based on demand at the time. They also recommended that an emphasis be placed on a changing vocabulary: one that moved away from architecture to environmental design. This terminology shift lent itself to a more inclusive approach and would allow students to prepare for a diverse range of occupation opportunities. In 1996, Building Community: A New Future for Architecture Education and Practice was released by Ernest L. Boyer, president of the Carnegie Foundation and Lee D. Mitgang, a senior fellow. The so-called “Boyer Report” called for a more liberal, flexible, and connected curriculum:

- Liberal: “Students must be prepared in the areas of communication skills, study habits, and maturity levels.”10

- Flexible: “Flexibility contributes by enabling students to pursue their interests and dreams, and simultaneously responds to the changing needs of the profession and society.”11

In the twenty years since the Boyer Report’s publication, technology has changed more profoundly than in any other period in history. Despite the progressive nature of architecture education and the many calls to action over the years, little has significantly changed in the discipline or professional education, which contributed to architecture being the hardest hit and slowest to recover profession during the 2008 recession. Though most if not all schools continually examine their curriculum and are looking to determine what the next development will be in the progression of architectural education, few have holistically explored or adopted radical pedagogical approaches.

**A Different Approach**

An examination of past educational models referenced against contemporary factors suggests that contemporary programs should be based on design thinking, diverse expression, and social equity in order to succeed.

**Design Thinking:**

Contemporary practice must address immensely diverse societies and a move toward increasing specialization. The design of the built environment encompasses a wide range of occupations. However, they are all based in similar concepts. Whether someone is designing a city park, a mixed-use tower, wayfinding solution for a space, or new product, they are thinking like a designer or architect. No longer can architecture as a discipline survive in its ivory tower without addressing this shift toward more multi- and trans-disciplinary models of practice. Students need the ability to adapt a fundamental skillset to many models and scales of practice with ease based on the direction of employment they choose to pursue. Architecture education should therefore focus on teaching a way of process-based thinking rather than a discipline-specific, technologically based, or style-specific approach.

**Diverse Expression:**

Students need to be taught to approach design problems, not based on popular styles but on their own synthesis of practices and factors affecting the built environment. This approach can be achieved by quality faculty who understand how to teach as well as how to design. Through the feedback of quality jury members at critiques who provide disciplinary perspective as well as support exploratory processes, students will also gain an understanding of contemporary approaches in practice. This
democratic approach to “style” in architecture school is one where students don’t simply follow past or present models but are active participants in imagining the discipline’s future.

**Social Equity:**

Equally on par with sensitivity to our diminishing natural resources, students should be taught that social and cultural resources should be considered invaluable commodities in society’s ability to survive and thrive. Every member of the community must have access to resources that are required to flourish, such as green space, quality food, and clean water. Architects have an ethical obligation to the public health, safety, and welfare. Though it can be difficult to get holistic community buy-in on innovative approaches, students of architecture should understand the built environment’s impact on each person’s daily life and consider when and where they may have the opportunity to impact this for the better.

**Pedagogy versus Curriculum and the NAAB**

While both pedagogy and curriculum are often unique to each institution, they are not the same thing. Pedagogy is the method of teaching. It is a approach established by the institution or the professor for the purpose of guiding the education experience toward learning objectives. The pedagogical approach informs and is informed by the curriculum, which is the overarching framework of content that will be taught.

Though it in no way directs accredited programs’ approaches to curriculum or pedagogy, the National Architectural Accrediting Board (NAAB) influences the structure of academic programs as the body that regulates accredited degree programs. This is done by periodic evaluation of learning outcomes that each student must demonstrate proficiency at before receiving an accredited architecture degree. Currently, these student performance criteria (SPCs) are organized into categories including: Critical Thinking and Representation; Building Practices, Technical Skills and Knowledge; Integrated Architectural Solutions; and Professional Practice.

**Curriculum Revision**

All programs have a process for continual curriculum evaluation, which results in revision and, at times, complete restructuring. In the event that a program-wide reevaluation is deemed necessary, the entire faculty should be engaged in the process. One methodology for overhaul that is currently gaining considerable traction in the education community is Integrated Course Design, more commonly known as Backward Design. This concept, brought to the education community by Dee Fink (an educational scholar and international consultant in higher education), should feel familiar to the design community, as it is a close corollary to the design process. The approach challenges designer-educators to start at the end goal and work backwards to end with the objectives and methodology for getting there.

In the past, the most common process for curriculum redevelopment was to take an existing curriculum and adapt it to best suit a program’s needs. This process had no way of properly measuring the success of the program being used as a basis nor could it set goals in order to address focus on continued improvement. It also forced a space between professors and the courses they taught; not allowing them to feel completely in control of the content they were asked to deliver or the context in which it was delivered to students.

The Backward Design process solves these three major issues. First, it keeps the faculty actively engaged through the curriculum redesign process, meaning the faculty must own the curriculum. Second, it has the ability to answer the question - “Is this course taught well?” - through the establishment of course objectives that can be objectively evaluated. And lastly, it has a measure to answer the question - “Is the overall program meeting the desired outcomes?” Whether the curriculum is being overhauled or an individual class is being altered, this process needs connection with the majority of the faculty in order for the mission and vision of the program to stay true.

**Curriculum Design Case Study**

The University of Utah is currently undergoing a holistic review and in some cases overhaul of curriculum in all programs, both at the undergraduate and graduate levels. This process was initiated by faculty and with full faculty buy-in. In the School of Architecture, the faculty determined that the existing 20+ year-old curriculum structure could no longer be maintained through revision but required a complete reimagining. The process of arriving at such a consensus was not simple or easy and required the investment of college and department leadership. Though it had been a topic of discussion amongst the whole faculty for many years, full investment in change did not come until a few senior faculty holdouts retired and a new generation of administrators was in place.

Once the faculty agreed on the need for a complete overhaul of the existing curriculum, the school administration approached the Center for Teaching and Learning Excellence (CTLE), a university-wide resource for development of faculty and depart-
ment educational practices for guidance on establishing a process. After consulting with the school and college leadership, it was determined that CTLE would facilitate a series of workshops with the faculty to systematically work through the process. The faculty, including student representatives, started with a ‘Dream Exercise,’ which asked the question, “What do we want students to be a few years out of school?” This led to establishing program outcomes, which outline the role the architecture program would have in guiding students toward these goals.

Working from program objectives, the faculty engaged in a discussion about learning objectives across the curriculum – still thinking outside of the context of faculty expertise, course structure, and semester sequence. The long list of learning objectives was mapped to a timeline by asking: “When do students need to learn these things in order to progress at the proper rate?” Though the process is still ongoing, there have been critical areas of the curriculum that have been identified and developed by focus groups of faculty.

A key outcome of the process was the identification that all programs in the College of Architecture + Planning, which includes the School of Architecture, City and Metropolitan Planning Department, Multi-Disciplinary Design program, as well as minors and certificates in Urban Design, Historic Preservation, etc., should share a common foundation sequence to link the undergraduate degree programs in architecture, multi-disciplinary design, and urban ecology through a common set of courses. This change aligned with a university-wide shift to freshman admission at the college-level and with a long-standing request from pre-major students to be more engaged in their chosen majors earlier in their academic careers.

The proposed Design Foundations structure was developed by a think tank of program leadership based on commonly-defined objectives. The resulting structure is a three-course sequence taken in the freshman year including: Design Thinking, Ecological Thinking, and Visual Literacy.

- **Design Thinking**: active thinking/challenging assumptions, visual thinking and communication, field documentation/observation, development of problem statements, creatively generate solutions and refine them, and presentation skills with varied stakeholders.

- **Ecological Thinking**: scale jumping (understanding relationships of things at all different scales: furniture to room to building to city to landscape, etc.), relationship with home, relationship materials have on society, relationships of different aspects of the earth (hydrosphere, geosphere, etc.), and how ethics and values impact design.

- Both Design Thinking and Ecological Thinking support the development of Visual Literacy through the exploration and understanding of process.

As a set, the Design Foundations sequence is intended to teach beginning students processes of observing, analyzing, diagnosing, framing, contextualizing, creatively responding, iterating, communicating, and acting through multiple methods and media, followed by reflection and adjustment of processes as

**Fig. 2 College Curriculum Restructuring Brainstorming Meeting Notes, © University of Utah**
Michael Frazier

needed. The belief is that by allowing students to become familiar with a variety of processes from the beginning of their education, they will be able to both understand the differences between the disciplines as well as what discipline they are interested in pursuing. Additionally, the common core of skills allow them to ‘hit the ground running’ when they enter their discipline-specific coursework in the following semesters.

The process of Backward Design has been crucial in creating a forward-thinking Design Foundations core as well as the initial framework for a new architecture curriculum. Backward Design is a difficult and lengthy process. It requires commitment from both the leadership and faculty as a whole. However, this process inevitably creates a curriculum that is owned by the faculty, a program that is measurable relative to a defined trajectory of success, and courses that clearly contribute to the overall program goals. No program is ever perfect; however, a program that is not questioning how to do better or what is next is one that is not pushing itself hard enough toward that ideal.

Curriculum Innovation Case Studies

A national survey is currently underway that aims to explore how beginning design education is currently being taught at accredited architecture programs. Curriculum, pedagogy, classroom teaching strategies, innovative approaches to addressing traditional design principles, and ways of exploring new topics being added to the core will be assessed and documented. The findings will be collated into a database combining curriculum structures and examples of course syllabi to allow all programs a better baseline as they inevitably undergo their own evaluation and/or overhaul.

The survey data will be analyzed using a “phenomenographic” approach. This is a scientific method for reviewing quantitative survey results that categorize information based on respondents’ mental models. Phenomenology is important to this research due to the complexity of perspectives that faculty participants have and how those affect their perception of education in the field of design.

A few examples of programs that have recently undergone a significant evaluation of all or part of their curriculum are listed below.

*University of Nebraska-Lincoln (BS in Design: Architecture) – Overall Curriculum*

**College Vision:** The College of Architecture brings together an array of disciplines to address real problems and difficult challenges with innovative and collaborative action. United by a commitment to the transformative power of planning and design, students and faculty come together in a creative environment integrating studio-based teaching, rigorous design-research and creative output, and community-focused engagement. The merger of disciplinary theory and professional practice allows for the program to innovate, add value, and give form to all aspects of the designed environment.

**Curriculum Restructuring Process:** The entire curriculum was mapped using a flow chart to get the process started and identify a progression through the programs. From this, each year was developed in more detail and taken through the approval process year-by-year as each cohort of students moved through the program. The process was very laborious, but faculty report that the ability to make changes annually based on feedback and student progress kept them engaged. Undergraduate students who began under the new curriculum are now in their 4th year and will graduate in May 2017.

![Fig. 3 Architecture Undergraduate Flow Diagram, © University of Nebraska-Lincoln, (image courtesy of Jeffery Day)](image)

**Curriculum Values:** Two driving core values define the undergraduate curriculum: design thinking and design research. Design thinking is the first course students take in the freshman year, and design research builds itself into the curriculum in more and more sophisticated ways as students move through the program. Faculty determined that it was critical to have students in all disciplines (Architecture, Interior Design, or Landscape Architecture) take a common core of courses in their freshman year in order to better inform their decision-making process with regard to a particular major. Another important factor in the revised curriculum is the purposeful integration of
collaborative processes. Students work in groups in the 1st and 4th years and develop skills in being effective in the navigation of teams (Conflict Management, Workflow Management, etc.).

**Foundation Program:** The result of the curriculum redevelopment process included the introduction of a common first-year curriculum across all disciplines within the college. Called d.ONE, this course sequence engages and prepares students for exciting futures in all design fields within the College of Architecture. At the end of d.ONE, students have gained an understanding of the broad scope of design and are eligible to apply for any of the undergraduate design programs offered by the College.

*California College of the Arts (B.Arch) – Design Media Curriculum*  

**CCA Architecture Division Mission Statement:** The Bachelor of Architecture Program integrates critical, artistic, and material approaches to the study and practice of architecture.

**CCA Architecture Faculty Vision:** Collectively the faculty at CCA share a commitment to innovation and experimental design in all of the degree programs. This is informed by CCA's setting in the Bay Area, which is saturated with tech companies and a rich culture of experimental technological innovation. Parallel to this is the College's long tradition of social engagement and commitment to social justice.

Within the university, the architecture programs are relatively new (the B.Arch was first accredited in 1992) as compared to the fine arts programs, which are over 100 years old. The institution was founded in the Arts & Crafts tradition that insisted that art must be engaged with the world; this ethos still very much exists, and even though the architecture program is a design discipline and not a fine arts program, this legacy carries through into the pedagogical approach to teaching architecture. Today, the architecture program is known for its commitment to digital technology and fabrication. Faculty state that underlying the program’s experimental approach is a commitment to leveraging new tools and techniques to improve the status quo through design.

**Design Media Curriculum:** Appointed as Director of Architecture in 2008, Ila Berman has been responsible for strengthening the academic curriculum of the school; providing new opportunities for expanded research and project-based learning; developing an increasingly robust interaction between the Architecture division and external professional, academic, governmental, and community networks; and better connecting the division with the urban environment of its Bay Area campus and the larger international architectural community.

As part of a major organizational restructuring of the College of Architecture beginning in 2008 with the hiring of Berman, the Architecture division’s internal administrative structure was also reorganized to establish chair positions for each accredited degree program as well as expanded faculty coordinator positions for academic oversight and curricular integration in key areas of design, building technology, visual digital media, history and theory, and urbanism and landscape. Corresponding to this move, Berman also established three corresponding research and design labs to focus on and build resources in areas identified to be facing significant changes in the profession—urbanization, sustainability and ecology, and the integrated use of new technologies. As a result of this codification of division-wide focus areas, the architecture faculty began developing more explicit curriculum and offering project-based opportunities for advanced research in these areas.

*Fig. 4 Digital Media Core Courses, © California College of the Arts (image courtesy Adam Marcus)*

The Bachelor of Architecture Program integrates critical, artistic, and material approaches to the study and practice of architecture. B.Arch students take three consecutive, required core Design Media courses in their 3rd, 4th, and 5th semesters as corequisites with their design studio. These courses focus on the
tools, technologies, and concepts needed in contemporary practice. Design Media 1 focuses on conventions of architectural representation through drawing and digital modeling. Design Media 2 introduces parametric design, scripting, and digital fabrication, with the intent of fostering integrated workflows between analog, digital, virtual, and physical processes. Design Media 3 focuses on advanced representation and more advanced data-driven approaches to design, such as how BIM software like Revit can be linked to more intuitive scripting platforms like Grasshopper. The Design Media core curriculum prepares students for advanced Design Media electives such as Generative Design, Synthetic Tectonics, Radical Representation, Digital Poetics, and Subtractive Material Logics.16

Curriculum Restructuring: The driver for revising the curriculum to incorporate the current Design Media sequence as a core foundation was primarily faculty-led. All curriculum changes are directed by the Architecture Curriculum Committee and by the area coordinator, who, in the case of Design Media, is Andrew Kudless. The faculty is committed to staying current with industry standards in regard to modeling, programming, and software tools. The Design Media curriculum has been in place for approximately six years with recent minor changes made to shift all content earlier in the curriculum sequence.

Previously Design Media 1 had focused on hand-drawing. This was phased out in the 2015-16 academic year, and now the course focuses on conventions of architectural representation (projection, orthographic drawing, etc.) but does so in a digital 3D environment using Rhino. The change opened up more space in the third course for advanced parametrics and the introduction of BIM. The faculty has been very wary of introducing BIM into the curriculum, believing that such software can be very limiting as design tools. However, they also recognize that knowledge of Revit is increasingly critical for graduating students to be competitive in the workplace. As a result, a new version of the Design Media 3 course will debut in fall 2017 that will introduce Revit in the context of tools like Dynamo and Rhynamo, which link the program to scripts developed in Grasshopper. The intent is to avoid the overly biased design constraints of Revit but to nevertheless introduce the tool as an extension of the parametric design process.

University of North Carolina – Charlotte – (4-year Bachelor of Arts in Architecture + 1-year B.Arch) - Computational Design Curriculum

School of Architecture Mission: The mission of the School of Architecture (SoA) is to provide intellectual, ethical, and innovative leadership in architecture and urban design through excellence in teaching, scholarly research, creative architectural practice, and community activism.

Faculty and students at the School of Architecture are committed to creating an open-minded and creative atmosphere to pursue research, explore new forms of building, and discover collaborative practices that nurture human potential. Our graduates understand where knowledge comes from and how to integrate their voice with others to influence the art and science of architecture. The School of Architecture opens opportunities to students through interdisciplinary programs, close alliances with the profession, and active programs in the community.

The creation of architecture is inherently complex, requiring design vision and competence; effective visual communication and literacy; cultural, historical and theoretical perspective; technological knowledge; environmental responsibility; sophisticated problem solving skills; and creative leadership. Architects must possess knowledge of science and liberal arts, ethics, critical thinking, and research methods. Architects understand the value of building an intellectual foundation that embraces the widest possible range of knowledge and ideas.

Computational Thinking Curriculum: The B.A. in Architecture is a four-year undergraduate pre-professional degree program in architecture. In the first three years, students are enrolled in general education and core architecture courses, including architectural design studio in the first year. In design studios and seminars, which occur each semester, students acquire the fundamentals of visual and spatial design, problem solving, conceptualization, technology, and environmental influences. In the fourth year, students select design studios and seminars related to topical interests such as energy and sustainability, digital design methods, urban design, and conceptual themes. In addition, students extend their knowledge of architectural history and technology while having the opportunity to pursue individual interests through architectural elective seminars. The B.A. in Architecture is awarded at the end of the fourth year, and students choose at that time which of the two professional degree options to pursue — B.Arch or M.Arch.

Curriculum Development: As part of a School-wide initiative to integrate digital design, faculty underwent a curriculum review process to address the challenges of providing students with a lasting foundation in the rapidly evolving technological and professional environment. Faculty identified the need to improve students’ comprehension of the material in order to creatively wield complex digital tools such as digital fabrication and BIM.
and determined explicit instruction in computational thinking as a foundational skill needed to enable this objective.

“The School of Architecture at UNC Charlotte sees computation as an integral part of 21st century architecture. However, a reliable model for teaching this outlook does not yet exist. To address this challenge, the curriculum committee believes that computer science and educational research can provide valuable insights into successfully teaching computational thinking where intuitive, command-based pedagogies fall short.”

Computational Thinking Foundation: Computational thinking is a difficult mindset to grasp, even in computer science. As such, there are no definitive models for teaching this to designers who often have only cursory introduction to the topic amongst the many other subjects required in their coursework. The SoA faculty identified the goal for students to develop transferrable knowledge both in direct and indirect application of skills as well as the sequencing of courses in the curriculum to allow for the build-up of knowledge over time. “We want to show that computation is not limited to a single semester or to certain pieces of software. Rather it is a way of doing things that is compatible with design thinking. If students see computation in multiple contexts and in ways that connect to their level of understanding, they will be more likely to integrate it into their work.”

To do this, they based their approach on an educational methodology called cognitive apprenticeship. Similar to the idea of the architecture design studio, this approach approximates how professional designers think and work. In the computational thinking curriculum, students progress through three levels of engagement: awareness, explicit understanding, and mastery. Awareness comes during early courses where computing strategies are explicitly taught. Explicit understanding is developed through a Computational Methods course in the third year of the curriculum when students transition from understanding to regular engagement. Mastery is developed during the final year of the program in the Computational Practice course where students become more independent in their approach to using the tools.

Conclusion

As shown above, there is no one way to approach beginning design curriculum. The curriculum is established based on the overarching pedagogy of the individual institution; and each program consists of an array of faculty that collectively determine a shared vision for the program. However, a few common characteristics are shared across many programs: forward thinking about how technology is influencing the built environment, exploration into design as a broader (not just as it directly relates to architecture) discipline, and consideration of how ethics and values relate to the design process. Changes in any program...
curricula must keep in mind that beginning design education is the foundation to students’ entire design practice, both academically and practically. Academic education is the driver of change in practical application. It is in academia that students have the most opportunity to explore and discover how design can positively impact society. By teaching design thinking, allowing for diverse expression, and exploring social equity, graduating students should be able to challenge the historical norm of the profession in order to push the quality and innovation of design to create a healthier and safer future for society.

Notes

2 Ibid, 12.
3 Ibid, 14.
4 The Morrill Land Grant Act was a national program that used proceeds from the sale of federal lands to create and permanently fund state supported institutions of higher learning.
8 The Flexner Report was a scathing critique of the quality of North American medical education. Its findings spurred extensive reforms in physicians’ training.
11 Ibid, 85.
12 Ibid, 86.
13 The majority of the information in this section was provided by, Brian Kelly, email correspondence to the author, February 13, 2017.
14 The majority of the information in this section was provided by, Adam Marcus, email correspondence to the author, February 15, 2017.
16 http://dm.cca.edu/.
Matter of Ruled Surfaces: Eladio Dieste for Beginners

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Abstract (Tags: Making, Collaboration, Craft)

“Why are we building a doubly curved brick wall?”

In the late 1950’s at the height of the modernist movement, the structural ceramic work of Uruguayan Engineer Eladio Dieste subverted the universal ideals of modernism in favor of a local sense of material economy. Dieste’s innovations in reinforced masonry combined a local and inexpensive material like brick with the technological advancements of steel. Like many architects and engineers before him, Dieste used double curvature geometries to resist gravity through form. Through his practice he developed four technological innovations related to reinforced masonry: Folded Plates, Self-supporting vaults, Gaussian vaults, and Ruled Surface Walls.1

Throughout design students’ education, the introduction of figures like Eladio Dieste happens in history class, seminars, and studio precedent studies or through travel and individual curiosity. In many cases, architects, engineers, and artists whose work minimizes the gap between representation and construction are seldom discussed, especially if these figures exist outside the cannon of western history. In the span of twelve weeks fifteen undergraduate architecture students from second, third, and fourth year participated in a two-credit hour Building Shop course titled, Curved Walls: Eladio Dieste and Ruled Surfaces. The aim of the course was to construct a ruled surface brick wall and study the material implications of Dieste’s work. This course is part of a sequence that is designed for students to focus on the intersection between construction and representation technology. In order to magnify this intersection the content of Building Shops such as Curved Walls is framed by the role of history. Students are asked to displace the individuality of the design act and focus on collaborative techniques that demonstrate why the authorship of processes is as important as the authorship of things. Building Shops highlight the importance of the history of construction and its role in the development of collaborative practices.

This paper focuses on three conditions that are fundamental to the trajectory of this course and its effect on the education of beginning design students. The three conditions are the following: 1. Diverse History and Forgotten Forms, 2. Construction and Representation Technology, and 3. Collaborative Practices and Authorship. In order to weave these conditions into the context of Eladio Dieste’s work each condition is paired with a writing by Dieste. The relationship among these conditions demonstrates how beginning design students can benefit from the haptic study of construction technology through a historical frame.

Fig. 1 Study Abroad 2014. Iglesia del Cristo Obrero. Atlantida, Uruguay.
Diverse History and Forgotten Forms

How is history recorded in buildings and synthesized through writing, or synthesized in buildings and recorded through writing? Whoever preforms these tasks asserts authority.

In one of his most recent lectures, The End of Authority, Peter Eisenman asserts that architectural education is no longer defined by an authority figure. In the first half of his lecture, Eisenman references Jeffrey Kipnis’ book, By Other Means, claiming that architecture has always existed in the service of an established power and that schools of architecture are teaching to follow established power without acknowledging the absence of a contemporary authority. In the context of architectural education this is an important claim for two reasons. First, this claim recognizes that history is not only about synthesizing the epoch of an era as Sigfried Gideon suggests, but it is also about the establishment of authority—a model to follow or challenge. The second reason why this claim is important is because it questions who establishes or recognizes authority in architecture. In western architectural education it is possible to trace schools of thought through the proliferation of architectural treatises. Through drawn and built documentation, as well as writing, figures like Vitruvius, Palladio, Durand, LeCorbusier, Mies van der Rohe, and Rem Koolhaas all have exerted their authority across generations of students and practicing architects. Publications by these figures were held in high-esteem and affected design culture. This influence is not confined to the names in the aforementioned list, but whether they were models to follow or figures to challenge these figures are still a fundamental part of western architectural history.

What part of the world has claim to the authority that influences education; shaping and misshaping generations of future architects. For this reason it is important to consider how history is taught in beginning design education and more importantly, what history is being taught. Depending on how we address this question education can acknowledge authority and challenge its power or reinforce its influence.

Precedent and Case Studies

The history of architectural education in North America is framed by the “encounter between successive generations, and in the broadest sense, the account of a meeting between the past and the future”. Since the establishment and subsequent rivalry between French Beaux Arts and German Polytechnic education models, architectural history has been a primary vehicle for developing knowledge of forms. Even before these academic models became formalized, the apprenticeship model was rooted in the rigorous study of history and travel. The use of the precedent is founded in the grand tour as a way of establishing a haptic connection to history.

The changes in education and the focus on the importance of tools have questioned the role of history and its place in pedagogical models. The use of precedents as a way to establish an alibi for decision-making continues to be common practice in the architectural design studio.

In spite of the abundant access to information acts of mimicry or direct appropriation have lost ground to the pursuit of fabrication techniques—many of which exclude historic knowledge models. These two approaches, historical appropriation and fabrication techniques, are not independent of each other and several schools are invested in the link between both. In general terms, this assumed dichotomy tends to fetishize the making of forms through the programmed uncertainty of parameters applied to the use of digital software tools. The relationship between architectural history as a studio precedent and architectural history as lecture content is seen in the distinction between the precedent and case study. Whereas the primary role of the precedent exists at the haptic connection with history, the case study was formed in the realm of research that may not be directly applied to designs made by students, but rather the collection of information and the application of this information to specific circumstances. The role of the case study advanced in the last three decades of education and practice—evolving from typological case studies to social and environmental studies focused on the link between form and performance.

The separation between these modes of working is dependent on curriculum and driven largely by faculty expertise and the history of the academic institution. These distinctions show how history influences design decisions and impacts thinking.

The forms of Architects whose work becomes widely used as precedent or research subjects are not forgotten. How do we teach history through a diverse set of architectural figures focused on the study of forms without fetishizing form-making?
Form is the composition of physical matter. The art of construction is critical to the relationship between history and education. The building shop, Curved Walls, asserts that Eladio Dieste is not an authority in design education in North America. Dieste’s forms have been largely forgotten or at best turned into footnotes in modernist sections of surveys of architectural history. Since Sanford Anderson’s *Innovations in Structural Art* was published in 2004 there have been no comprehensive English publications on the work of Dieste. The most recent public exhibit including his work was the Museum of Modern Art’s, *Latin America Under Construction* exhibit in July of 2015. During the first week of Curved Walls, students are asked to read a translated version of Dieste’s, *Awareness of Form*. This reading prompts students to consider history as a way of understanding the intelligible language of forms.

Form is a language, and this language should be intelligible to us. We are anxious for intelligibility and therefore for expressiveness. Part of modern anxiety is due to the absence of legitimate expressiveness. It is also due to the hermetic inexpressiveness of the things that surround us.°5

Unlike many of his modernist contemporaries, Dieste was not a prolific writer. Before the end of the semester students read every major writing written by Dieste. Reading often implies and requires a form of reflection based on the act of writing. Students do not write a reading response or an essay demonstrating their understanding of the assigned readings. In this course the task of reading is not performed apriori, nor does it provide an alibi for the work at hand, it is performed in concert with the labor of construction, drawing, and modeling. This is a way to forge a relationship between the history of construction and the making of forms. Through this approach history is unfolded as the careful and deliberate consideration of turning information into knowledge. How can building with brick be analogous to the thinking and reading that goes into writing a paper—what are the implications of simultaneously intellectualizing and performing labor? Dieste’s writings are used not only to highlight these questions, but to demand that this type of thinking is present in student work. There are weeks in which writings such as the *Awareness of Form* are re-read and discussed after working on the construction of the wall. In one sentence Dieste can describe the structure of the world. “I have explained, and supported with evidence, the concern for rationality in construction and economy understood in, I dared to say a cosmic sense rather than a financial sense.”°6 The scalar fluctuation between a “cosmic sensibility” and “rationality in construction” are complimentary ways of thinking. Superimposing scales conflates a number of practical and theoretical issues that are fundamental to pre-Columbian, modernist, and post-industrial technology in South American architecture. This conflation is essential to the student work in this class.

During an interview with then mayor of Montevideo, the architect Mariano Arana, Eladio Dieste observed that western architects in the Northern hemisphere perceive architecture in the Southern hemisphere as exotic. Regardless of technological sophistication the “south cannot dictate what happens in the north”. In his modesty, Dieste considered that his reinforced masonry innovations were admired from a distance, but could never assert authority. This distance implied that the study of forms such as Ruled Surface Walls never became an active participant in the educational discourse of North America. It is important to point out that Dieste’s work is part of a historical project that stretches before Dieste and certainly has continued past him. His work is part of a masonry legacy that stretches thousands of years, back to the vaulting work seen in Mesopotamia and the ceramic tiles of Spain, eventually brought to the Americas by the Catalan architect Rafael Guastavino. Because of this lineage, Dieste’s work reveals a complexity that has made critics and architects name him one of the most individual or innovative modernist, a vernacular regional authority, and a baroque master.°7 This fluid categorization indicates that his work cannot be reduced into a single style—asserting that the most sophisticated forms are resistant to simple written, drawn, or modelled analysis.

### Construction and Representation Technology

Technology is a mechanism, it is the knowledge of processes and a collection of techniques that are capable of manifesting the relationship between culture and architecture. Representation is a way of describing this relationship through notational systems. Construction technology is the means through which this relationship is made into physical forms. In architecture, the current descriptions of work that guide construction through drawing and specifications describe work in place rather than work in process. This has broken the knowledge loop between the architect and skilled laborer. Historically, an initial disconnect formed between the architect and skilled laborer during the Renaissance when architects like Leon Battista Alberti departed from the model of architect as master-builder to architect as master-drawer.
While architects have remained knowledgeable about construction methods, since the Renaissance their role has been to make drawings that describe the building rather than making the building. The gap between representation and construction technology has been widening and changing shapes ever since. In *Curved Walls* technology is not synonymous with progress, it is used as a means to understand the relationship between representation and construction.

In *Architecture and Construction* Dieste recalls a conversation with a friend who remarks about the work of Catalan architect Antoni Gaudi, “his [Gaudi] work has nothing to do with us—in fact, I wouldn’t know how to draw one of his buildings”. This statement reveals the modernist tendency to prioritize representational technology over construction technology, establishing a linear progression between ideation and execution. According to Dieste architecture in developed nations favored a planar construction framework in part because of the plane’s ease of representation; “we think more about the plan than the structure or we only think about the structure through the framework of the plans”.  

In addition to representation, the construction technology associated with planes has been historically connected with the material economies of steel, glass, and the advancements in reinforced concrete. The ideals of modernist architecture solidified the role of the plane as structure’s most elemental form. In many cases, this restraint produced simplistic structural solutions that were supported by engineers’ familiarity with calculating the structural capacity of planar structures. Simply because a structure is easy to calculate, draw and materials are produced at high-rates does not mean that it is rational to construct. The advancement in digital tools has obscured the relationship between representation and construction technology in many contemporary practices and educational models. Emerging parametric processes and programmable assemblies such as robotics have subverted Dieste’s notion that sophisticated geometries are easily described and produced through direct fabrication processes.

One of the most significant distinctions between Dieste and other engineers, architects, and artist, such as Frei Otto, which also focused on rational structural solutions through form-finding is that Dieste arrived at forms through mathematical calculations. Unlike Gaudi, who used the inverted chain method to make catenary curves, Dieste produced the forms for all his projects through numerical calculations. Models were not a part of his form-finding process. Drawings were made to describe the construction of formwork and obtain the necessary legal permits, but the construction technology of Dieste’s reinforced masonry innovations was not developed or imagined through drawings or models. How does this absence of representation influence the student work in *Curved Walls*?

In order to explore this question, students in the class do not make drawings or models of the ruled surface wall they will build. How do students prepare for making a wall without drawing or modelling the wall? As a response, teams of students...
work on the construction process for making the wall, the literal framework and scaffolding that defines the geometry of the wall and the displacement of brick material (Fig 2 and 3). The relationship between construction and representation technology is affected by the overlap between computational and digital methods of describing the double curvature geometries of ruled surfaces. Computational processes are understood as systematic techniques of translating information — these processes can be done using digital software or hand drawing and modeling techniques. Ruled surfaces are curved surfaces defined by a series of vertical lines called ruling lines (Fig. 2). The ruled surface wall constructed by the students in this course is defined by a sinusoidal curve at its base and a straight line at the top. Ultimately, the wall was constructed in 1000 square foot area adjacent to the Department of Architecture’s wood shop.

In *Curved Walls*, the means of representation, drawing and modeling, are a product of the means of construction. The methods for graphically describing the framework for building a ruled surface wall are analogous to the processes of its construction. More importantly, the process of construction registers the representational devices used to describe the construction without specifying each step in the construction process. This positions each student in areas of negotiation that result in imprecisions, but also reveal the latent potential in collapsing the gap between representation and construction technology. There were three methods used to output representational technology in this course: Hand-drawing, computer modelling in Rhino, and Physical Modeling. Each one of these tools is used to anticipate the construction of the wall and gain knowledge about the precise description of a double-curve surface — acknowledging the potential imprecision of its construction.

The ruled surface wall is made of solid, nominal, clay bricks produced and donated by Endicott Brick. Laying brick is a skilled form of labor that the students will not master within the time restraints of this class - it takes decades to become a master mason. The pedagogical approach for this course is to prioritize geometrical knowledge of form over the incremental improvement of brick laying skills. Regardless, it becomes clear that throughout the semester the process of mixing and striking mortar, laying and levelling courses of brick, greatly improved. This process is challenging because the wall is most difficult to build at its base. The last stages of construction are straighter and require less bricks.

The collective work of students points to the fact that building is indispensable. “In fact, the project for a building is not really complete if it does not consider how it will be built, and the ways in which a building can be built have notable power of inspiration. All viable new structures are intimately related to construction methods, and these methods are visible in the finished building”. The manner in which methods of construction influence the assembly of teams of people is essential to the history of architecture and the collaborative effects on education.
Collaborative Practices and Authorship

How can students become the intellectual authors of a process rather than the authors of the documents that describe the construction of physical forms?

The first section of this paper discusses authority as a reflection of history. This portion of the paper unfolds the collaborative implications of authority in the context of authorship. Authorship is a fundamental factor in the relationship between architecture and construction. In legal terms architects are not responsible for the means and methods of construction of a building. It is easy to take for granted that architecture is a form of collective knowledge produced by groups of people. However, the separation between ideation and execution, between imagination and labor is still present even in the most collaborative architectural endeavors. Use of the word collaboration has become increasingly popular in professional and academic settings. The etymology and legacy of the word imply a sense of complicity in a subversive act. Perhaps this consideration of the word is provocative for its own sake. Provocative or not, it is important to pull collaboration out of the benign trendiness that has grown out of many contemporary collaborative efforts. It is important for students to learn how to work with others - this has become an inarguable fact that reinforces the aforementioned trendiness of “collaboration” in academic and professional realms. How is collaboration a provocative and challenging way of establishing teaching mechanisms in beginning design education. If we can acknowledge that learning to design and making architecture require forms of collaboration – embedded in the process of iterative making and analysis – then why is it hard to problematize the role of collaboration in education.

In architecture today despite the proclaimed integration of all phases of the building process through high-tech management techniques, the rhetoric of immaterial production contributes to absolving architects from accountability to material bodies and places, not to mention provides an alibi from legal liability. The collaborative aspects of the architectural discipline are being leveraged through tools and technologies that allow groups of people to simultaneously access and share information. The conflation between information and knowledge has contributed to the indifference of authorship and the propagation of geometrically complex forms. In other words, “designing with many hands” can result in the cultivation of shared knowledge or the removal of authority by absolving responsibility. This problematic is evident in the production of forms and parts made with CNC and rapid prototyping machines, and assembled through automated forms of production such as robotics. Peggy Deamer refers to this condition as the split between parametrics as form-driven scripting and intelligence management. Excluding some modes of digital fabrication, the widening gap between
construction and architecture is the result of a gambit played by collaborative practices that continue to exclude the architect from the social and political consequences of labor. It is possible that this exclusion has been self-imposed through the prioritization of tools and technologies over socio-political effects and capital. The consequence of the advancement of tools has shifted and repositioned the architect and student as fabricators with no interest in labor.

How can students involve themselves in questions of labor and production while asserting independence from the tools they use? Is teaching collaborative practices a matter of teaching tools or is it primarily a way of configuring processes? If this is only a provocation and if these categories are not mutually exclusive; where can students engage in the politics of labor and its effects on architectural production?

**Material and Immaterial Bodies**

Immaterial labor is the set of circumstances that link architecture to its site, people and the technologies used in its representation and construction. In essence, immaterial labor builds a network of often invisible relationships that are critical to the ideation and execution of a building. This form of labor is central to Dieste’s work and is evident in his writing, *Art, People, and Technocracy*. Indirectly, Dieste refutes the notion that there is a social hierarchy between high and low technology, even disavowing that this distinction exist. Without reinforcing this hierarchy it is clear that the choreography of collaboration is rooted in the labor dynamics of place, not the individuality of authorship. The hierarchical model established by Alberti reinforced this dichotomy. If ideation precedes execution then the people involved in each phase must exist at a social distance from each other. In Dieste’s work this social distance is minimized. In addition to forming a partnership with Eugenio Montanez, Dieste relied on three job captains to organize labor on construction sites. Vittorio Vergalito, Vito Pacheco, and Alberto Hernandez were fundamental translators and agents of material and immaterial labor used to build many of Dieste’s most audacious structures. The objective of *Curved Walls* is to minimize the social distance between the students while maximizing the collective responsibility of their work. One of the contributing factors in this process is the age difference between all the students. Undergraduate architecture students from second, third, and fourth year participated in the first version of the class. The range in ages and academic experience is fertile ground to narrow the social distance between the students and document the effect on their work.

![Fig. 5 Construction workflow and student organization of labor.](image)

After becoming familiar with the doubly curved geometry of the wall students focus on how to organize labor. This method of production is not dependent on developing a set of drawings or accurate representations of the eventual physical output. Instead, students are asked to design the construction and the labor dynamics of the construction process. Each student is asked to dissolve their ownership of the wall in favor of a collective way of authoring its construction, which manifests in the choreography of bodies on the site.

Authoring workflows that are not fixed on representation or predetermined models of hierarchical organization is one of strategies used to execute the semester’s work. Two of the tactics used to deploy this strategy are a detailed wall log and a series of workflow diagrams (Fig. 5). Students assembled into teams of four; teams evolved according to the scope of labor. Each team-change and involvement in the construction of the wall was registered on the wall log and documented by individual students. In order to organize this process it was necessary to distinguish between synchronic and diachronic forms of collaboration. The evolution of student teams is a way of understanding the difference between these two forms of collaboration. Synchronic collaborations connect people working in the same moment towards a common goal, often resulting in a single thing. Diachronic collaborations connect all design attempts forming relationships that emerge across time. This type of collaboration can connect distant and distinct objects across space. The single semester collaboration between students is synchronic. The subsequent versions of *Curved Walls* will establish a diachronic form of collaboration between students and with faculty. The most significant form of this type of collaboration is the connection to Eladio Dieste’s work.
Federico Garcia Lammers

This Ruled Surface brick wall is a learning tool, another model, it is the physical construction of a network of errors that can be evaluated. Through designing and documenting the construction of the wall students can understand when and if this network of errors undermines the geometry of the wall and its structural capacity. More importantly, the ongoing collaboration between faculty and students is materialized through the connection to a part of modernist history that is outside the core of traditional authority. Eladio Dieste was an idealist, he was a modest expressionist who worked with a small, ceramic object as the catalyst to expand form-making and the perception of space, students involved in Curved Walls will continue to mine the history of his work. Forgotten forms that negotiate between representation and construction technology are at the center of collaborative practices and authorship. This center is a place that expands and contracts according to students’ ability to ask direct and obvious questions like, “why are we building a doubly-curved wall”?

Notes


6 Ibid, p 191.


10 Ibid, p 183.

11 Ibid, p 185.

12 Ibid, p 185.


Working across the Art/Architecture divide: From musical notation to urban form: Why and how does a multidisciplinary and transdisciplinary experience modify an understanding of architecture, its possibilities and limitations?

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Architecture as a cultural practice

Because architecture is a wide cultural phenomenon and is related to ideas, discourses and practices: architecture is not only about buildings, it’s a set of ideas. It’s pervasive through every part of our lives.

Architecture is a public art and therefore architects should add something to culture with every gesture that is inserted into the city. This, of course translates into things that you do through buildings, but, also leads into a cultural discourse: bringing out new ideas to change cities and the ways we live. The rise of performance in architecture: Back to the streets: is a movement called tactile urbanismus initiated by architects that are trying to reengage with the city and echoes the Performing Arts Movement, a genre within the Arts based on the idea that the city acts like a museum itself.

Sometimes what is called “mainstream practice” loses this perspective and therefore only responds to technical and financial demands in a way that is certainly professional and very exquisitely done, but, lacks the capacity to make a cultural statement.

The value of multidisciplinary and transdisciplinary concepts in architecture

“The history of architecture ever since has been punctuated with similarly ambitious attempts to recategorize architecture through crossovers into other disciplines”, “including the arts and crafts movement in England in the 19th Century, as well as the Bauhaus and the Werkbund in the 20th Century in Germany. As a reaction against the medium-specificity and objecthood of modernism, interdisciplinary practices became increasingly commonplace in the 1960’s and 70’s.

“Alles ist Architektur” (“Everything is architecture”), a Manifesto written by the Austrian architect and artist Hans Hollein in 1968, was a “complete rebooting of architectural thinking, a radical recategorization of architecture, the elimination of closure in its definition, removal of all boundaries between it and other fields, and an endless process of connectivity.”

Hans Hollein (born in 1934) was one of the key protagonists in the debates around architecture and design in the 1960’s and 70’s. Hollein, along with Oswald Oberhuber and Walter Pichler, editor of the Wiener Zeitschrift BAU in the mid 1960’s, represented a new international generation that was engaged in radical analyses of architectural modernism and modernism in general. “Everything is architecture” builds on the connection between art and everyday life, which in the 20th Century has led to the development of the international definition of Design. Starting from this modernist term, Hollein acts in an artistic and anthropological way of thinking which includes architecture as a generic spatial art. In 1967, before his first major museum commission in Mönchengladbach, Germany, and with the mediation of Joseph Beuys (Appointed Professor for Sculpture at the Düsseldorf Art Academy since 1961), Hollein became a Professor for Architecture at this leading Art Institution in Europe. In that same year, he published his seminal text, “Everything is architecture,” building his relationship to Johannes Cladders, then newly appointed Director of the Municipal Museum in Mönchengladbach and curator of Beuy’s very first institutional exhibition. So, it was not a surprise that Hollein’s own revolt was paralleled by similar developments in all fields of arts and sciences. “At the same time Hollein was writing “Everything is architecture,” his colleague Joseph Beuys was claiming “Everybody is an artist,” borrowed from Novalis and John Cage’s “Everything we do is music.”
Transdisciplinary action between architecture and music

The idea of sharing, overlapping and translating disciplines such as art, architecture, music and science are design strategies used by contemporary architects and artists such as Daniel Libeskind (architecture and music) Steven Holl, (architecture, music, dance and sculpture) and Doug Aitken (art, architecture, film and music). Since ancient times and until today, analogies, coincidences, affinities and bonds existing between architectural and musical compositions have been the object of research. (For example, the work of Vitruvius, Alberti, Schelling, Xenakis)

Chamber Works: Drawings by Libeskind, 1983

Chamber Works is the Libeskind drawing collection nearest to the field in music. The link between his artistic expression and music is already evident by the title that means Composition for a chamber group of instruments. Chamber Works, Architectural Meditations on Themes from Heraclitus consists of 28 drawings completed in 1983 by the architect as he served as the head of the Architecture Department at the Cranbrook Academy of Art in Bloomfield Hills, Michigan.

The work is divided into two series—one vertical and one horizontal—each with 14 numbered black and white ink drawings. Additionally, each series can be followed in (at least) two ways. The drawings can be viewed in pairs—the numbers of the paired prints always summing up to 15 (i.e., #1 + #14=15, or #2 + #13=15) or tracked as a linear progression from 1-14 (as shown on Libeskind’s homepage). Viewed the second way, the first pair in each series serves as both a beginning and an ending, and the last pair is either an ending or a midpoint that sends the viewer back along the series to the initial pair. As Robin Evans describes it in his essay, “In the front of lines that leave nothing behind, “The lines themselves are expressive although they are constructed as an architectural drawing with architectural instruments” (rotring ink pen, curve templates, splines, etc.).
“The lines do interact by drifting in parallel sets, intersecting, pairing up into ribbon forms which sometimes intertwine in complex knots, they float together in loose formation or condense into tight fibrous branches.” 9 This might have something to do with Kandinsky’s musical compositions was Evans suggestion. The two series of these drawings, the horizontal and the vertical, form a continuum of graphic interventions that Kurt W. Forster defines as spatial music: they are spatialized scores, musical translations which Forster wrote in one out of four. They are spatialized scores, musical translations according to Kurt W. Forster ‘s short introductory essays together with Libeskind’s folio reproduction of Chamber Works in 1983. 10 Evans perceived that “drawing is the fountainhead of architectural creation” and “architecture has always involved drawing before building, and can be split into prior and subsequent activities: design and construction” 11 in order to answer the question: What do Chamber Works drawings have to do with architecture?

Libeskind was a professional musician before he moved into the field of architecture and therefore his knowledge of music became the basis from which he generated drawings and projects as an architect. In a Ted X Dublin Talk with the title Architecture is a language, Libeskind remarks, “that drawing is really a score it is just like a piece of music and that drawing is the source of architecture.” 12

The Experiment of Teaching Architectonics of Music

“Architectonic of Music” 13 records the sixth in a series of studios taught by Steven Holl in 2014 at Columbia University in New York on Music and Architecture. This is part of a larger project to develop cross-disciplinary, inspiration-provoking work on new architectural languages. Cotaught with architect Dimitra Tsachrelia and composer Raphael Mostel, this studio began with a four-week experiment translating a music excerpt into space, material and form. In the first half of the studio, the students selected works of 20th Century composers like John Cage and Olivier Messiaen with an eye to the geometric potential of translation to architecture. The second half of the studio focused on transcribing the language experiment at the Center for Contemporary Music Research in Athens, established by Iannis Xenakis.

In an interview with Steven Holl and Dimitra Tsachrelia about “Architectonics of Music,” Holl continues to explain that architecture is public art and a collective experience. It is not private when walking through spaces; there is a collective energy and music is also one of those forces. “For me there is a deep analogy between architecture and music but music is an immersive experience it is all around you as is architecture. The perception of different kinds of perceptions that we have between conditions of light, conditions of texture, space, spatial overlap all of those are analogous to music. Xenakis is a kind of link between architecture and music because he worked for Le Corbusier for a number of years.” 14 Holl is seeing potential in future architecture that is open to a multi- and trans-disciplinary experiment by asking questions like what is architecture? And what is music?

“Architecture today is a kind of confused moment and I think what Architecture needs is to be rekindled with the other arts. So for me that is a very important work, I am not doing this as a sort of side gesture somehow to entertain myself. You see this merging of the different arts as central to certain moments in culture that are very inventive and productive.” 15

Conclusion:

Art, architecture and science should be equal forms of knowledge production and understood as a cultural practice. In this light, architectural design can be re-thought of as a form of research and experiment, as a self-critical process between thinking and making. Beginning students learn from interdisciplinary examination of methods of artists (musicians, sculptors, etc.) and alternative approaches to design far from cliché. In my teaching, I employ architecture as a continued form of experimentation from the beginning, centered on the question of “why” rather than “how,” where design methods are explored and developed by the students individually from their cross-disciplinary experiences.

In this last part of the presentation, I will discuss a 14 year design studio for the 3+ Students (interdisciplinary design beginners from a non-architectural background) with the theme of a Pop Academy for Downtown Salt Lake City, UT.

Pop-Academy, Granary District, SLC, 2012

1. Readings: Spatial Music and Musical Space

Start the project by reading all the texts you will find on the Canvas webpage for this course. Choose one of the texts, sign up (on the sign-up sheet), compare its main argument with the images of Daniel Libeskind (also on Canvas) and reflect upon the relationship discussed between music (as art of time) and architecture (as art of
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space). Think about the differences as well as the parallels between the two, with regard to experience, representation and performance. Focus especially on forms of abstract (visual) notation – score and plans – and about design as a bridge between the two arts of architecture and music. Prepare a presentation (Powerpoint) on the text you have chosen.

In this first step, students reflected upon the relationship between music (as art of time) and architecture (as art of space), and the parallels as well as differences with regard to experience, representation and performance.

2.
Drawing and Collage

Choose a piece of music and transform this piece (a motif) into a two-dimensional representation or translation in black and white. Since architecture differs from music fundamentally (art of space versus art of time), rethink the means of visual representation to achieve the temporal complexity and thickness of music. This drawing may employ digital as well as analog techniques, original drawing as well as re-mix of existing visual materials (collage), layering, sampling, scaling, etc. in black and white. For inspiration, please refer to Daniel Libeskind and his “Chamber Works” (1983). Format: 12” X 24”, black and white line drawing.

In the second step, student’s analyzed abstract (visual) notation – score and plans – and explored the potential translation from one discipline (music) into a spatial composition (architecture): design as knowledge production. This step initiated a process of constant reinterpretation and editing from 2d representations to models and vice versa.

3.
3-D Model

In the third step, re-interpret your spatial drawing of step 2 and transform the two-dimensional representa-
Working across the Art/Architecture divide: from musical notation to urban form

tion/notation of a three-dimensional musical space into a three-dimensional model.
Format: 12”x12”x12”, material: foam, foam core, wood or cardboard; techniques: laser cutter, styro cutter. This step initiated a process of constant reinterpretations and editing from 2d representations to models and vice versa.

4. Site and Context
To understand the given Granary District site within its contexts, not only from an architectural point of view, you will document the project site by producing different types of documentaries. Your documentation might include photographs, a movie, sound, conceptual models, etc. Focus on adjacent functions, facilities, people, places for the community, specifics, time, traffic, aura, etc.

Your site analysis/documentation/survey will cover an area that includes the immediate urban surrounding in all 4 directions. This will be of importance for the urban development of the context before you actually start designing your individual project.

You are to explore the site and its possible building conditions with an emphasis on urban conditions. Understand its surrounding urban context and relationship between existing buildings and the site.

In the fourth step, students were asked to layer and overlap the building program with the urban context, which introduced another process of editing, re-interpretation and alteration.

The presentation of student examples will show the different stages between abstract notation, first spatial translations, reiterations, and also dead-ends (as a result of non-alignment of the student’s interpretation derived from music with the requirements of the program or site), which led to second attempts, different readings and alternative translations.

As an architect and sculptor educated at an interdisciplinary art academy at Düsseldorf, where sculpture, painting, installation, photography/media, architecture and performing arts were next to each other, where teachers as much as students were able (and encouraged) to cross between different media and forms of expression, I bring a multi-disciplinary approach and translational experience far from separation in knowledge silos so common in academia. I believe that this design approach is especially valuable for interdisciplinary beginning design students of a 3+ program since it activates their translational capacities.

Notes
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5 John Cage, “Everything we do is music”, interview by John Kosler, Saturday Evening Post, October 1969


8 Robin Evans, “In Front of lines that Leave nothing Behind”, Architectural Association files 6, (1983): 89

9 Robin Evans, “In Front of lines that Leave nothing Behind”, Architectural Association files 6, (1983): 91


12 Daniel Libeskind, “Architecture is a Language” last modified September 19th 2012, Ted X Dublin https://www.youtube.com/watch?v=yEkDosanxGk


15 Steven Holl and Jessica Lang, “32 BNY: Dance with Architecture”, last modified February 1st 2016 https://vimeo.com/151530569
The Ethics of Architectural Form
Matthew Hall, Auburn University College of Architecture, Design and Construction

Poemics

“One has to make a choice to either be a saint or a designer.” (1)

The discipline of architecture has lost its discipline. The leash has been cut, and the gloves are off. Designers are locked in a fierce combat for attention to produce the most original and seductive imagery, selling the centerfold money shots of architectural spectacle in exotic locations around the world. Theorists persist, but it seems that they write for themselves by constructing an insular and elitist fortification of impenetrable syntax coded only for those in the know. Our monuments to excess compete for attention, as if radical form is all we have left to contribute. Machines that make our forms possible and our methods sustainable are a result of an unwavering faith in technology, valorizing the new as our only savior from all that is vulnerable and uncertain.

It’s truly amazing what we have been able to accomplish, but what’s disturbing is the fact that not much of it really matters. As architects, we design very little of what is implemented in the vast built environment, facing a myriad of crises from the ecological to the economic. Some say they build from material, but in most parts of the world we build from human suffering, invariably creating the next generation’s problems- by design.

Motives

What is the motivation for our architectural production, polemizing and pontificating? For whatever reason we do it, is there a right one? And if not, is there at least a reasonable one? Even if our intent is benign, do we have any semblance of ethical responsibility for our built environment’s state of crisis? Our profession’s future is in peril. Most every problematic issue that faces our world is a product of our policy, culture and desire. The issues that plague our world are obvious and many yet not easily predictable. Of the many roles for the architect, solving problems is obvious. But can designers solve the problem of design?

Inquiry

Clearly, this polemic is cynical, generalizing based on the worst-case scenario. It suggests that an approach based on doubt and skepticism may allow us to ultimately become more responsible and more receptive to culture’s perception of our work. This realization may offer useful insight in regards to the impact design has on the physical and cultural environment; a new tool for evaluating design decision-making.
Matthew Hall

Theoretical Premise

The philosopher Vilém Flusser refers to the dilemma of cultural production by defining the design act as an obstacle for the removal of future, present and often previous obstacles. This is based on the premise that every act of design is a reaction to previous designs, which have limited or obstructed and perhaps even created new conditions that we need to design (or at least maneuver) our way around. This perpetual crisis can be understood as the “internal and primary dialectic of culture,” which is reactionary in its most basic motivations. This theory implies that we are caught in an endless cycle of confronting obstacles as we progress, and thus are being forced to develop newer objects to navigate around the previous obstacles. This, in turn, creates future obstructions that will demand yet more objects of design in a seemingly never-ending cycle. (3)

The first obstacle humankind faced was the natural context, which we overcame via blunt force, giving reason to progress. Our obstacles are no longer mountains and vast bodies of water, but our own previous constructions. Every act of design is a metaphorical bridge, tunnel, bulldozer or vehicle to overcome, subvert or sometimes destroy in the name of progress, but such progress for many is no longer related to survival but often driven by convenience, efficiency and comfort. Layer upon layer, our built environment is structured in revisionist fashion, sometimes with rigor and order, but often via ad-hoc and chaotic intervention. Regardless of which method we choose, it seems that we are simply adding to a pile to be dealt with sooner or later in dramatic fashion. We have real problems to solve, yet our profession is not positioned to approach them without conversely threatening its own survival.

Provocation

This reality presents designers with the ethical dilemma of accepting that no matter what they do, they will do some harm. We devote considerable time in the academy to the possibilities of design, but not to the detriments and consequences. Ultimately, like philosophy, there are no concrete answers but countless attitudes. It is imperative to confront students with these issues as a foundation for responsible decision making rather than a disclaimer after the fact. We simply need to get beyond potential and originality, measuring our work based on the harm it could inflict for many, rather than the good it does for some. While architectural errors may originate in good intentions, history has shown that we lack foresight and that our work is often subject to cultural forces far beyond our control and imagination.

Unfortunately, there are few venues in design education for students to articulate their own agenda relative to this and other essential philosophical issues. Ultimately, philosophy will drive their design work, yet there is no clear place in the architecture curriculum to approach it. There is a reason we start with form— it is because there are no perceived consequences as we explore, test and take risks. A real discussion about values and responsibility would paralyze in the wake of an increasingly problematic world of our own design. We simply lack the time and space for polemics, and the realization of the scale and scope of design’s problems would stop progress in its tracks. Aply, the course description stated, “If you do not have an existential crisis as a designer, you best be prepared to develop one.”

Context

A recent seminar course at the Auburn University College of Architecture, Design and Construction entitled “The Ethics of Architectural Form” provided a venue for dialog on these critical issues through directed inquiry into the current state of design. Topics included: what form would our architecture take if we were primarily concerned with consequences? Rather than being motivated by the potential of architecture to be compelling via aesthetics, experience, performance and meaning, what if efforts were expended to test how it will fail, harm and miscommunicate? Is there value in hitting architectural rock-bottom accepting that no matter what we do, we will do some harm? In essence, is there an ethic to architectural form just as there is to responsible practice?

As the late Christopher Hitchens once stated, “The only thing I’m sure of is uncertainty, and the only thing that is certain is doubt. Only educated when you find out how ignorant you are.” (2) If we are ignorant about anything, it is clearly about the impact of our work. The introductory polemic to this essay summarizes the attitude and conclusions of the class after a series of exercises, experiments and predictions. The goal of the course was to introduce students to a dialectic on design’s intent, interpretation and consequences. We often state that design is an act of problem-solving, but with critical investigation and perhaps a healthy dose of cynicism, one can frame design as essentially problem creating. Before we can develop solutions, we must understand the context.

The course involved discussions based on precedent and evidence to identify examples of design as a problem creating endeavor, not by intention, but by reaction, chance, or failure to adequately estimate the consequences.
Value and Judgement

The previously stated realizations are the result of assignments and discussions that began with issues of value and judgment. We all have a notion of what good design can do yet rarely take the time to articulate what good design fundamentally is. The central question is: how do we determine, or judge what is good from what is bad? Where do our values come from and how do we reconcile the conflicting values of the architect with that of the culture that facilitates their work? What are our criteria and what do differing perspectives offer when casting such judgment? Students were asked to define the “good, the bad and the ugly” forcing them to articulate reasonable evidence for views in an effort to translate opinions into precise attitudes. The terms for the discussion were loose because “good” to some may be appropriate relative to culture or context, while to others it may be functional or performance based. “ugly” was separated to compartmentalize the topic of aesthetics, which is suspiciously lacking in the architectural curriculum as a precise philosophical tool for intent and decision-making. We achieved unison from this discussion articulating practical impediments to achieving the good that we worked so hard to identify. The world around us clearly showed that most of what we do is highly problematic due to cultural values and limits. This epiphany was the bridge to the next exercise, which involved the shaping of the students’ individual positions.

Consequences and Predictions

To bring the discussion directly back to architecture, a precedent project was assigned directed at polemical and dystopic projects that had no motivation for realization, but rather, served as contrarian or satirical statements in response the state of the world or the direction it may take. Rather than a typical precedent study of form, space and material, this reframed a familiar exercise to study intent, cultural context and impact. Precedents dealt with rapidly evolving technology, globalization, the consequences of less work and more leisure time (for the select few,) the myriad of virtual and hardened demarcations between cultures and zones (often enforcing binary concepts of good and bad,) the struggle and demand for originality, and lastly the enormous scale and repetition of our built environment encompassing the various programs of social, domestic and productive space. The work was framed relative the cultural and historical sub-currents that made them possible. In addition to identifying motivations for the project through a clear assessment of their intent and interpretation, students were asked to decontextualize them within the developments and dilemmas of the current day to test both their validity and longevity as critiques. Each polemical project provided a framework for entry into design as a tool for warning and prediction. We often think of design as a series of tests to achieve a desired conceptual outcome. This project reframed the experiment to test design’s capacity to at best, yield unpredictable yet massive cultural change, and at worst, provide a recipe for decline and destruction.

Each student was required to create a graphic manifesto tracing current problematic trends to their potential and terrifying endgames. These projects acted as ‘future-casts’ using the architectural imagination to propose consequences rather than utopian imagery. It was not a massive leap to reframe Archizoom’s No-stop-City as our endless interiors and sprawling banality. Superstudio’s Continuous Monument was not intended to be physically built, but for the students it was imagined as the global all-encompassing virtual world that spans the globe, more monumental as a communicating cultural tool and venue than any urban plaza or architectural space. Tangential realizations of such a thesis led to predictions of virtual space supplanting physical space and a decline of mechanical technology and tangible artifacts and interactions already prevalent in touch screens, e-books and online avatars and communities.

Even Constant’s New Babylon gains pressing validity in the wake of self-driving cars and other technological conveniences that displace the work of a human by offering the massive contingent of the workforce that drive for a living no alternative
means for economic survival. Student’s articulated analogous themes between Koolhaas’ “Voluntary Prisoners of Architecture” and the typology of the gated community, the surveillance state, and the reconstitution and reinforcement of borders through nationalistic policy, fear or economics. Perhaps Trump’s proposed wall on the southern border will serve as the ultimate realization of Koolhaas’ dystopia. These and other examples allowed students to take the radical paper architectural project and subvert it as a tool for understanding the current trends in our culture, often not starting with architectural ideas which suggests that building is subject to other cultural forces, reacting rather than instigating.

Propaganda

Building upon these predictions and concepts, the students were then tasked with creating succinct statements and imagery to focus their positions. The chosen format was that of the commercial, advertising an alternative present or potential future, and Bernard Tschumi’s Advertisements for Architecture served as a precedent to simultaneously start the dialog and format the work. Tschumi’s advertisements were polemical statements for architecture’s identity crisis. Tschumi sought to press the point that architecture could not simply be formulaic, dogmatic or even consistent. It had greater powers, aims and consequences, by hijacking the predominant communicative format of our time: propaganda.

Tschumi described them as a “…manifesto of sorts, confronting the dissociation between the immediacy of spatial experience and the analytical definition of theoretical concepts [in order to] trigger desire for something beyond the page itself. When removed from their customary endorsement of commodity values, advertisements are the ultimate magazine form, even if used ironically.” Our students are well versed in the creation of images and representations, always of an intended reality, desire, or an academic requirement at their most banal. Rather than produce images of desire through thinly veiled optimism like Tschumi, what would be the images of critique and dissatisfaction? As a vehicle for developing and disseminating an agenda, students were asked to make advertisements against architecture, attacking our inevitable lack of foresight regarding the impact of our work.

Collectively, we decided that given the nature of the course, our efforts may be better spent designing the worst case scenario rather than representing our hopes and dreams. The former requires an estimation of consequences with a concentration on the detriments, given that benefits are obvious and generally intentional. Rather than design the endgame, perhaps it would be more cutting to propose our theories relative the recent or alternative present, paying close attention to the warning signs through productive fictions as architectural projections that at best, dramatize believable events.

Fig. 3 Architecture as an object of desire, status and convenience, but not for everyone. Jordan Wood

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based media. With predictions on the disappearance of the printed word and the eventual loss of the tangible, why limit the polemic to print? Student teams proceeded to create video commercials using tools such as irony, satire and narrative to produce critiques from the comical to the horrifying. Rather than selling an idea and concept about the value of design, they sought to juxtapose the perceived benefit or convenience with the unforeseen consequences. Inspiration from film and literature was instrumental, with the dystopic anthology show “Black Mirror”\(^{(5)}\) providing fodder for the dissection of seemingly innocent technological advancements or architectural achievements through a lens of dystopic scenarios. These and other projects provided a vehicle to synthesize unique agendas from a collective dialog using relatively traditional representational methods to express a convincing argument.

![Image](5. In an advertisement against the polarizing development patterns of city and suburb, consequences are dire yet predictable. Caleb Munson)

**Conclusion**

This course was designed as an open and organic system. The agenda was set in an attempt to present a convincing hypothesis regarding the problematic state of design. If the students bought into it and could provide evidence to position themselves within the dialog, it could proceed as planned. If they didn’t, a detour would be taken. Discourse can be delivered on a schedule, but a dialog must be open-ended. While only two specific exercises were described, the ongoing project involved constructing a method for viewing our place within the world as shapes and changers, thus honing awareness of a diametrically opposed attitude to everything our profession depends upon. I have tried to capture the essence of the class’ conclusions in the paper rather than my own position in an attempt to illustrate that the dialog works both ways when the instructor acts as more of a mediator than lecturer.

Given our school’s curriculum, such a seminar/professional elective only has a place later in the students’ education. The question of the topic’s validity was never doubted, but we often returned to the central question of the appropriate time to cover such a topic. As a first year student, it would be a paralyzing endeavor, as they would lack the confidence, experience and precedent to enter the dialog. This position is offered for discussion in the context of Beginning Design C to gauge its validity as a tool to shape values that are primary rather than dependent on other ways of evaluating design, typical to early architectural education. While the space for such a test only existed in the third and fourth year professional elective sequence, the results showed that there are merits that could serve as the basis for foundational exercises that enforce ethics rather than aesthetics via readings, discussions and precedents that seek meaning through cultural contribution rather than simply formal prowess. For the young architecture student, ignorance can be bliss as they are free to explore. A critical introduction to the problematic nature of our profession and world as an *a-priori* for architectural form-making will no doubt present a decisive shift in the nature of a student’s work. The intent for the course was to aggressively pump fresh (and often hot) air into the vacuum of our formal dreams. This experiment was a prototype for the dialog we are perhaps obligated to have given the issues that face our culture. If done effectively, we will broaden the potential for the design act to be both contributory and critical in search of the ever-changing answer to the question: can design change culture, or is it reactionary and dependent on changes within culture to drive it?

The concluding statements from the students regarding their attitude towards the course unanimously stated that the tremendous consequences of the work deserve critical investigation. This enables students to establish an ethical framework and critical view of the world they will have a hand in shaping. Through precisely researched predictions, the extreme and potentially terrifying futures that result from our architectural acts could be planned out ahead of time. The predictions of what the future may hold for architecture have bred fascination, rebellion and radical impossibilities for the better part of the previous century. In the sixties we were throwing bricks; now we only build skins out of them. Our profession desperately needs a rally point and a productive venue for protest. We should be writing, or better yet, building manifestos. If we can’t incite change on a global or...
societal level, our retreat to local and manageable environs is a good start.

Fig. 6 A surrender and acceptance to the fact that architecture is not autonomous and not heroic but rather dependent to the whims and desires of an everchanging culture. Michaela Robinson

The earlier this discussion is had, the better off we will be. Peril, paralysis and perhaps some ugly work will be resultant, but at least it will be shaped as much by a young student’s ideas of ethics and culture as it is by the silo of our profession’s history and discourse. In the words of Mike Montiero “We need to fear the consequences of our work more than we love the cleverness of our ideas or else we stop becoming designers. We become agents of recklessness.” (ii)

Notes


2 Christopher Hitchens, Letters to a Young Contrarian (New York: Basic Books 2005)


6 Mike Montiero, How Designers Ruined the World, Lecture, Webstock ’13, Wellington New Zealand
A Speculative Essay on Design Process: Agency through Making

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Let us begin by clearly stating that this paper is not explicitly about or directed toward the subject of beginning design in the space of a first year design studio, but rather it is deeply intrigued by the idea that foundational design is a moment of constant unfolding within the broad parameters of everyday life, occasionally overlapping with formalized educational settings. The impulse to explore is a fundamental human need, which cannot be contained to the physical walls of a studio space or the theoretical bounds of intellectual discourse. Unfortunately, the model that many institutions of education rely upon replaces this impulse to explore with an obligation to answer. Many beginning design students come to a design school with just this mentality; they expect the institution to teach them how to design. This must be de-programmed in order to allow exploration to actually take place and for the individual to learn how and why design an imperative that goes beyond object and extends toward ones being. To learn design is to live design. In pursuit of this, contemporary educational models and methods must reframe this question-answer paradigm by providing the space and time to live the questions, which will deschool the student.

In his 1987 book The Ignorant Schoolmaster: Five Lessons in Intellectual Emancipation, Jacques Ranciere points out that traditional educational models obstruct students, compressing them into a pre-packaged mold. Ranciere suggests that such students can be characterized by their ignorance of what they do not know and how or why they ought to know it. In Ranciere’s model, the master becomes both the placeholder of knowledge and the position of knowledge dissemination. In step with Ranciere’s critique, we argue that contemporary design education must break down this model and shift power toward the learner within the constraints of the learned language-medium. In order to re-frame the question-answer paradigm, one must re-frame the master-pupil paradigm as well.1

The most important argument of this paper is that a pedagogy of making is the most direct and broadly accessible way to upend the intertwined paradigms of question-answer and master-pupil. We will...
attempt not to drag the room into the weeds too deeply, but it cannot be helped.

The teaching philosophy reaches back to Ancient Greece as Socrates announces “I know that I know nothing.” This statement suggests that confusion and uncertainty are perhaps more valuable to learning than any form of actual knowing. But how can one engage confusion? How might one capture uncertainty? 2

Sometime later Charles Darwin is accredited with suggesting that a mathematician is “like a blind man in a dark room looking for a black cat that isn’t there.” Darwin saw the work of a mathematician as unable to describe the world in anything other than abstract or speculative ways. The work of any designer is confined to seeing (or not seeing?) the world in just this way and while Darwin’s tone suggests this is a negative, it is also the greatest strength of the arts. 3

An image that might help articulate the point comes in Walter Benjamin’s 1940 description of Paul Klee’s painting Angelus Novus,

“The Angel of History must look just so. His face is turned towards the past. Where we see the appearance of a chain of events, he sees one single catastrophe, which unceasingly piles rubble on top of rubble and hurls it before his feet...But a storm is blowing from Paradise, it has caught itself up in his wings and is so strong that the Angel can no longer close them. The storm drives him irresistibly into the future, to which his back is turned, while the rubble-heap before him grows sky-high. That which we call progress, is this storm.” 4

Benjamin’s words are an exploration of being and possibly design methodology from a perspective quite similar to Darwin’s blind man. Design could be understood as an exploration of this rubble-heap with a focused intent. We are blind to the future, but perhaps we have this blurred link to the past and present. If we fear the catastrophe or if we seek to understand it for its own sake, the mounting rubble will overwhelm and consume us, but it might also allow us to understand the deep connectedness our contemporary and future processes of making-thinking-being.

Design as an educational endeavor must make these dynamics clear for all who participate and to establish the conditions for the participants to develop a sense of agency in a landscape of uncertainty and non-knowledge. These two conditions of uncertainty and non-knowledge are central tenants of why making is such a strong response to the imperative we have set forth here.

Presenting the premise that each design school encounter presents something new and something which must be a form of beginning, we present two projects that do not occur in a first-year setting, but are none-the-less foundational. The basis of commonality two foundational design experiences and discusses the strategic way these directed investigations are outlined so that the students can have freedom to explore within a disciplinary framework.

a project to engage making as “the thing”

The first process explores a sequence of design problems that question materiality in architecture. Students are exposed to Marshall McLuhan’s dictum “the medium is the message.” 5 Learning from the material (a medium) itself proposes a connection between the physicality of a crafted artifact and the content it communicates; there is an embodied economy within a crafting process that expresses aspects of design that go beyond the infinity of the mind. While we could dive into McLuhan and all of the theoretical implications, which extend from the referenced work, we would rather just describe the parameters of the design process at hand and allow his reference to linger as its own sort of question.
The studio focuses on the elemental, constructive matter-forces (tectonics) of architecture and how these elements can be influenced by and integrated into a plastic ground condition (landscape) to structure space. The design emphasis centers on the organization and technology of space and form as a unified scope; specifically, a boundary design that considers the character of the enclosure, building-site thresholds and outside/inside spatial connections.

Design language is developed through a series of directed investigations, each viewed through a specific lens of scale – XL, L, M, S, XS – and enacted through a method of making - cast, fold, mill, print, bas-relief, collage, perspective, plan, section, elevation.

These experiments are offered as thresholds that bridge site, enclosure, envelope, and conditioned space, and negotiations with ground, sky, edge, corner, and threshold. Students produce a series of discrete architectural projections that explore techniques and opportunities inherent in the materials of exploration. The relationship between construction and drawing is also explored, rounding out a procedure of critical application of these tools within the process of communicating design ideas and intent.

Emphasis is placed on architectural projections as crafted objects – purposefully constructed descriptive, analytical, and generative devices – that collectively describe and analyze the design of buildings. The goal is that students utilize the explorations to enhance spatial acuity. Iterative architectural modeling (including manual, digital, and rapid prototyping equipment) in two and three dimensions is a powerful way to engage the hand in the production of learning, what we have already labeled non-knowledge. Tectonic constructs emphasizing mass, frame, and plane (plastic and articulated constructions) as antecedents to architectural form open opportunities for the student to identify elements of spatial assembly such as enclosure, architectural promenade, threshold, and volumetric definition.

The primary structure of the work is as follows:

**XL** – Site as Structure - Building begins with preparing the ground, not only in the sense of laying physical foundations, but through digging into the surrounding milieu – the physical, social, climatic context.

**L** – Disposition, Sequence - is investigation of massing, proportioning, sequencing, and programming – the disposition of building on the site. (Building here is used in the inclusive sense, meaning all built elements, both interior and exterior.)

**M** – Language: Composition of Space and Material - is exploration of language – legible spatial, material, and siting patterns: structure, rhythm, character, atmosphere.
A Speculative Essay on Design Process

S – Enclosing, Separating, Joining - exploration of enclosing space – material deployed to create varying atmospheres and degrees of interiority.

XS – Joining Systems - is investigation of joining. Detail development will focus on how material meets at the sky, ground, corner, and opening, inspired by or based on detail precedents.

Fig. 3 student work; studies of materiality, space and form

The ultimate work of the studio evolved beyond the critique of some idealized building, into a curated presentation of the artifacts of exploration. By laying out the work, anyone who choose to consume the efforts was able to draw linkages and ultimately develop both direct and indirect conversations with the students work. In this way the work produced another form on non-knowledge in those who truly engage with it. Learning became a collective act.

on non-Knowledge/on Uncertainty

Two of the key issues at play within the context of this first project are the dynamics of non-knowledge and uncertainty, which were touched on previously as critical to the speculative agenda we are putting forth. The non-knowledge concept was coined by French philosopher Georges Bataille as a means of placing the concept of not-knowing within the fabric of knowledge, as opposed to being outside it as a negative. The concept is well documented in art critic and gallery director Anthony Huberman’s art manifesto entitled For the Blind Man In the Dark Room Looking for the Black Cat That Isn’t There (a title borrowed from the Darwin quotation discussed previously); the term has come to refer to a sort of knowledge embodied within us through experience – a knowledge of the unnamable and yet ever present aspects of lived experience. This type of experience privileges individual engagement as a means of coming to grasp a thing, even if one cannot speak its name. Its lack of strong definition also emphasizes the need for collective acts of processing through an experience in order to reinforce personal engagement.
In almost all cases, this is the framework that design educating operates within even when that education happens inside of other more rigid structures. In almost all cases, the instructor is placed in a position to impart and the student is placed in a position to receive. This is precisely the power-knowledge dynamic we have already critiqued here as having too little to do with how or why a student learns. Stated plainly, the model places knowledge in a strange position – a static object to be obtained. We do not believe that learners are passive receptors; the act of learning is a dynamic and variable process, both individual and collective.

With this philosophy in mind, the next question that has to be addressed is “with what does this process engage?” While such a question is not meant to have an answer, the question can be lived as we interact with our context and the things we use to mediate our relationship with that context – our environments and our tools; these two things are inexorably linked. We are buried by the swell of knowledge, information, opinion, bullshit and any number of other forms of lived content – a landscape of uncertainty – and design offers us agency to mediate this context.

Another project to engage making as “the thing”

It is just such a landscape with which the second project presented here comes face to face. This process explores a design/build exercise where students begin with a design in hand. The work provided was in need of strong vetting and, eventually construction. This vetting exposes the necessity of iteration in uncertain conditions and the potential of having space to explore beyond the scope of known quantities such as detailing and typical construction methods; the design of the components coming together becomes the design of “the thing.”

The core objective of the studio was to actualize the construction phase of the Kamama Prairie Tiny House project. Work began with a thorough investigation, dissection, and analysis of an existing design package, site, and relevant typological precedents. The dive exposed primary areas of inquiry for further detailed design development as well as a clarification of the core building components to be constructed during the semester.

A process of simultaneously questioning and forming a design hypothesis led to the crucial decision of using a single shipping container to house all essential programs, as opposed to an initial idea of using the container as a part of a bigger, more conventional structure. The essence of this core living area, however, is carried out to the extended plane of the deck, which mediates a spectacular view of the prairie with the everyday moments of living.

Fig. 4 design/build house design completed
Focus then shifted to the implementation of the specific, discrete components required to craft a livable site for the caretaker, along with a road map for future completion of the project. The lion’s share of the studio’s efforts and time focused on the design, fabrication, and deployment of those essential components. Site proximity posed an ongoing challenge to the feasibility and schedule of the project making pre-fabrication a key strategic thread throughout the design build process.

As a sequence of connected components responding in part to an existing design, the studio ended up proposing solutions that filled the gaps and deficiencies of the scenario. Design development, representation, and production relied upon a working dialogue between analogue and digital techniques, fostering a more thorough physical understanding of design by the designer.

The body of work produced was directly reliant upon the skill and craft of the maker, pushing the development of idea through the hand and machine-hand. Iteration was paramount to exhaust design ideas of their architectural potential.

The design process in the creation of the tiny house included many studies related to the essential living spaces, raising important questions like, is living essentially an indoor activity? What exactly does a living room signify? Are walls necessary to enclose or define a space? Where does a dwelling begin and end? While on the surface, these questions seem to emerge from function and experiential concerns, beneath the surface the act of physically producing the space drives the inquiry and by extension the narrative.

“the thing” as conclusion? Or “the thing” as beginning...

In both of these projects, emphasizing crafted objects – purposefully constructed, descriptive, analytical, and generative devices – forms the foundation of the discussion. The two projects work in tandem to collectively articulate the relationship between making processes and the formation of the internalized knowing we have called nonknowledge; the discussions also describe the platforms that production offers for jumping off into future exploration. In his pamphlett, *The Third Table*, contemporary philosopher Graham Harman discusses the potential of art and architecture to qualify the world in a unique way, which is quite pertinent to the discussion we have presented here. What we have describe are two moments of inquiry, that allow us to access something both more directly and with less certainty.

In Harman’s brife text, he specifically wants to addresses what he calls “real objects” through an analysis of Sir Aurther Eddington’s two tables. As Eddington describes sitting to write at a single table, for him, two tables actually emerge. The scientific table is the first, which he is most interested in. This table is a reduction of the thing before him to all of the tiny particles, which make it up. This perspective of the table effectively comes from a worldview based in the abstractions we have discussed earlier. The second table, which Eddington is not as interested in, yet feels the need to point out it the everyday table, which is a sort of broad generalization of the idea of table into all of our memories and connections to table-ness. Harman suggests in his way that this table is something generally addressed within the culture of the humanities. Where Harman’s discourse becomes most interesting for us is that he suggests that these tables are each in there own way ignorant of the real table, which exists somewhere between the overmining and undermining of the thing itself. Moreover, Harman suggests that the disciplines of the arts and architecture are uniquely positioned to access this third table. 

We bring up Harman in order to point in the direction we are going. It may not be entirely correct to say that a pedagogy of making and the projects developed from this thinking (two of which we have discussed here) are trying to access something real per se, but there is a way in which Harman’s critique of the simplification of a thing or the overblowing of a thing tends to lead toward a form of trying to answer the questions of the world as opposed to living them.

It is tremendously difficult to access the value of these processes, but through explorations we have seen students begin to take on power for themselves. As a learner, one makes and then evaluates and then
carries that forward... it is not an economy of question and answer, but a process of uncovering, re-working and educating one’s self, which contributes to the learner’s agency and their ability to continue to learn once they are no longer within the institution of education. Design isn’t an object to be obtained, but rather becomes an ethic of living within the moments of everyday life. As Rainer Maria Rilke once wrote in his Letters to a Young Poet,

“Be patient toward all that is unsolved in your heart and try to love the questions themselves, like locked rooms and like books that are now written in a very foreign tongue. Do not now seek the answers, which cannot be given you because you would not be able to live them. And the point is, to live everything. Live the questions now. Perhaps you will then gradually, without noticing it, live along some distant day into the answer.” 9

Notes


2 Huberman, Anthony. For the Blind Man In the Dark Room Looking for the Black Cat That Isn’t There Contemporary Art Museum St. Louis: St. Louis, MO. 2009

3 Huberman, Anthony. For the Blind Man In the Dark Room Looking for the Black Cat That Isn’t There Contemporary Art Museum St. Louis: St. Louis, MO. 2009


6 Huberman, Anthony. For the Blind Man In the Dark Room Looking for the Black Cat That Isn’t There Contemporary Art Museum St. Louis: St. Louis, MO. 2009


Begin Where They Are: Teaching the Value of Design Through the Ethics of Sustainable Food Systems

Sallie Hambright-Belue and Martin Holland, Clemson University

This paper details the ongoing beginning design studio efforts within the School of Architecture, and the Department of Landscape Architecture at (REDACTED), with a local, non-profit organization, the FEED & SEED. The FEED & SEED’s mandate is to mitigate the social inequities present within the disenfranchised neighborhoods of West Greenville, South Carolina through providing affordable, nutritious, and locally grown foodstuffs to these disenfranchised areas. The organization has engaged the University to conduct a series of collaborative design studios focused on providing a holistic and systematic rethinking of how food production operates within the City. In addition, the FEED & SEED has an educational component to its mission: informing local growers regarding the best current practices of urban agriculture and providing nutritional meal planning, cooking lessons, and additional vocational training for interested residents. The civic interventions and productive community landscapes are meant to create both compelling spaces and urban places that are valued and regarded as shared civic assets. The design studios understood the role designers will need to play in the future workplace as “adaptive and agile systematic and integrative thinkers.” The design interventions illustrated throughout this work are the culmination of research across a wide range of diverse topics, which ultimately, seeks to use design as a way to make more equitable access to fresh food possible.

As the educators and investigators behind these studio projects, we fundamentally believe that our students and the communities that they are working with are engaging in an alternative model of traditional design practice. This perception is born out of the understanding that, fundamentally, architects, landscape architects, planners and designers are critical thinkers and creative problem solvers. Our students can offer the communities centered around West Greenville, real and viable alternatives to the existing conditions that denote the area as a food desert. A “food desert” is defined by the United States Department of Agriculture (USDA) as a geographic area whose population lacks the necessary level of income such that they do not have adequate access to fresh and whole foods. The studios utilized and channeled the energetic passion of millennial students to engage in meaningful and thoughtful debate concerning issues of economic equity, community building, and social justice while still having the practical question of how to mitigate the insidious and pervasive effects of the existing food desert. Simply, the studio became a place to discuss ethics and values associated with access to fresh foods.

Ultimately, it appeared that the most successful design projects had the greatest social utility, and directly addressed the issues of sustainability and resiliency of communities holistically - not just selected individual component pieces within the larger geographic area. Instead of focusing on the products or design outcomes that are usually generated by students for professionals, this utilitarian perspective of sustainability and resiliency offered more credence to the design disciplines understanding of how to measure our impact as practitioners and engaged...
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citizens. Design that has social impact and utility does not necessarily have a predetermined, professional audience. Instead, almost by necessity, such projects weave themselves through communities, creating real change that affects the lives of all citizens. The following projects gave the students an opportunity to engage in the struggles many of our communities face and to understand the impact design can have in mitigating those challenges.

Food Deserts and their Impact on Community Health

The design projects described here are based within the City of Greenville, located in the “Upstate” region of South Carolina. While Greenville has been identified as one of the fastest growing areas in the country, there are many communities that are being disenfranchised and removed from the economic benefits associated with such rapid growth. This is not an unusual occurrence within certain areas of South Carolina, and is a common problem found in many cities across the United States. These disenfranchised communities are frequently the home of the most vulnerable and at risk citizens, and in turn, they are the probable location of a potential or existing food desert. The USDA estimates that 23.5 million people, including 6.5 million children, live within food deserts in the United States.

Food deserts are inextricably linked to areas of significant poverty and limited access to fresh food. When these two factors mutually coexist, the obesity rate with affected communities usually increases. According to the American Journal of Preventative Medicine, adults who have neighborhood access to stores that sell fresh foods have a 21% obesity rate, compared with 32-40% for those living in neighborhoods with no such access. South Carolina shares the Country’s food access problem, and according to a recent South Carolina Community Loan Fund study, one million South Carolinians are without adequate access to grocery stores that sell perishable goods, geographically removed from fresh food markets or lack accessibility to affordable and convenient transportation networks to get to such critical places. These disturbing statistics contribute to an obesity rate of adults in the South Carolina Upstate of 67.9%. While this epidemic may not seem to be a traditional issue within the professional sphere of architecture and landscape architecture, it is the position of the authors that the health and well being of all members of a community is of paramount concern for those design disciplines that deal with the built environment. As designers, we feel that we are well suited to envision cities where landscapes and civic spaces can encourage and do support, local food production. A problem this pervasive and overwhelming will only be solved through collective action at a host of levels.

The Community of West Greenville

The West Greenville neighborhoods of Sterling, West Greenville, and West End possess qualitative characteristics that indicate that they are either existing food deserts or are susceptible to become a food desert in the immediate future. These neighborhoods have less than half the median income of the City of Greenville, have a larger number of residents per average household, and have less formal education than their more affluent counterparts. All of these factors contribute to the likelihood of obesity among the residents, with the absence of a local neighborhood grocery store compounding the problem. While these neighborhoods face challenges, they each possess a strong sense of identity, history, and community. These neighborhoods are 50%-83% African American and are home to the oldest churches and the first African American high school in the area.
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The FEED & SEED organization is attempting to address the community’s challenges of obesity, general health, and food access from a regional perspective by positioning themselves as a food hub. The USDA defines a food hub as a regional business or organization that actively manages the aggregation, distribution, and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand. In essence, food hubs are a “scaling up” strategy that allows an expanded reach into communities for locally grown and produced food.9

Currently, South Carolina has one food hub, Grow Food Carolina, located in Charleston and approximately two hundred miles Southeast of Greenville. Charleston, and the adjacent coastal areas, provide ideal growing conditions for vegetables and other consumable crops, while the Upstate is best suited for livestock production. Grow Food Carolina and the FEED & SEED envision working together across the state to maximize the local consumption of South Carolinian grown food.

The FEED & SEED plans to rejuvenate the local food system in a number of ways. First, the FEED & SEED intends to provide a large warehouse facility that will meet the wholesale demand for foodstuffs and provide access to individual residents and families in the form of a market selling fresh produce, meats, dairy, and baked items. Second, the organization intends to educate the community at large and the farming community in the advantages and processes of sustainable agriculture. To that end, the warehouse facility will therefore have an educational urban farm in the surrounding landscape. Finally, food distribution locations will be located throughout the region in order to distribute the fresh food items into the at risk communities and to lessen the effects of existing food deserts. The following student projects identify and address key concepts about each of these components: the food hub, the urban farm, and the food desert distribution locations.

FEED & SEED_Community Partner

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FEED & SEED_Food Hub

The first studio course entitled, FEED & SEED Studio: Reconnecting Farms, Markets, and Tables was completed in Fall 2014, and provided a holistic approach to address food access issues as well as social, economic, and environmental concerns. These ideas were specifically addressed by students to generate possibilities for a more sustainable, increased equality, and overall, healthier city. The studio addressed and evaluated existing farm to market conditions, and looked for opportunities to increase effectiveness and efficiencies within the local food system. The studio also sought to answer the question “What role does architecture play in the local food community?” Ultimately, the purpose of the studio was to understand how design can be used as a catalyst to encourage more just community development. This was undertaken to gain a working knowledge of how these neighborhoods functioned as a community network. This information included, but was not limited to; understanding the broader potential impact that the FEED & SEED could have on the existing communities, possible site strategies, programmatic development ideas, as well as ideas for how the building and site themselves could become a civic asset.
The students soon discovered that the failure rate of food hubs in the United States is quite high, and realized that in order for the FEED & SEED to be successful, it would need to become an integral part of the community. In turn, the students sought out specific ways to incorporate the voices, and the larger concerns of the community within their projects. During the process, students became aware of the multitude of other challenges faced by the communities in addition to the lack of fresh food access. A majority of these additional challenges were addressed by the student design work, and in turn, these additional limiting conditions often made the student’s final projects stronger. There were three basic design strategies that arose from these additional concerns voiced by the communities; create an extension of the Swamp Rabbit Trail recreational corridor and connect it with a major transportation and leisure corridor in the city of Greenville to address limited transportation options; integrate an understanding of the site as a former mill and incorporate the mill’s rich social and industrial history with that of the neighborhood residents who once worked there; and to create an integrated building and site strategy which reveals all of the necessary cycles associated with farming and food production, in order to educate the community about the processes and requirements of urban agriculture. Two of these strategies are presented below.

**Food Hub Design Solution 1 - Food Cycle**  
*By Brianne Burdy, Yue Ren, Sarah Stumpo*

This project recognized that the surrounding community lacked not only access to fresh foods, but also suffered from inadequate transportation connections with the other areas of Greenville. The design team discovered that one in five African American households did not own a car; and that bicycle usage by African Americans effectively doubled from 2001 to 2009 and was continuing to be adopted at a rate five times faster than cycling among whites. The students also discovered that the Greenville bike share program was more affordable, accessible, and flexible than the current public bus system. The economic investment and accessibility of these two systems was startling in contrast - the price of the bike share program is $0.16/day, compared to $1.35/day for the bus system. The bike share program is accessible from 5am to 11pm everyday of the week, while the bus suffers from limited hours of operation: 5:30am - 7:30pm Monday through Friday, and 8:30am - 6:30pm on Saturday. No rider services are offered on Sunday, and official holidays. The student’s proposed a synergistic relationship between the food hub, the bike share program, and the popular Swamp Rabbit Trail recreational corridor. The addition of bike share stops, complete with available bicycles located at the food hub provides the local community with more flexibility and another affordable transportation alternative compared to the current bus system. In addition, bicycle service encourages increased physical activity, improved access and expanded connectivity to the other parts of the city, enabling community members to take advantage and participate within Greenville’s growing economy. The connection with the Swamp Rabbit Trail allowed the community to access Greenville’s most valued active recreation asset. Such civic recreational opportunities are scarce in the neighborhoods of West Greenville. The triangulation among increasing resident’s access to fresh food, the ability to live an active lifestyle, and improved transportation opportunities addresses health issues found in at-risk communities from a holistic, and common sense, perspective.

**Food Hub Design Solution 2 - Exposure**  
*By Kathleen Peek and Aaron Peter*

The second student design team saw a parallel between the fact that Americans are uneducated when it comes to the cycles of food production, and the reinvestment necessary when considering construction, maintenance, and reinvestment cycles of buildings and site infrastructure systems. This lack of basic understanding of how food is grown, handled, processed, stored, and transported leads to uninformed and poor decisions, which often can lead to poor and unhealthy food choices. Chronic diseases associated with a poor diet account for 75% of all
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healthcare costs, which could be redirected to other aspects of prevention and treatment if the basic diet of Americans were changed. The design team recognized that while poor food choices contributed to poor health, poor building designs and wasteful infrastructure decisions also lead to terrible implications on the environment and economic systems.

The students’ design solution revealed shared commonalities between the cycles of farming and building construction by using transparent materials and weaving public space throughout the food hub facility and urban farm. No part of the production system was hidden from public view and such visibility encouraged the community to watch and engage with the processes of each. The design thinking that radical transparency in how the food was produced, handled, processed, and distributed would ensure a degree of trust from the local community, and a renewed attention to actively solving problems rather than disguising or hiding them from public scrutiny.

The students realized that architecture’s role in the local food community was more than simply creating usable spaces for the selling of fresh food products, rather architecture and landscape architecture offered unique opportunities to integrate meaningful, local food spaces into the community. By understanding the programmatic needs and specific challenges of the communities, and by revealing key moments in what is otherwise an “invisible” and “closed system,” the designers ensured that these new spaces addressed some of the biggest challenges facing the community.

**FEED & SEED_ Urban Farm**

In the Spring of 2016, an undergraduate landscape architecture site design studio examined the land intended for the establishment of an urban farm operated by the FEED & SEED’s main food hub facility. Part of the FEED & SEED’s mandate is to serve the public good through the sustained commitment to provide educational classes. Such topics include the growth of organic produce, safe food handling procedures, seasonal planting strategies along with the best practices of companion plantings. In addition, informational cooking classes and primers on how to start small scale restaurants and other food focused businesses are planned for the immediate future.

The benefits to the neighboring areas are at least fourfold; the facility will provide affordable and nutritious fresh food to the nearby residents at competitive prices, thus mitigating the effects of the current food desert. The FEED & SEED is forecast to provide educational classes that are based upon the topics of food and nutrition, food security, environmental sustainability and economic development. These classes are intended to range from simple and informal workshops, through to certificate programs run and administered by a local community college. The facility will function as a new civic entity, providing a venue for community events, complete with an industrial kitchen and all the necessary amenities to host up to 300 people. Finally, it will also be a source of economic development for the area, providing a much needed source of employment for locals, while also capturing revenue from people outside of the area who use the recreational corridor of the Swamp Rabbit Trail who decide to stop for a meal or a cup of coffee.

**Urban Farm Design Solution 1 - Visualizing the Abstract Cost of Soil**

By Austin Allen

One student became preoccupied with the practical logistics and the economic requirements and examined whether the FEED & SEED could be a viable entity based upon the limitations of the site itself. The facility was an abandoned storage facility, located along banks of the Reedy River, and adjacent to the Swamp Rabbit Trail. The site served as a storage facility to a once active rail line and has multiple hazardous pollutants on site, with the most pervasive being the presence of Coal Ash. Coal ash is a common term for the waste produced through the burning of coal for industrial purposes, leaving such toxins as mercury, lead, arsenic and other heavy metals as a by product. The remediation of sites that contain coal ash can often be
a laborious, expensive, and must adhere to the Environmental Protection Agency’s (EPA) significant regulations with regards to proper storage and approved mitigation strategies. While the site has only slight traces of coal ash on site compared to other adjacent sites, it effectively removed the possibility for the existing soil to be used as a medium for the growth of produce intended for consumption.

Austin Allen discovered that the clean soil required to use as a growth medium would be one of the FEED & SEED’s largest capital expenses. Based upon projected estimates by the FEED & SEED, an acre of land would be required to grow the fresh produce needed for the facility. It was this thorough attention to the specific requirements of the facility that reinforced the value of soil to the students, and to the larger community, who often took access to clean soil for granted. His work articulated not only the economic reality required to make the facility feasible, but his work also amplified the almost mute voices concerning long standing environmental justice issues within the community.

**Urban Farm Design Solution 2 - Kintsugi**

*By Allison Chan*

Allison Chan’s project used the idea of kintsugi, a form of Japanese pottery that uses a gold lacquer to hold the fragments of broken pottery together as a symbolic gesture of repairing the broken food system within Greenville. Chan’s thoughtful investigation of how to reveal the past, erroneous farming practices indicating how the land was mistreated, and how habitats were destroyed, is an important step in recognizing how many unspoken and unreflective farming practices are unconsciously transferred from one generation of farmers to another without significant reflection or scrutiny. Her use of kintsugi as an art form of repairing and restoring a broken object, highlights the necessity of not discarding the majority of farming practices, but rather indicates that the insertion of new principles and best practices can restore a broken system back into a useful, even beautiful entity. In this particular design, restoring the nearby wetland assisted in generating greater biodiversity and provided habitat for local insect populations that would pollinate the produce grown at the FEED & SEED. Chan’s work acknowledged and expanded the understanding of who the residents are in this community, allowing for other species and their habitats to be included within this definition of community.

**FEED & SEED_Food Desert**

The mitigation of the existing food desert proposed by the FEED & SEED relies upon a collaboration with a private and locally owned gas station chain known as Spinx. The Spinx convenience stores are located throughout the region, and are often situated directly within these identified food deserts. These gas stations frequently contain convenience stores, and have an established system for distribution and delivery of material goods, food, and beverages. These stores are often the closest thing to a grocery store that low-income residents have nearby, and as a result the Spinx chain stocks a higher percentage of food items where residents can spend their SNAP dollars on state approved food items. Additionally, the Spinx company owns many undeveloped land parcels adjacent to their service stations and stores. Part of the FEED & SEED’s food distribution strategy seeks to place fresh food products sourced by the FEED & SEED within the Spinx convenience stores and to extend the idea of the urban farm into that of community gardens, which will inhabit the adjacent land to these stations.

This project was completed in collaboration with the Communications Department at Clemson University, in the form of a Creative Inquiry course entitled Site Specific Messaging: Communicating Food, Identity, and Culture. Using ethnographic interviews and focus groups, as well regional historical research, students identified and researched key audience segments and populations who are adjacent to the existing Spinx stores. The resulting projects included the content and design of the physical spaces as well as opportunities to communicate the message of the FEED & SEED to the community as a whole. It was necessary that each of these design interventions be appropriate to the specific communities where they were to be located, as the residential areas across the region are vastly
different in terms of ethnicity, food culture, educational levels, and disposable income. It was imperative that these designed spaces be accepted as being part of the surrounding civic fabric in order for the members and stakeholders of the neighborhood to take active ownership of the community gardens.

Food Desert Design Solution 1 - Our Backyard
By Colin Bland, Sally Dunaway, Taylor King, Sana Mirza, Josh Rowell

The first design team noted that communities with residents who had low incomes and lower levels of formal education have reduced access to parks and other recreational spaces, and had reduced quality leisure time. By interweaving recreational spaces into the community garden, the garden reconnects the community with active food production while providing areas where the community can remedy its lack of public parks and open space.

Our Backyard identified the need for quality recreational areas and provided a series of leisure spaces for three neighborhoods - West Greenville, West End, and Sterling - to come together to play, grow, and relax. The student design team worked to develop playful, creative, and appealing signage, messaging, and architectural designs that would engage the community as a whole. The particular intent was to develop strategies that would encourage children to play, adults to relax while supervising their children, and to encourage the elderly to enjoy the outdoors while feeling like a vital part of an intergenerational community. The desire was to allow everyone to grow through shared activities, enhance social bonds across all groups, and encouraging overall healthier and active lifestyles.

Fig. 2 Your Backyard Visualization

Food Desert Design Solution 2 - Create Greenville
By Hannah Harrison, Amanda Hill, Taylor Shank, Lindsay Wehmeier, Logan White

Greenville is a constantly evolving and expanding city; with the downtown and the immediately adjacent areas undergoing the most radical and intense transformations in terms of land use and population growth. This project provided the neighborhood with a strategy to allow the existing culture and identity to be preserved, even in the face of rapid development of the city. Create Greenville aimed to establish a community hub for West Greenville by drawing specifically upon its rich history to maintain the original community character and culture while still updating and reinvesting within the neighborhood.

Create Greenville found that the surrounding neighborhoods to the downtown were the most historically significant, and engaged African American communities in the region. The first African American high school in Greenville County was located in the area, as well as many of the oldest, and most significant traditionally black churches. This rich history is important for the community to recognize while looking ahead to future opportunities. The community garden design incorporated ways to tell the history of the neighborhoods while simultaneously addressing the lack of fresh food by making culturally appropriate foods available.
Benefits for Students: Transformative Learning Experiences and Outcomes

Those teaching architecture or other design related disciplines are familiar with the numerous requirements demanded by our respective national accrediting agencies. In turn, these courses must meet the specified outcomes that these regulating bodies stipulate to ensure a comprehensive and consistent level of proficiency of graduates, yet these requirements can often span multiple and diverse categories including: the application of critical thinking and representation skills, building practices, technical skills, application of knowledge, and professional practice. While it is our professional responsibility to ensure our students have the expected skillsets, it is our belief, that we have an obligation to educate the design student as an engaged and informed citizen. By focusing on the design process within community service learning projects, we aspire to impart the following characteristics:

1. REFLECTION: Provides students with an expanded and alternative view of the skill sets provided within the context of a design education, encouraging students to possibly enjoy an “alternative” critical design practice rather than more traditional career trajectory. For instance, a designer as an advocate, the designer as community builder, the designer as educator, and the designer as an entrepreneur.

This reflective practice embedded within service learning projects inspires students to challenge their own beliefs and mores. This is not a flat footed, blanket promotion of tolerance or diversity, but rather an internal empathic engagement that assists the student to see situations with a wider and more nuanced lens. This perspective can offer students the realization that the traditional architectural language and renderings, which are often second nature to them, can be viewed as a bewildering and isolating form of communication that reinforces an unintended hierarchy of power. The reassessment of language, terminology, working methods, drawings, illustrations, and models all should be reassessed to effectively communicate to a wider community audience.

2. ENGAGEMENT: Inspires students to be engaged with issues that mirror their personal interests, but ensures that those topics are also grounded within the needs of their own local communities. This “grounding” of projects allows students to keep a perspective that is focused on resolution and completion, but communicates that the successes or the failures of a project can have far greater reverberations upon themselves and the community than predicted. This insight provides a sense of purpose and responsibility that is not often encountered within abstract, academic hypothetical projects. As one commentator has observed, “critical service-learning programs encourage students to see themselves as agents of social change and use the experience of service to address and respond to injustice in communities.” This process of personal engagement with the issues present within a community also expands a student’s sense of empathy.

3. EMPATHY: The role of social empathy for those in a community based studio cannot be understated, as it extends far beyond mere “do goodism.” Rather, the design process provides students an opportunity for open and honest recognition of the needs and limitations of real world communities, as it simultaneously educates them of the larger socio-economic and political forces exemplified by social practices and policy.

As noted by Mitchell (2008), “...a critical service-learning approach allows students to become aware of the systematic and institutionalized nature of oppression. The action/reflection dynamic of a critical service-learning pedagogy encourages contemplation of both personal and institutional contributions to social problems and measure that may lead to social change.”

It is that
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Recognizing the engagement of citizenship.

4. **CITIZENSHIP**: Students are challenged to develop meaningful client and community relationships, combined with effective communication and public-process methodologies to ensure that they are accurately representing the desires of the community. This challenges the student designer to express multiple perspectives within a community, and recognize their own voice, agency, and expertise within the project.

It should be noted that these four categories are not considered as a mutually exclusive, stepwise procedure, but rather a cyclical process that is constantly evolving and developing. As Eyler (2002) notes, “Effective citizenship should also include an ability to analyze problems and to engage in action. These capabilities have intellectual components such as knowledge, skills and cognitive development.” It is this return to the reflective comprehension of skill sets and a re-examination of attitudes that are critical to the developmental success of the design student.

**Conclusion**

The student projects detailed throughout this paper address a range of social justice issues that are both intractable and invaluable within the context of beginning design. While it is often immensely difficult to challenge some student’s perceptions of the people who face multiple social and economic challenges on a daily basis, such exposure provides students the opportunity to become engaged and socially empathic citizens. We encouraged the students to realize that they were not designing for these communities, rather we asked them to design with these communities. This understanding of how designers should operate; being more than just the creators of products or places, situates designers as the integral and empathetic center to the decision making processes that constitute neighborhoods, cities, and regions. Designers bring multiple skills, which can expand the discussion and the dialogue concerning economic equity, issues of community building, and ways to create socially equitable spaces. With the continual fragmentation of society, where economic opportunity between the haves and have-nots widens each and every year, we need to be aware, concerned, and engaged regarding the political and economic decisions being made to ensure our work within the urban fabric are not contributing to or accelerating this already great disparity. This is the real value we are giving society - educating future designers to become engaged citizens and knowledgeable about how their decisions and impacts can affect others.

**Notes**

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https://www.census.gov/quickfacts/table/PST045215/4530850,1731589,45045
(Accessed, February 25, 2016.)
Generation WHY: emphasizing the individual in pedagogy

Liane Hancock, Louisiana Tech University, Miguel Lasala, University of Louisiana Lafayette

Introduction

The Bauhaus, modernism, and their direct pedagogical offspring presented a one size fits all education – tailored to produce an army of architects who could use the same fundamentals of design and theory to rebuild cities, and colonize the globe. Such efforts sought to equalize culture in the name of progress, just as Jefferson believed he could tame the wilds of the US through the extension of his grid from sea to sea. These pedagogies did not celebrate diversity in the student-body; those students that could not mold themselves into the stereotype did not belong. Highly connected and diverse, millennials show a tendency towards questioning the status quo. They are the ‘why?’ generation. The challenges and design opportunities they will face during their lifetimes are mind bending – saving the world from environmental disaster, navigating digital realms, and maybe colonizing Mars. They have been told to formulate questions, collect data, and make a difference. Not only do they ask these whys, they also have to have a reason why they should engage. As a result, they have distinguished themselves as celebrating their diversity ethnically, culturally, sexually; instead of seeking to fit into a mold thrust upon them, they revel in their individuality.

Architecture 215 Course Organization

This paper focuses upon assignments from the fall quarter that emphasize the identity and diversity of individual students. These assignments challenge their problem solving capabilities, and push their creativity. They ask: what is important to a student? Knowing that these students come from a broad array of backgrounds and interests, how do we, as faculty members, value their individuality when we are also required to provide foundation-level skills and design competence? This individuality is promoted within a pedagogical framework that also fulfills conventional learning objectives: at best the delivery of these objectives serves to reinforce the student’s ideas; at worst their delivery does not water down the concept.

Specifically, we have developed assignments that are controlled enough to result in predictable outcome with regard to formal expression and technical acumen while also open enough to promote self-expression and innovation within response. Projects begin with a concept or idea phase based originating through analysis of a dataset. The ideas are then translated to formal results that are compositions of aggregated individual units that are held within a structural framework. Variation occurs in the individuality of the specific units, compositional logic and expression within the aggregation, and the design of the structural framework.

To understand this delicate balance we analyze studio work from three years for a design project for lodging, focusing upon how altering exercises impacted the overall outcome of the quarter-long project. The general arc of the course’s learning objectives are: design thinking through the analysis and interpretation of data, and translation of analysis to idea; architectural design skills through students’ design of an initial enclosed space for inhabitation; compositional and ordering skills through the aggregation of units; site consideration and analysis; structural exploration with a particular emphasis on expressiveness; and representation skills with the introduction of digital tools.

The differences in curricular delivery include: changes in studio prompt; alternative sequencing of analytical and intuitive exercises; difference in when “reality” was introduced; and changes in when the transition from hand making to digital representation occurred. The effects on the results were pronounced, revealing assumptions by the faculty, easily attained efficacies, and when connections between learning objectives frayed.

Study how the site affects you – this includes views that you want to capture, atmospheric qualities, and how the site affects your senses. Light, sounds, touch. The heaviness of the humidity, the movement of the water, tiny details such as algae growing on a tree trunk. – Arch 215 Collage project prompt
Changes in studio prompt: appealing to the students’ interest and knowledge

In first and second year, studios at Louisiana Tech begin with design thinking, requiring the students to interpret an initial dataset as catalyst for each project. In the first two years of the fall 2nd year studio, students began by studying the interaction of the body with an automobile. The faculty made several assertions and assumptions. First, cars and highways have a primary relationship with lodging and motels. Second, we expected that students, at the age of 19 or 20, would value their car and be eager to study how they inhabit it. Third, we believed college students would have a latent interest in travel. While the first assertion was correct the latter two assumptions were poorly informed. Many students settled upon simple ergonomic relationships in the car, eschewing a rich variety of possible explorations. In addition, we came to understand how limited our students’ travel experience was, and that they had little to no knowledge of how motel rooms were configured. Recognizing this, this past fall we shifted the initial study to analyze a site at the Black Bayou in Monroe, Louisiana. We found the students to be much more engaged. Many had a latent and yet sophisticated understanding of the ecosystem and exhibited a real appreciation for the character of the place. Even those who responded viscerally against the location (so many bugs!) could identify why. It was also evident that students had a more personal understanding of how one might stay overnight in nature — with many having completed extensive camping or wildlife hunting excursions. The result was a broader range of individual response and inquiry that also showed more in depth study.

Alternative sequencing of analytical and intuitive exercises

In developing the studio’s curriculum, we intentionally alternated between analytical and intuitive exercises as a way to choreograph the expansion of design ideas and then to regulate those ideas through measure and analysis. We discovered that changes to sequencing had significant effect on their design exploration and understanding. While we found both analytical and intuitive processes had equal precision in decision making and intentionality, the students were far more fluid in their interpretation of the dataset that they studied when they initiated work with their hands. The intuitive work was more synthesized, more subtle, and more expansive in its ability to be interpreted individually. For instance, in the first two years, students transitioned directly from the body/car analysis to design of the room in plan and section. Suppressing a conceptual modeling step also suppressed intuitive
response and its relationship to form making. While students were able to imbed their ideas in the design, the faculty found that formal resolution was more difficult to attain. This past year, the faculty made an effort to smooth the transition from idea to realization through a series of additional exercises. After completing an initial site collage, students then designed a device to produce the individualized experience at the site. Students translated this initial device to an idea of a room as device. It was only after this step that students were told they were designing a room for lodging, completing one additional iteration to marry their previous work with what was now a program. This process maintained intuitive response, resulting in less realistic and perfected rooms, but imbedded ideas thoroughly and more formally considered three dimensionally.

**Difference in when we introduced “reality”**

It is always a challenge in foundation studio to navigate when to introduce reality. Inevitably, young students are eager to design something real and to leave behind conceptual work. However, the introduction of reality can easily result in the impulse to create reductive and normative designs that eschew individual response.

The studio was predicated upon the analysis of a tangible dataset: cars or the bayou. Data gathering was through photography and hand drawing. Both resulted in a single drawing that presented their analysis. While both relied upon photography, the automobile analysis used a framework of graphic design and diagramming through digital means to present the work, whereas students presented the bayou data through hand constructed collage. The finished nature of the automobile analysis orphaned it off from the design process, whereas the collage provided a looser, more conceptual source for future work.

In terms of site, for the first two years the faculty introduced a location along the highway after students designed the hotel room. This caused a brief disruption in design, as students took time to understand this new information. In contrast, introducing a site at beginning of the design process was seminal to the project, situating the understanding of site as a touchstone throughout the quarter.

Another area of consideration was the layout of the room for lodging. This was the students first introduction to a specific program; students considered circulation, view, the size of things, and the sequencing of use of the room. For the initial two years, the students developed their individual design ideas, originating from their analysis project, while simultaneously considering typical hotel room constraints. In several cases the result was a mishmash of reality and poetics. This past fall a trip to Dallas early in the quarter provided the opportunity to study
a well-designed Aloft hotel room. Later, when students initiated their room design, they already had an understanding of the hotel room imbedded in their consciousness. This provided a data set to refer to, without directly imposing rules on top of the individual design creating an atmosphere of synthesis.

Across all three years, the students were told their rooms must be held within a structural framework or exoskeleton – aligning with an interest in promoting expressive structure and tectonics across our curriculum. These structures were intuitively designed with specific discussions on span, member sizing, and detailing broached in 3rd year. For the past two years we required a 1/8” sectional model of two units and associated structure. While the faculty feel it is important to think at this scale, the sequencing of this assignment is not yet correctly integrated. Students become bogged down in details, and do not move on to the overall structural framework quickly enough.

Changes in transfer from hand drawing to digital representation

We introduce Photoshop and Autocad in this course; the students have already completed freehand and drafting coursework. Ironically, we found the more we encouraged individualized exploration of these digital tools, the more students decreased their exploration of design response. Rather than considering the programs as tools to represent their ideas, the students became bogged down, attempting to achieve very specific minutiae. For instance, in the first two years, students were introduced almost immediately to Photoshop as a way to represent their analysis of the body and the car. This introduction provided a wide array of rendering, layering, and masking techniques. We then introduced students to Autocad, where they drew plans and sections of their individual room, and we then returned to Photoshop to render those plans and sections. At the end of the quarter students developed perspective renderings, layering photographs of their models over images from the site. We discovered this back and forth between programs, and variation in their use created too many possibilities, and confusion, especially for students who were technologically challenged.

In contrast, this year we changed the sequencing. The site analysis project was analog. This allowed us to first introduce Autocad, and then to build upon Autocad through Photoshop. We also changed where we introduced the programs. We developed an assignment that ran parallel to the studio work, occurring as the students developed their collages and conceptual devices. At the same time, all the students produced drawings of the Aloft hotel room from their stay in Dallas. This provided far more controlled learning objectives, easier
classroom instruction, and resulted in a drawing set that worked perfectly for a simple introduction to rendering plans and sections in Photoshop. Students gained competency without slowing down their design process. Then, once the individual rooms were designed, we encouraged students to experiment with more specific individuated representational techniques.

**Fig. 12** Final model. Ethan Carlisle.

**Material choice, connection, positive / negative relationships, texture, structure, pattern, skin, and color, can all be understood through the filter of your theme.** – Arch 215 Room as device project prompt

**The Students’ Experience**

During the first two years we rarely observed students who were nervous about the individuality of their response. However we did find it was sometimes difficult to translate the car and body analysis to the room, and then if the room became very idiosyncratic it took more effort on the part of the faculty to lead room composition in a meaningful way. In contrast, this past year added design steps smoothed the transition between the analysis and the room design. However, this transition also resulted in students nervously asking how “real” the room should be as they transitioned from the room as device to the room as lodging.

In some cases it was also a challenge to translate the lessons learned from the car analysis to the compositional design of the rooms. The first year we taught this curriculum the compositional strategies resulted in tightly compacted massing often as matt buildings (students worked with seventy five units). In the next year we encouraged students to make larger formal gestures across the site (students worked with forty five units). This past year, when we directed the students to analyze the bayou they were instructed to work at two scales: the scale of spatial experience; and also at either a microscopic or macroscopic scale, looking at how elements organized geometrically. Resultantly, the compositional aggregation more easily derived from this second line of inquiry (thirty units across the site).

**Fig. 13** Final model. Chris Perry.

*To design the motel we will start with the room. What constitutes an optimal sleeping experience? How is one awakened from such an experience? What place does comfort play? How do you create comfort in an unfamiliar environment? Do you emphasize the temporary character of the habitation? What is your relationship to outside? How do you begin to shape the membrane/enclosure between interior and exterior space? What is your attitude about privacy?* – Arch 215 Hotel room prompt

Of course, the real test with regard to this method, is whether this emphasis on individuality resonates with the students as they matriculate through the program. The following excerpts from interviews provide data on the long term impact of this methodology, and how the students evaluate this pedagogy’s relevance within the broader scope of their education.

*In Arch 215 I learned to appreciate clean elegant design that has translated to many of my later designs. The transfer from the study of the mechanics of the car to my motel room design was the most successful part.* – Emily Greene, senior

*All of second year was about promoting the individual way of designing. For me the combined study of site and conceptual development is still important. It might not be as deliberate as the study of the body and the car but individual conceptual development is still important. Retrospectively, I also recognize that structural expression has been in every one of my favorite projects.* – Hunter Bradshaw, senior

*For me 215 was about the study of light, for sure, and the idea of interlocking shapes and patterns. It has been important to me for every studio since. Now I’m working outside of my comfort zone, creating new kinds of spaces, and working with artificial light – but I always relate what I’m doing now to what I learned in 2nd year.* – Lacey Hanemann, junior
Every design that I do I try to go back somehow to that project. It expresses my identity for future buildings. It made it possible to explore different forms of structure. And it was the first project that we pulled a lot of all-nighters – that is part of why it is a memory. – Sulaiman Yousef, senior

It was a good project to learn how to program spaces. That was the first time I had to think about that sort of thing. – Ethan Robison, senior

What I learned from that quarter is still more on a subconscious level. I think I learned most about the iterative process and ways of organizing things in different ways. The tectonics carried through from 1st year spring through Arch 215 – that is where I became really interested in the expression of structural systems. – John Moosa, junior

I feel like Arch 215 allowed me to be more expressive and loose with regard to designing structure. Now I’m learning what is “real” and how to do it “right”, but I look forward to going back to being more expressive, but in a more informed way. – Mac Blades, junior

I don’t really remember the project that I did – my later projects that year were more important. – Rosa Schellinger, senior

From this data it is clear that the studio resonated with students in a myriad of ways and promoted their individual development in later coursework. In addition, our program-wide emphasis on expressiveness of structure and tectonics made a strong impact during this studio. And of course, despite our best efforts, for some students the studio had little or no influence on their education. It seems that by developing assignments that are controlled enough to teach specific learning objectives, while also promoting self-expression, this course is serving as a foundational base not only for advanced studios, but also as a way to initiate students’ the specific interests in design inquiry.

Fig. 14 Final board. Emily Greene.
Why Theory: Enabling Criticality in Beginning Design Students
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Introduction
In line with the conference thematic investigation, this paper examines the importance of asking questions in order to develop critical habits among our foundation students. Criticality requires a reaction against something; thus, this paper looks into the realm of theory, which is generally understood as a supposition or a system of ideas intended to explain something, especially one based on general principles independent of the thing to be explained. How do we navigate this field of ideas? How do we generate careful judgment in which the students give their opinion about the good and bad parts of something, understanding they need reasons to back up those opinions? How do we help them develop a criticality in relationship to their interests and their intuition? We wish to incite our students to be active participants in their education. We want them to acknowledge that reasoned viewpoints have value and those viewpoints can impact the built environment. It is important that we take our students beyond teaching to the test, to an understanding that as citizens of the globe and future leaders they must be able to develop reasoned design responses that reflect geo-political, cultural, and technological changes, communicating those responses through both visual and verbal representation.

“Defined by its questioning, architecture is the expression of a lack, a shortcoming, a non-completion. It always misses something, either reality or a concept.”
- Bernard Tschumi, “Questions of Space,” p.142

Beginning design students often struggle to adapt to the introduction of design fundamentals. Those struggles represent a first exposure to the act of making as a balanced result between critical and intuitive processes. This is both entirely of their own making, but also measured by reasoning and inquiry. Of course, critical thinking is not just exclusive to the discipline of architecture and design; instead, it is an interdisciplinary process defined by rational argumentation and multivalence. Thus, in order to ground this discussion of ethics and values to the field of architectural design, this paper looks at: a) the moment theory gets introduced to design students; b) the pedagogical framework that supports the critical act of questioning; c) the dialogue between that framework and foundation level studio pedagogy. In particular, we examine the pedagogical redevelopment of ARCH 134, which is a first year mandatory course that introduces architectural and design theory to students in the architecture and interior design curricula in the spring quarter of the first year.

Originally structured around limiting concepts rooted into a predominantly history-based pedagogy, the current version of ARCH 134 has shifted its focus to directly relate the process of critical thinking to the current foundation level pedagogy. This pedagogical change maturated from the curricular necessity to vertically realign the theory sequence proposing a return to its title of “theory,” or introduction to it. Students are gradually introduced to ideas and concepts that are always correlated, creating a strong foundational background, which can be used as a framework for intellectual growth. This implies the presence of a pedagogical framework defined by a set of guiding principles whose purpose is mostly explanatory: i.e. why we do what we do. But this is a slippery slope. Rather than accepting these principles, we have refocused our attention to the exploratory nature of architectural theory, creating a course that is accessible and relevant to what happens in the studio and beyond, making theory and its critical framework more participatory.

Course Framework
Structured as a lecture, this course is currently taught as a hybrid module offering an overview of important ideas related to both architecture and design. The students not only learn how to interpret what they read (theory), but they also make design decisions (practice) based on the value they discovered in the
readings, and to discuss and debate their stances on the subject (communicate). Thus, instead of testing students on the materials presented in a traditional way, they learn how to present their understanding through different means (both constructed and verbalized), addressing student performance requirements related to the students’ ability to read, write, speak and listen effectively. By making something that is reflecting upon their understanding of the theory presented, or by having to verbally defend their ideas, the students take on a more personal approach. As a result, theory seems to be more valued.

However, one of the crucial elements of this pedagogical framework has to do with the variety of theoretical models that exist, and which ones students should learn as part of this introductory module. Critique requires a reaction to something; that means exposing students to a variety of approaches, which propose contrasting worldviews on design and architecture. These approaches anticipate established theoretical models, while bridging to foundation level conceptualizations. They can be based on cultural, socio-political, ideological, and formal circumstances; this is endorsed so that the students can understand architecture in more than one way.

Information is delivered through a variety of formats: readings, videos, movie clips, and graphic representation. Primary texts and videos are kept short – to align with beginning design students attention spans – however that brevity does not mean students can be rudimentary in their response: they must ferret out meaning, construct systems of relationships between ideas, and examine their own response to these ideas and their impact on the world around them. We will teach them to first actively listen to the author without projecting their own agenda; and then to position themselves back to, to say something of their own, something meaningful and thought-out - through verbal, written, or designed response. In a sort of algorithmic way, learning is outlined by axiomatic pedagogical phases, which include processes such as parsing, filtering, mining, representing and refining. While parsing is promoted by the faculty leading the topical lecture/lectures, filtering requires more of a critical understanding of the subject, so that it can be represented by the students through the media chosen by the instructor.

“You cannot have a voice without the risk of criticism.”

-Charlie Day, excerpt from his commencement speech at Merrimack College

In order to support this framework, critical reading is introduced as a type of reading which moves beyond just finding information. It asks the student to examine their own response to these ideas and their impact on the world around them. It requires that the students question the work presented to them intensely and rationally. As some of the texts are not necessarily easy, we also ask the students to list in their notebooks words they do not understand so that they can research and discover their meaning and link it back to the reading in question.

*If you have no response, you are reading lazily and need to instead, read critically: to formulate a response. Such response involves analysis, synthesis, and creativity.*

-De Paola, Syllabus

How do we involve students just entering the discipline? What questions anticipate the major strains of theoretical teaching? What questions are on the students minds? How do we take broader issues and illustrate how they can be critically directed towards the discipline? To answer these questions we have outlined nine areas of inquiry – which foresee topics covered in advanced theory coursework that follows, but which are also relevant to the immediate questions of a foundation design student:

**What is Architecture?**
**How is architecture different from Building?**
**Which stance do you take: Intuition vs Logic (or Math vs Art)**
**Which stance do you take on craft: Technology vs Handmade**
**Which stance do you take: History vs Future**
**Diversity vs Homogeneity**
**Narrative vs Data**
**Thin vs. Thick (Surface vs. Solid / Wrapping vs. Carving)**
**How do you consider Scale: Monumental vs Solid**
**What is Context: Nature vs Human**

*Are we gonna make things? Can it be like debate club?*

-Questions from current 1st year students

Assignments include in-class readings directly followed by written response; in class debates based upon readings and research; and longer assignments that require representation of ideas graphically or textually. The following two examples show how students will represent what they have learned while using compositional skills acquired in studio.
Why Theory?

Scale: Monumental vs Human

To begin the discussion of monumental versus human scale we ask: How big is space? How do we perceive space that is scaled to a person? Why is product design important? Students begin their consideration of scale with a collage of images of biggest place they have ever been, the smallest thing that means something to them, and a space that they think is perfectly sized. Scale is related by representing the size of their pace to an image of the smallest thing in their hand, to the biggest space, and a section of the perfectly sized space with the student as scale figure.

History vs Future

History or future? Do you think architecture should look back to history or forwards to the future? When has architecture looked back? When does it look forward? Why? Should we only build for the future? Should we preserve the past? Can we replicate the past? To begin, each student is assigned a year. They must represent an architecturally significant building, a technological advance, and a cultural development. A second assignment requires students to construct a large wall sized timeline of architecture – depicting significant buildings, relating to technological, geopolitical and cultural influences, and representing the myriad of ways that the ‘future’ and the ‘past’ have been represented by architects.

Additional assignments will ask students to reflect upon coursework they have already completed in their studio and representation classes. These previous assignments will be used as examples to illustrate the dichotomies presented in the theoretical framework. For example the study of thin vs thick will ask students to consider the differences between a surface based exercise from fall quarter with a cast project from winter quarter. This kind of direct association will allow students to revisit their work from different perspectives, and to teach them to evaluate their work through a more critical lens.

Conclusion

Using a mix of projects, writings, and verbal responses, this course seeks to actively engage students in thinking about why they are designing. The course will use the principles that the students have learned in studio to develop responses to issues presented in the class. At the same time, lectures will relate assignments previously completed in studio directly to the theoretical framework of the course.

Pedagogically aligned with a first year design studios, the revised version of “Introduction to Architectural Theory” will indeed presents the significance of critical thinking as a way to formulate good design questions and to generate appropriate answers. Investigating and exposing theory to beginning design students aids in understanding the complexity of our discipline, and enhances the students’ process of observation and analysis. Without this pedagogical integration, theory remains relegated to its marginal role of “curricular filler” in the minds of our young designers.
Gendered Architectural Education and how to hack it:  
A student guide

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Introduction

This paper seeks to provide students with a rationale for using feminism as a design tool. At present, few architecture students are introduced to feminist theory within their undergraduate programmes. When it does get mentioned, it’s usually within history and theory lectures, as opposed to being taught within design studio. Moreover, feminism is more commonly taught as a framework for interpreting society and not as a means to shape it: as a diagnostic rather than design tool. This paper therefore contends that Feminism is a meaningful mechanism to respond all forms of inequality, and as such can and should be used by male, female and gender non-binary students to assist them with their design work, right from their first year of study. It then identifies student-centred, actionable directives for immediate studio application: offering design studio-ready strategies for ‘hacking’ the problem of gender inequality and wider forms of discrimination and disadvantage.

Practice and prejudice

Across the canon of feminist literature, but more acutely within the current ‘fourth wave’ period, feminism is increasingly understood to offer a meaningful mechanism to respond to the inequalities of capitalism. However, we are met all too often with the stubborn misconception that feminism is only for and about women. Furthermore, as Inter-sectional Theory highlights, capitalisms success remains contingent on a spectrum of societal inequalities. Only when the working endeavours of some sections of society are under-valued, can profits be made. What this means is that all inequalities are tacitly market driven: whether it’s a matter of ethnicity, gender/non-gender, age or sexuality. For this reason the conversation has to be collectively critical: women cannot dictate a solution to men, just as men cannot dictate a solution to women. And these gender categories need to be understood as open for negotiation anyway. One could argue that it is a failure of our profession to resolve its own internal inequalities. At stake is more than just the lack of female representation in the profession. Sexism and gendered practices in architecture condemn all of us to a set of expectations around stereotypical behaviour. Male architects suffer from the same ingrained mechanisms of gender stereotyping that prejudice women, obliging us to place professional commitments above those to our family and children.

And for those whose gender and sexuality do not fit comfortably within the binary conception of male or female,
gay or straight, the progress made in improving workplace conditions in the architect’s studio has yet to be matched in other aspects of the profession, not least the construction site. It is therefore critical to dispute not only the traditional binary definition of gender, but also a mono-dimensional conception of gender along a spectrum, one that ultimately categorizes everyone between the same binary. We need to think beyond women’s experiences of architectural education, practice and culture; gender is instead the key to a broader and more inclusive understanding of how our identity affects our experience of life and work.

**Feminism for designing (with)out inequality**

“We believe that, precisely because women are brought up differently in our society we have different experiences and needs in relation to the built environment which are rarely expressed.” Matrix Feminist Design Collective, 1984

In order to recast the role of the architect in society – and to design out societies inequalities - it is necessary to take on the political and economic challenges entwined within the gender debate, in order to practice ethically and inclusively. It is critical to recognise that we operate within relative frameworks. As we age, climb the ladder of progression, grow as an architect – we change too, more than we might like to think. What we lack in empathy for others is to some extent a reflection of a lack of self-care: we display a surprising willingness to accept poor pay and working conditions, particularly for a group of professionals who insist that architecture is focussed upon improving quality of life. Little wonder then that it proves so difficult to teach architecture students about gendered spaces. If we are to change our starchyt culture, then we must surely change how we train students. This also requires us to scrutinise the ‘master-pupil’ relationship, and how competition and long working hours can reaffirm stereotypical ‘hegemonic masculinity’ arguing for new and different labour practices and hours of work that suit both genders; that resist traditionalism, discrimination and academic capitalism. We need to more than hope for a profession in which tacit values and judgments made on stereotypical assumptions will become a thing of the past, we need to design this future now. Starting in school. Tutors need to set briefs that present inequalities as a design problem: not a sociological one. Since architects are spatial thinkers, solving problems in three dimensions is far better than in two. Students of architecture should therefore be aware of their trained ability to tackle societal inequalities, in much the same way that they would approach solving a construction detail: each element needs to be identified, and its interface with other elements needs to work reciprocally. This is where feminism – and its ability to provide both a diagnostic as well as a design solution – can prove to be particularly useful.

**Masters, mistresses and historical omissions**

“Whoever has the power takes over the noun – and the norm – whilst the less powerful get the adjective.”

Gloria Steinem

“History is not a simple meritocracy: it is a narrative of the past written and revised — or not written at all — by people with agendas.”

Despina Stratigakos

Women architects minority presence within the architecture media is mirrored by their absence from architectural history books too. Whilst the prejudices facing women architects are becoming more widely discussed, less is known about the pressures facing women architecture academics: who remain in a minority position and fail to mirror the career progression
afforded their male counterparts. Precisely because education both reflects and directs professional practice, that women remain poorly represented in academic leadership roles is concerning. To serve society equally requires an equal profession, and the same rule in applies to education. There is a world of difference between learning about inequality and experiencing it, after all. The lack of representation is further exacerbated by a disciplinary inclination towards celebrating the contribution of its masters, and not its mistresses. As one colleague pointed out, ‘architecture is the study of three men: Mies, Wright and Corb’. In contrast, Scott-Brown, Drew and Gray might as well be paint-codes, as far a curricular emphasis is concerned. There is also a false assumption that women in academia are undervalued and undermined in other ways. In a study of U.S. based website, www.ratemyprofessors.com, the language students use to rate male and female professors generally disadvantaged the latter. Words such as “bossy” and “nurturing” are more likely to turn up in reviews of women, as well as ‘strict’ and ‘demanding’, whereas the words, ‘smart’, ‘intellect’ and ‘genius’ were more commonly used to describe male professors. That students are consciously or otherwise active in affirming gender stereotypes that perpetuate a lack of female progression in academia, illustrates the need for an institutional and not just an individual response.

Fig 3. Genius ratings by gender. Source: Inside Higher Ed

Nowhere in the USA’s NAAB’s Procedures For Accreditation and nor the UK’s RIBA Criteria validation is there any explicit mention of designing against discrimination, for women, or with minority groups in mind. However given the NAAB’s ‘1.1.4 Defining Perspectives’ section states that students should not only design for, ‘improved futures’, and ‘civilised, liveable places’ but for students to become, ‘active engaged citizens, and serve a, ‘diverse groups and stakeholders’ and the RIBA’s criteria emphasises the need for students to fulfil their ‘obligations to stakeholders’, develop an ‘understanding of the the needs and aspirations of building users’ in addressing the ‘social’ aspects of design, both criteria provide enough of a mandate for designing with women (and others) in mind. Evidently, architectural academia not only professionally disadvantages women, but also pedagogically fails it students, by not delivering a sufficiently diverse curriculum either.

Feminism as a design tool

As the introduction tendered, Feminism’s ability to act as a meaningful mechanism to respond all forms of inequality makes suitable for use as a design tool. The extent of the educational transformation needed to address gender biases is clearly beyond the capability of the profession, the institution and professorial best intentions alone. Instead, students need to become active in shaping pedagogic agendas, creating templates that will persist and sustain them with professional practice life. To this aim, five, student-centred, actionable directives intended to assist students in ‘hacking’ the problem of gender inequality are listed below.

1. Hack the problem

Originating from the software industry, a ‘hack’ involves several days intensive team work, where a problem is taken apart as a means to find the solution. Often competitive, sweaty and messy, hacks are used to work out solutions to any kind of product, service or space challenge. The ‘hacking’ process is not unlike feminist theory, which has served to review and deconstruct the social world as a means to reveal that many of the institutions and paradigms taken to be neutral but are in fact gendered. Feminism can therefore be used to hack the problem of gender inequality – and all forms of discrimination in general – through its deconstructing capabilities. Adopting this approach in response to all the pedagogic content and
processes within architecture school, will be the first step in identifying any hidden prejudices that will need to be addressed.

2. Design selfie(s)

The rising trend in selfism reveals a concerted enthusiasm for forgrounding ourselves in our engagement with the world. Rather than simply dismiss this trend as narcissism, the design selfie could provide a useful starting point for encouraging students to question their own values and world views. Indeed, notions of the self have always been a core preoccupation within feminist philosophy, from personal identity to the body as both object and interior. Within Western culture, men are considered the norm and women the other. In response to this, feminist has sought to challenge the dominant modern, Western views of the self, empower women to define their own identity and characteristics (beyond notions of lady-like ‘behaviour’ and feminine ‘qualities’) and reminded us all of our intersectional identities: where our ethnicity and our affluence can form the basis of multiple forms of oppression. Given approximately 50% of architecture undergraduates are female, setting ‘design selfie’ briefs could well be the way forward in encouraging all students to design with their differences in mind.

3. Historicize and theorise

As previously outlined, women’s minority presence within architectural history books creates a false impression about the extent of their contribution to the profession. Where women have been excluded or written out of history, feminism has responded by engaging in the essential task of recovering and rediscovering women[xxi]: and this remains a work in progress. With this in mind, students can and should demand reading lists, lectures and design briefs that reflect the diversity of the student body: including learning about non-Western forms of architectural development. Added to this, is the need for students to write about women architects and architecture for women, to historicize and theorise where there are absences, as a means to make their own contribution to the knowledge core of our field. If tutors fail to supply essay questions or assignment briefs that reflect the professions aspirational diversity, students should at least be afforded the opportunity to set this agenda for themselves. And even beyond essays and design work, students should generate content that reflects their differences and diversity. As Despina Stratigakos’ study into wikipedia’s gender biases highlighted, on 25% of wikipedia’s editors are women and even these women routinely face more editorial challenges from male editors on their content than male editors from women. Since more of us google than read a book, a multichannel approach is needed to raise the profile of women and other forgotten groups in an age where search engines are entirely influencing our engagement with the world.xxv

4. Design with others, and with others in mind

Rather than design to meet the needs of modolor man, students need to be pushed to give identities to the inhabitants of their schemes. Too many student renderings are populated by shutter stock models seemingly on extended lunch breaks. What’s missing are the office skyscrapers featuring creches, the housing featuring safe spaces for the one in four women likely to suffer domestic violence, or the ‘mixed use developments’ that provide sheltered accommodation and learning facilities for refugee children. In much the same way 1980’s group, Matrix Feminist Design Collective sought to design the sorts of spaces that had been ignored by a male-led profession, it also developed tools which could involve women in the design process itself. Today’s students should not only concern themselves with designing spaces for groups largely ignored by mainstream architecture, but should also focus upon designing the processes for engagement too: and both should be valued by schools in the way portfolio work is assessed.

5. Design studio as proto-practice

Within one in five students reporting mental health problems as a consequence of the long hours culture, schools of architecture are complicit with practice in creating the blueprint for unhealthy working behaviours. Added to this is the startling statistics that 71% of US based women architects feel their architectural practice makes it impossible for them to become mothers** and 87% of UK based women architects feel children disadvantage their professional development and promotion opportunitiesxvi. Blend in homophobia[xxvii] and racism[xxviii] (noting the lack of data on other forms of discrimination) and the practice pay and conditions begin to sound somewhat toxic. To call it out is to be seen as ‘less committed’ that those that don’t: a view that troublingly echoes the observations of 1970’s feminist Silvia Federici, who noted that women who complained about housework were seen as ‘nagging bitches, not workers in struggle’.xix Subsequently, since the design studio teaching environment is supposedly prototypical of practice life, students can become active in using it to test alternative models of architectural practice. This is about far more than shared milk, beanies and coffee machines. Indeed, what’s to stop students creating creche facilities, wellness spaces (dedicated to de-stressing, rest and meditation), places to cook and eat together
and even offer free tampons and contraceptives? Architecture school should therefore be geared towards students designing the kind of profession they want to lead upon graduation, not one that serve to enslave them to discriminatory and dehumanising conditions.

Concluding remarks

Architecture students educational experiences are informed by pedagogic, disciplinary and socio-structural influences – and not by a simple gender push and pull. Similarly, feminism’s ability perform prejudice diagnostics allows us to discern the range of prejudices affecting our profession – and not just the problems faced by women alone. While professors and practitioners continue to try to address the imbalances, students can and should play a more active role in challenging the situation too. Indeed, the increasing commodification of education will give students more power to influence academe. The question then becomes, which way will it be influenced? As the rising cost of education threatens the diversity of the student body, it may well transpire that minority students are simply out-voted – in precisely the environment designed to help them find their voice. For this reason, it will require both institutional and individual intentions and actions: to make the political, personal, and to make the personal, pedagogical. We have to be conspicuous in committing ourselves to widening participation in our discipline, and to becoming more representative of the society we seek to serve. This means we should renew our vows to social justice, beginning with how we treat each other. By raising awareness of privilege and not just inequality and acting to mitigate these, we create the environment in which we can change the nature of the architecture profession that only a societally representative cohort can offer. As long as architects claim an ability to transform society at the scale of the master-plan (or mistress-plan, for that matter), we owe it to ourselves – as well as everyone else - to meet our own expectations.

Citations and references

1 In this paper the much-contested term ‘fourth wave feminism’ adopts Diana Diamond definition of a, ‘movement that “combines politics, psychology, and spirituality in an overarching vision of change”’. SEE Diamond, Diana (2009). The fourth wave of feminism: Psychoanalytic perspectives. Studies in Gender and Sexuality, 10(4), 213-223.

2 Intersectionality theory is a feminist sociological theory that indentified how interconnected social categorizations such as class, race and gender become overlapping and interdependent systems of discrimination or disadvantage. See Cho, S., Crenshaw, K. W., & McGall, L.

Gendered Architectural Education and how to hack it


The ASCA statistics (2015) identify 1:4 women/men educator ratios in the USA, 1:5 at Dean level. See http://www.ascarch.org/resources/data-resources/women. In contrast, UK stats are closer to 1:3 women/men (see Gloster, (2015) RIBA Education Statistics, 2013-14, statistics exist identifying whether the women are likely to be in leadership roles or not.


RIBA Validation Criteria at part 1 and part 2, 2010


IBID


Metacognitive Transdisciplinary Practices

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Introduction

On the premise that language and architecture are expanding systems in structural networks, the first year courses described in this paper provide a setting for a student to acquire interpretive practices and language making operations that will enable them to learn how to develop and present their project as interlocutors in those systems and networks. Instead of seeing the first year architecture studio project as a modernist project that is based on compositional exercises that borrow from fine art practices, the first year project in the curriculum that is being presented here is developed iteratively as research exercises in rule based formal systems that are responsive to pressures of economies in language and architecture systems. The question is: how do cultural dynamics at a time when the construction of gender and race are moving into new formations enter into the studio project—especially in a discipline that has kept those formations at bay. The AWLM initiative incorporates cultural dynamics in a first year project by setting up mapping operations between literature, writing and architecture through vertically linked courses that generate metacognitive practices in transdisciplinary studies.

“Architecture Writing” and “Language Making”—AWLM—is a pedagogical research initiative which develops new approaches to synthetic learning at the intersection of linguistics, architecture and cognitive science. AWLM was conceived as “trans” or “across” instead of “inter” or “between” disciplines in recognition of the autonomy of the disciplines of architecture and language and the resultant epistemological spaces that can provide for new knowledge and practice across the disciplines. This active working across the disciplines has resulted in cross linked and integrated humanities and media studies courses, so that the coding systems of languages can be considered in verbal and visual media to encourage new forms of spatial intelligences through study, movement and performance. Bringing the work of the humanities and media studies into the studio for a transdisciplinary practice in metacognition, the new practice and discipline of Humanities and Media Studies (HMS) incorporates the traditional disciplines of writing and literature in a hybrid discipline of emergent epistemologies. As it is evolving, HMS combine a range of disciplines and creative-critical practices to foreground the expanding roles of multiple humans in discerning the ways that knowledge and power are intertwined in verbal and visual media so as to highlight the production of subjectivity, codification of signs and the global transformation of the environment for the beginning student.

Language Diagram

The exchange between the transdisciplinary writing course and studio essentially filters expression from literature and writing in a mechanism known as a language diagram. The language diagram mixes expression from one discipline that is based on content in another discipline and loops back to deliver expression in a third space that is across both disciplines. On the understanding that a diagram is not a thing in itself but “shows relationships between elements that can map possible futures,” the language diagram leads to the production of a concept that can be examined critically under a variety of theoretical lenses. The first year curriculum anticipates and addresses the conceptual requirements of the fifth year guided research project. In the first year, students learn to locate a concept from within their project. In the fifth year, they locate a project for a concept. The three first year courses—literature, writing and studio—are calibrated, linked and responsive to each other in a way that is doubly operative, by which it is meant that the vertical integration of the courses creates a feedback loop across the disciplines that provides for mapping operations to generate new types of formal and informal knowledge—explicit and descriptive, tacit and anticipatory. The vertical integration of the courses challenges the horizontal sequencing of a traditional English course that is shoe-horned in between the studio and other technical courses to provide a standard introduction to English literature and composition. It is this vertical integration of the courses that are traditionally sequenced horizontally that increases the dynamism of studying literature and practicing writing in an architecture curriculum.

The foundation of the doubly operative courses can be found in Aristotle’s distinction between poeisis and techne, which is to
say, between making language and making form, as it can be hybridized as technepoeisis, from which the terms language making and architecture writing are derived. Inspired by the Kantian proposition that the purpose of all knowledge is synthesis, Charles Peirce in the early twentieth century introduced a three-part linguistic process by which knowledge could be synthesized as first, second and third, referring to the cognitive processes that can lead to metacognition—thinking about thinking. Peircian thirdness was appropriated by Deleuze and Guattari as a diagrammatic process by which thought could be mapped across disciplines as percept, affect and concept. The diagrammatic practice entered into architecture in the pedagogy of Stanley Allen, who proposed that the diagram would create a supple architecture that would allow for new information to come into architecture from the outside at a time when new forms of digitization is requiring advanced synthetic practices across media. In response to the thirdness of Peirce, Deleuze and Guattari, Francisco Varela introduces, “en-action,” the “sensorimotor interactions with an environment in which both the individual and environment are modified” which defines the transdisciplinary courses under discussion here.

The introduction of the language diagram in a first year studio has distinguished the approach to teaching in the curriculum with practices in transposition of languages between media that have resulted in a signifying semiotics that can become a material language which can make a name space in the project. It is the argument of this paper that the architecture project itself is a diagrammatic proposition that is responsive to the material of the studio for a mapping of futures to come. Theory can emerge from within the project instead of being imposed on it from the outside. The Millennium has brought a refocused attention on the discipline of architecture. Theory has been reinvented to address form and data, and a historiography of the profession is leading to new types of activism that concentrate in the research studio. Architecture Writing: Language/Making is a response to the refocused attention on the discipline as practice along those theoretical lines. Language making is an essential practice of research and experimentation in the studio; perhaps the center of the studio experience is for the student to engage in a metacognitive relationship with the process of making, which is communicated in drawings and models as well as poetical and rhetorical formations and constructions in written and spoken form. Conscious of the possibility that architecture can be generative of new types of sensitivity to the body and inner subjectivity in relationship to space, and new forms of knowledge and understanding of the world, the program seeks to locate a critical position from within the production of architecture as it responds to critical theory, criticism, philosophy, literature and film. The practice of “architecture writing” and “language/making” looks to literature, film, theory, criticism and philosophy as material with which to make and name space in the emerging technologies of the biopolitical body.

By centering the curriculum around the studio courses are taught as co-requisites that are integrated vertically instead of a series of prerequisites that build on each other horizontally in a standard curriculum. The vertical orientation of the courses is what makes transdisciplinary knowledge possible because it generates new knowledge across disciplines that are usually separate, and expands on that knowledge through mapping operations. The vertical integration of courses allows for spontaneous moments of new knowledge to take place in the seminar and studio as a result of interactions between faculty members and students. Instead of compromising instruction in literature and writing, the intensity of the level of instruction in the Humanities and Media Studies courses is deliberately set up to match the intensity of instruction in the first year studio and related architecture courses. You can only get the attention of a student once, and by beginning the courses with assignments and ambitions that challenge the expectations of students who have already studied English for twelve years, the courses set out to excite them intellectually to want to read, write and discuss the provocations that they are engaging in the seminars and writing workshops and to begin to learn how to produce new knowledge. The courses appropriate the excess energy of the studio by aligning the curriculum in the exchange between content and expression and the resultant a-signifying semiotics and diagrammatic practices. “The independence of the two kinds of forms, forms of expression and forms of content, is not contradicted but confirmed by the fact that the expression or expressed are inserted into or intervene in contents, not to represent them but to anticipate them or move them back, slow them down or speed them up.”

Mapping/Interpretation

A range of material on subjectivity, space, the codification of signs and earth-environment is organized thematically in HMS courses, and through in-class reading and writing exercises the students are provided with critical tools to carve a self directed path through a genealogy of texts to produce a series of essays and research papers. This exercise in guided study and practice replicates the pedagogy of the studio in the seminar and introduces skills of independent thinking and research for a first year student. Students learn that language and architecture exist within systems that are overlapping as they learn to conduct research in an archive from which they will curate a
position and hybridize visual and verbal language systems in both the seminar and studio—on a level that is appropriate for a first year student. While the students are introduced to a wide range of dense philosophical and theoretical texts that they will master in advanced theory courses, they do learn how to locate what’s interesting to them in a theoretical or philosophical text as a result of taking this course, and they learn to understand how to read critically and how to develop associative and analogical skills in mapping that bring new information from the outside to the inside of an architecture project, which will be useful in the development of upper level studio projects and final degree project as well as their continuing and expanding intellectual life as citizen-poets inside and outside of school.

The AWLM was conceived as broadly philosophical and narrowly disciplinary centered to locate the connections across the disciplines on terms that are understandable to academics from different backgrounds, and to ground writing in a genealogy of philosophical ideals and concepts. This approach to constructing a writing course that weaves theory with praxis provides a common platform for faculty working across disciplines who can appreciate, in a general way, the distinction between ontology as the essence of language and epistemology as the formation of knowledge in the curriculum of the first and second semester first year sequence. The first year projects develop visual systems from rule based formalism that are curated from an archive of research in visual systems for a final hybrid project. In the first semester project on ontology of architecture, students generate abstract visual systems to develop a recognizable syntax for a folly on a hypothetical site that is responsive to the grammar of the structure. In the second semester project on epistemology of architecture, students generate contextual abstract systems to develop a dwelling for two occupants on an urban infill site that is responsive to its context and the occupants. Each of the writing courses begin with exercises in embodied cognition so that the students can learn that syntax and context are produced in their own bodies and in the texts they will be studying and the designs that they will be developing to incorporate the movements of bodies as a practice in metacognition in transdisciplinary studies.

Through reading and writing and through visual mapping in walking practices students learn to adopt relational aesthetics and peripatetics in the development of their projects. They learn how to make scalar adjustments in their performances as they read and study texts that perform the same exercises so as to map from real to text and text to text to create new ways of thinking about ideas that they have not formulated coherently but are actively interested in due to their high level of spatial and kinetic intelligence and engagement with an expanding cultural dynamics that is available on accelerating platforms. Based on constructivist ideas in pedagogy, the assumption is that first year students are bringing knowledge and practices with them to school now that students were not before and that they are capable of critical thinking from the get-go instead of building up to critical thinking at the completion of an undergraduate degree. It’s admittedly an anti-foundational acceleration of research initiatives formerly reserved for capstone projects or graduate school programs. Getting students to ask the why questions that this conferences is asking earlier in their educations. Empowering the students to become scholars and practitioners who can see their projects and the critical apparatuses that support them as guided research that they are invested in as active participants. It’s one thing to understand mapping as it was introduced by the historical avant-garde and post structuralism as a cultural project, another to understand it as a mapping of their own bodies in relationship to texts, including their architecture. Students learn how to see theory as a mapping operation that can take place across disciplines for a transdisciplinary study and practice. It is this mapping at the intersection of horizontal and vertical in what Felix Guattari has theorized as the “transversal” where new types of transdisciplinary knowledge takes place for the student and the faculty as a result of metacognition—the practice of seeing thinking as making meaning through embodied cognition in transformational form.

Event/Concept

The three-part sequencing of metacognition that is expressed in the linguistic theories of Peirce, Deleuze and Guattari can be located in a parallel framework in the three-part sequencing of knowledge that takes place between the three different classes: the design studio, the transdisciplinary writing course and the literary and critical studies course. The lit/crit course brings affect into the conversation. The transdisciplinary writing class acts as an acupuncture point that opens the disciplines of literature and writing and architecture studio to bring content from one discipline and loop it into another discipline and transform it into expression in a third discipline. The third discipline is actually the final presentation, which brings all of the three classes together in a single event where the ideal student is able to confidently present all of the many strands of the systems that lead to a project that is communicated in logics of representation and processes of mediation that have resulted in the fiction of architecture which is made real by the presentation. The AWLM responds to a desire that this conferences addresses to reform the studio culture so as to provide agency for the student. In place of the standard architecture review with a large panel of experts interrogating the student from a master-pupil vantage point is a student centered review in which they can confidently express themselves as they learn how to establish the terms by which they want their project to be assessed and to develop a critical set of guidelines to evaluate, understand and present their work within the ways in which thought and feeling are mediated by social, political and symbolic structures. The voice of the student as the interpreter of their own architecture is vital.
at a time when students come from increasingly diverse background and architecture incorporates new economies brought about by the introduction of interrelationship of design variables through computational tools and techniques of the digital studio. A project is rarely as real as it is in the presentation. The student today will have to reinvent architecture in new ways that require them to become an independent operator on shared platforms that they will have to intervene in rapidly moving systems that are as complex as they are varied. The days of the large firm and the magazine projects are coming to a close with the introduction of smaller and faster digital devices and the breakdown of the economies of technology and property that influence architecture with an increased emphasis on collective performance and social justice.

Based on Hegelian ideas in formalism, early in the experiment in education the AWLM attempted to incorporate poetic forms that are inherited from the Renaissance. It was thought that since they are rule based formalisms, they are adaptable to many settings where formalism is practiced. However, it was found that the expression of the sonnet or madrigal or set exta when it incorporates content from the architecture studio, however sonorous to listen to when recited, was a distraction from the project itself by creating a layer of language over the project instead of moving into the project in the mapping exercise in radical empiricism that we have adopted now. By locating the language from within the operation of the project in a-synchronizing semiotics that produce word compounds and neologisms that locate the tacit and the anticipatory in the descriptive and explicit, the student learns to appreciate the ways in which language can be made which is supple and performative and generative as well as discursive; The exchange between poetics and rhetoric where the language makes up and the language posts a proposition. As the student comes to appreciate the distinction between interpretation as a static looking backward to the history of the text and mapping as an active looking forward to the future of the text as a new form of knowledge across disciplines and media, they are able to develop the type of supple transformative knowledge that mapping practices in diagrammatic operations can bring to the humanities: “…an organization of radiating circles expanding by circular irradiation in all directions, and in which the individual jumps from one point to another, one circle to another, approaches the center then moves away, operates prospectively and retrospectively; and by a transformation of the atmosphere, as a function of variable traits or secondary centers clustered around a principal nucleus.”

The point that I want to make here about the mapping operation that is critical to the paper is that the mapping of texts as a performative experience allows the tissues of texts to generate new forms of becoming to create a distinct territory for embodied performativity and futurity. Indeed, the mapping practices that were introduced by the historical avant-garde have enlarged the scope of literary analysis in the post-structuralism exhibition of the late twentieth century. The shift in critical practices from the textual analysis of literature to the cultural study of literary, artistic and ideological forms of mapping that can lead to the diagram that can propose a concept for a new future to-come. Bruno Bosteels has pointed out in important writing on the topic of mapping in the humanities that the radical shift at the end of the last century in critical practices in the humanities brought about by the introduction of new methods of knowledge production can be understood by a reconsideration of the “event.” This is a movement from the event of temporality to the “locus” of the event. From the event as a passing phenomenon placed in time to the event as a set or configuration of all points that radiate out from the event to inform the systems and networks that are circulating in, through and around the event. In this way, the event becomes not a beginning or an ending point, but a constellation of points. Mapping which leads inexorably to diagrams ultimately provides the critical practices in language formation that enable students to develop a concept for their architectural project to reside within for the event to come. The relationship between the event and the concept becomes clearer to the students as they learn to diagram language. “The concept is the contour, the configuration, the constellation of the event to come,” Deleuze and Guattari write, “The concept is not object but territory.”

This introduction of critical practices allows literary analysis to reorder combinations of texts such as the ones discussed here and perform on, in and through the text as if it were a territory. Deleuze and Guattari have identified this shift in pedagogy as the passage from the archive “the forms and strata of discursive knowledge which variously define both what is visible and what is expressible in a specific domain and at a precise moment in history,” to the “map” or “diagram.” With the introduction of this new mapping and diagrammatic practice, literary analysis encourages the mapping of texts so as to engender a new territory or topological space for the body to engage in. This, in turn, activates the reading and studying of literature in new ways that expand agency for the student who is engaged in acquiring a voice for the abstract complexity of the design of architecture. Language becomes a material with which to make and name space. The concept emerges through diagrams of literary and architectural space. The study of literature becomes a dynamic process through the mapping of texts that can lead to diagrams. The body in movement is engaged with the reading, writing and performing of texts in the classroom. The process of mapping can then in turn create new diagrams for an architectural project to reside within by mapping structures between texts.
Abstract/Concrete

The first year studio and related writing and literature classes described in this paper take up the challenge from the practices of post structuralism, the historical avant-garde, concrete and experimental poetry, conceptual and performance art to introduce first semester students to a practice in generating visual systems that operate on a high level of abstraction while they learn practices in abstractions that denaturalize the natural. Abstraction allows for variety and complexity for the first year student who comes from diverse backgrounds and with diverse interests and abilities. The writing and literature classes are set up in such a way that the practices in knowledge production are foregrounded at the beginning of each semester at a time when the architecture student is still available for intense instruction outside of the studio, which tends to builds up incrementally to a pitch of production at the midterm and final. On their first day in the first semester students are plunged into the depths of literary abstraction when they are given a copy of Tender Buttons by Gertrude Stein to read aloud in unison as they receive the directions to spontaneously perform the unlikely scrambling of syntax that the experimental poem provides for the reader as they map the sounds of the poem on their own bodies. By reading the poem aloud in unison and writing down concrete descriptions of the way the poem is experienced in their body they develop a bond with the class that is sharing improbable sounds that would seem strange if read silent but become a performance when read in unison. The reading together creates the circle of knowledge production that enaction can provide. “As a result, reading is never exclusively linear, even in linear systems, and involves the mapping of visual perception with a system of predictions (involving lexical selections, grammatical order, etc.) acquired through experience and training.”

Syntax/Grammar

Tender Buttons—a poem that is often challenging for graduate students in English—becomes a centerpiece of the first semester transdisciplinary writing and lit/crit course for first year architecture students by opening the passageways in the poem for performance and appropriation that is embodied and diagrammatic. As the play of language, beginning with the title, is provocative, the structure of the poem itself as diagram becomes a skeleton for the abstract visual systems that the students are generating in the design studio, which results in their first language diagrams. Stein’s diagrammatic language and radical empiricism works effectively with a theory of a-signifying semiotics and diagrams and map together with the abstractions of Hans Richter’s 1928 film Ghosts Before Breakfast and Kurt Schwitter’s Ursonata, which abstract visuality and sound in the same way that Stein abstracts words—by scrambling syntax to create new patterns and repetitions that introduce radical ideas about film and sound as well as the contested gendered body in the case of Stein and Richter. Differences in responses are encouraged. The students are asked to map the sounds from the poem onto their bodies and document their performances at a time when they are learning to locate visual systems that they are generating with their own bodies in the studio so that they can see that architecture like music is an allographic system that produces knowledge in notations that are diagrammatic. “The difference is spreading,” Stein writes in Tender Buttons.

As they combine and turn points into lines that can become volumes they learn to add new language to describe and interpret the operations that they are performing in the studio. Because the lines are formed in layers that suggest time and movement a list of action verbs has proven beneficial to the articulation of the visual systems. The language diagram creates a place for the proposition to reside within—an aesthetic act that is also corporeal in the sense that bending and folding are corporeal—the body bends and folds in the arms and hands. Verbs become word compounds and neologisms that highlight the distinctive nature of each project so the student begins to inhabit the realm of conceptual knowledge, such as bendfold or twistrotate. Sharing language formation in the respective classes excites the value of collective performance. “Syntax is an algorithm collectively formed through personal experience in the course of individual experience and collective experience of language forming, leaning, using and teaching. This algorithm is an ordered sequence of actions: grammatical relations are to be reconstructed in real time in the process of creating sentences.”

With the vocabulary that the students deploy to design their projects, they begin to generate their own language diagrams that expand the language to locate associations between clusters of words that can live in their own bodies. The diagrams name the rule or algorithm that the drawing or model is inspired by, lists or inventories the elements and components that result from the application of the rule in the medium. They also provide a description of the outcome and as a result they propose a possible future for the medium as a generator of a design through discovery, interpretation and speculation. The individual sentence becomes the final form of the language making diagrams because the sentence is a complete formal structure in language. In The Origin of the Work of Art, Martin
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Heidegger writes of the sentence that it is the origin of the thing and then he goes onto suggest that perhaps this isn’t the case because the sentence structure does not provide the standard for the pattern of thing-structure, nor is the latter simply mirrored in the former. Both sentence and thing-structure derive, in their typical form and their possible mutual relationship, from a common and more original source. Which is to say that they are both becoming that which they can become in a process of becoming the thingness of the thing, the thing as the bearer of its characteristic traits, despite its currency—“an ever special poetizing within the clearing of thing as the bearer of its characteristic traits, despite its becoming in a process of becoming the thingness of the thing, the thing as the bearer of its characteristic traits, despite its currency—“an ever special poetizing within the clearing of

Context/Montage

In addition to the performative practice of philosophy, the formal approach to teaching philosophy is to present a genealogy of influences in embodied cognition that begins with the admittedly uncritical phenomenology of Maurice Merleau Ponty as an introduction to the phenomenological project in studies in cognitive science and expands to a more critical approach to phenomenology in power relationships as texts are introduced by Michel Foucault and Judith Butler. “To be a body, is to be tied to a certain world…our body is not primarily in space; it is of it” “Not only did bodies indicate a world beyond themselves, but this movement beyond their own boundaries, a movement of boundary itself, appeared to be quite central to what bodies “are.” Ideally, through studying these three texts the students can see the ways in which thought as it is performed critically expands in each generation to ultimately incorporate the role of gender in the production of knowledge as the contested body continues to be foregrounded in the classroom—from Merleau Ponty’s phantom limb patients to Butler’s own body that she quips self-deprecatingly needs to be disciplined by her own discipline. The expanding domain of philosophy is mapped onto the literature of Stein’s Tender Buttons and Virginia Woolf’s A Room of One’s Own along with Gregory Bateson’s transdisciplinary “Form, Substance and Difference” to show the ways in which the map and the territory can operate between literature and studio to open structures of affect in an autopoietic landscape. Instead of offering a strict Frankfurt School course in critical theory, the literary and critical studies and transdisciplinary writing courses incorporate relational aesthetics and other embodied practices to teach poetics and rhetoric in both the studio and seminar. Moreover, the studio culture provides a setting for the critical theory that is being taught to be practiced in, which is a desired and often missing outcome of critical theory courses. It is one thing to learn a sequence of critical theory, another to have a setting to directly apply it in.

As the first semester project on ontology introduces autopoietic visual systems that become specific to each student through embodied language practices in syntax, the second semester project on epistemology introduces context generated visual systems that become specific to each student through language practices in montage. The first class begins, as the first semester class began, with an embodied immersion into a radical medium. Without a prologue, students view Sergei Eisenstein’s Odessa Steps sequence from The Battleship Potemkin, accompanied by a discussion of the montage as defined by Eisenstein. This is followed by a mapping with their bodies of the procession up and down a staircase in the school to generate their own montages, which they see through class discussion are distinctive to each of the individual walking practices. The exercise creates a mapping operation between real and text that informs the research into body diagrams, thresholds and development of the program between two occupants on an urban site in the studio project. Montage, “the path in the mind that assembles a multiplicity of phenomena…gathered in a certain sequence in a meaningful concept…” as it is defined across disciplines by Eisenstein, informs the analysis of the studies in critical race theory that begin with a mapping of African Fractals and Michel de Certeau’s space and place relationships as a lens to read Kindred, an alternate to the present novel by Octavia Butler that utilizes compressed time to telettransport the protagonist between 1976 Los Angeles and an antebellum slave labor camp. The montage informs the perspectives of the protagonist (and the readers) as she absorbs the violence of the past in her own contemporary body in a performance of the post slavery subject that becomes the centerpiece of a research paper for the students that incorporates space, place, boundary, frontier, threshold, feminist informal geographies and double consciousness. That the school in which this curriculum is being taught is located in one of the nation’s leading African American communities is an advantage for the students in their studies. Developing the final sequence through their project, they conduct surrealist walking practices of the neighborhood to locate an unconscious operation in the vernacular thresholds on the network of sidewalks approaching the urban infill site.

Conclusion

In each semester the student engages with mapping operations between subject and object and between text and territory that incorporate radical poetics in a first year architecture studio. The capacities of collaboration and empathy and research and agency that the courses under review in this paper engender as well as the skills to map and interpret and learn the associative skills that will break down knowledge into visual form through operations that are integral to their own bodies and own ways of thinking, engender in the beginning student the ability to see their architecture in a broader context as they learn to deter-
mine the terms by which they want their work to be assessed and acquire the tools to critically assess their work. These outcomes of the course move it into the transversal dimension that Guattari outlined in his later writing. “Transversality is a dimension that tries to overcome both the impasses of pure verticality and mere horizontality; it tends to be achieved when there is maximum communication among the different levels and, above all, in the different directions. This is the very object of the quest of a subject group.”

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Notes

2 Aristotle: Episteme and Techne
https://plato.stanford.edu/entries/episteme-technet/  
Aristotle: Poiesis
https://sites.google.com/site/praxisandtechne/Home/architecture/knowledge/episteme

8 Deleuze, A Thousand Plateaus, 120.
11 Deleuze, A Thousand Plateaus, 121.
12 Bottineau, "Language and Enaction," 270.
Metacognitive Transdisciplinary Practices

Pratt Institute School of Architecture – Architecture 101 HMS 291B
REVEALING INTERSECTIONS

PROGRAMMATIC: **ABUSE**
FRAMING: **URBAN CONTINUITY**
PARAMETRICALLY MANIPULATED: **POLYGONAL CELLS**

FLOWING **CONTINUATION** OF URBAN ENVIRONMENT

**ABUSE** OF URBAN ENVIRONMENT
DRAWING: AN ARCHITECTURE OF AUTHENTICITY

Robert Holton, Louisiana State University, College of Art & Design, School of Architecture

Approach

"Why is it paramount to have an understanding of material attributes, assembly techniques, and environmental conditions fundamental to constructing architecture immersed in the process of developing architectural drawings?"

‘Architectural Systems’, an introductory course in materials and constructions, emerged around this question and is based on an understanding of specific conditions, an iterative process of application, and the resulting outcome. The pedagogical approach is grounded in the conviction that the processes by which something comes to be is critical to what it is. The method towards developing this technique of critical thought is the presentation of knowledge, ‘what is something’, and the practice of application, ‘why is something’. The approach strives to understand the potential of architectural drawing as a means to communicate physical conditions, the processes by which they are achieved, and the physical and cultural parameters in which they exist. The corresponding relevance of setting, performance, and result are expressed in a quote by Peter Gluck published in the monograph, The Modern Impulse.

"Architecture has often been likened to frozen music. If so, the construction of a building is the equivalent of a musical performance, which is in fact the only thing that makes it real. To realize a design, the architect ought to be not only the composer but also the conductor, the more so because with a building there is only one performance. The best way to maintain whatever balance the architect has managed to achieve during the design phase is to direct the architectural process from initial conception to final construction. This makes it possible for the constant interaction among the various attributes to continue until the building is completed, so that issues of cost, technique, and construction help to inform the design and insure its integrity rather than impede its realization. The responsibility for the alignment of attributes in the completed building lies with the architect."

And the goal of this complex process is the building it produces – a building that resolves the overlapping attributes in so strong and elegant a manner that experience of it is all the explanation it needs.”

In the example of audible constructs, lines, signs, and characters set out the pitch, rhythm, and tempo of a composition. This notation describes a specific sequence of actions as a way to perform the resulting composition. The simultaneous existence of both the process and the result is an inherent quality of a musical score. In the example of physical constructs, lines, symbols, and annotations are conventions used to set out the shape, size, and arrangement of a composition. This notation describes a specific completed work, however the sequence of actions, as a way to perform the resulting composition, is often traditionally undefined. Through the inclusion of processes of generation and contextual parameters in conjunction with material characteristics, the act of architectural drawing has the potential to question why specific conditions are relevant in the complex union of multiple variables. This dynamic set of relations is fundamental to the practice of making and constructing architecture.

Fig. 1 Cut-away axonometric showing structural and enclosure components

Objectives
The course objectives of ‘Architectural Systems’ seek to investigate material attributes, assembly techniques, and environmental conditions intrinsic in the construction of architecture and apply the findings through the varied processes of architectural drawing. Drawing techniques and objectives are explored with an emphasis on questioning the procedures inherent in the practice of making architecture: authenticity, context, & relevance. The following primary objectives are focused around both tangible and abstract concepts fundamental to design thinking.

**Ability to develop a sensibility for the application of materials linked to their distinct properties.**

**Understand and evaluate factors that influence material selection and assembly methods.**

**Ability to comprehend necessary assembly sequences relative to specific construction techniques.**

**Develop an understanding of fabrication processes, tools, and established communication procedures.**

**Understand the means by which building systems and assemblies influence one another.**

**Understand the implied possibilities implicit in transferring a material from one application to another.**

**Demonstrate an understanding of the physical and social context that guides building construction.**

**Understand the environmental, historical, and cultural impact on an applied tectonic language.**

**Develop an ability to investigate the built environment through a series of detailed drawings.**

**Context**

Organized around the goal of developing an awareness of the built environment, ‘Architectural Systems’ examines the means by which materials, assemblies, and context influence design thinking. The course initially presents topics that explore the elemental qualities of physical building components and the varying processes by which they are both manufactured and standardized. This beginning inquiry is built upon through additional topics that investigate the parameters and possibilities by which components may be combined. Contextual questions related to environment, cultural methodology, and proximity are introduced through historical case studies. Drawing on this knowledge, assignments provide an opportunity for creative synthesis based on unique design queries. The assignments intend to engage a tectonic language and seek to establish a vocabulary capable of communicating complex issues of selection, technique, fabrication, and assembly. The course utilizes the decision processes inherent in the act of drawing and aspires to address the many associations essential to developing architecture.

The material presentations offer a foundation of knowledge intrinsic to an architectural process of formulating questions and making decisions. Each presentation is structured around three categories titled ‘Properties, Manufacturing, and Standards’. The objective is to develop an understanding of natural materials, the methods by which they are transformed, and then subsequently regulated.

‘Properties’ focuses on basic material attributes. Classifications are presented to relate material types of similar qualities as in the cases of hardwood and softwood or ferrous and non-ferrous metals. Compositions are introduced to reveal a commonality of elements across materials as evidenced in the silica, soda, and lime makeup of glass in comparison to the lime, aluminia, and silica makeup of a brick. Attributes are specified to define unique material characteristics of strength, stability, and performance. Awareness of distinct aspects of strength, such as compression and tension, are vital to the selection of concrete, steel, or wood structural components. The stability of materials is important to ensure dependable enclosures and requires the separation of certain metals, especially aluminum and steel, to prevent galvanic action. Understanding the performance characteristics of a material, including expansion and contraction, is critical to proposing appropriate components in response to specific environmental conditions. Each of these aspects plays a pivotal role in the inquiry towards why a specific material is appropriate for a particular application.
‘Manufacturing’ highlights techniques that have been used to transform primary material elements into composite building materials. A historical evolution of fabrication technologies, from manual to mechanized processes, is presented to address advancements in quality, time, and expense. One example is the advancement of masonry production processes from soft-mud to stiff-mud to dry-press to the highly automated contemporary brick fabrication assembly line. These modern assembly production sequences are shown to articulate the current practices of converting raw materials into finished building components as illustrated in the process of producing float glass or rolled steel sections. The location where materials originate and how they are extracted from specific sites is emphasized. Of significant importance to understanding the management of natural resource sites such as forests or mines are issues of sustainability. Sustainable matters in question include harvesting expenditures, renewability of resources, site resiliency, and relative locale. Understanding the processes, including energy expenditure and renewability, by which materials are brought into existence is vital to asking why a material is suitable to a certain demand.

‘Standards’ concentrates on the norms, customs, and regulations to which building components are manufactured. Benchmark dimensions of wood, steel, concrete, masonry, and glass are considered as a set of parameters to work with in the development of architectural concepts. An awareness of nominal and dressed wood dimensions provides a relevant link between the manufacturing processes and the regulated sizing nomenclature. The intrinsic necessity of buildings to transfer loads from the structure to the ground is similarly based on an understanding of sizes. In steel construction, simple rules of thumb can be used as a way to preliminary size components and realize the dimensional impact of design goals. Steel shapes ranging from a W-section to a tube are similarly significant in the determination of structural performance. Material types are presented to realize that material properties are commonly modified and specialized to meet the demands of particular applications. The modification of annealed glass to heat strengthened or tempered exemplifies the refashioning of a material to meet specific security needs. Quality specification and determination is a critical part of the construction process as represented by the process of cylinder testing concrete samples over a series of daily intervals. Correspondingly, material grading is a method used to specify the strength or appearance of a building component and is often linked to the means by which it is distributed and sold as is in the case of timber. A cognitive understanding of the standards that articulate material properties is fundamental to inquiring why certain physical attributes are necessary to achieve unique design decisions.

The assembly presentations are of equal importance in the learning of knowledge that is essential to the processes of formulating questions and proposing techniques. The presentations are structured around categories of architectural components titled ‘Foundations, Floors, Walls, and Roofs’. The aspiration is to achieve a level of knowledge that can be applied in the development of constructible building systems.

‘Foundations’ focuses on the means by which an interface between buildings and the ground they are placed within is established. An understanding of both land composition and building characteristics is critical to how they come together. An analysis of soil classes and types is discussed to reveal that a particular site may be made up of various materials with differing characteristics. The different behavior of fine or course material is critical to the load bearing capacity of a soil. Likewise, the contrasting performances of sand and gravel to silt and clay play a vital role in soil stability. The composition of the material that supports a structure plays a key role in the transmission of live and dead loads from the building to the earth. The importance of geographic location is introduced as a factor in the determination of a particular foundation type. The knowledge of Northern freeze and thaw cycles bares a relevant factor in the degree to which a foundation extends into the earth, necessitating foundation designs of greater depth compared to Southern regions with warmer climates. All of these attributes contribute to the formulation of questions into why a particular set of foundation specifications is needed for a specific building site.
Fig. 3 Exploded enclosure to structure connection

‘Floors’ is centered on structural concepts and explores the spanning capacity of beams, joists, and slab compositions. Wood, metal, and concrete components are presented along with the relative merits of each material. Wood framing standards are oriented relative to individual applications to call attention to questions of performance relative to corresponding joist span and depth. An investigation of different framing types leads to questions and tradeoffs associated with considerations of schedule, economics, and aesthetics. Metal systems are similarly presented through questions of performance linked to different types of structural members as seen in the application of W-section beams to transfer heavier loads and open web joists to transfer lighter loads. The use of a moment or shear steel connection is investigated as a response to resolving structural forces of varying floor configurations as in the case of cantilevered areas. Properties of concrete elements are described to apprehend the strength and means by which forces are transferred through different slab configurations. Recognition of precise attributes of structural capacity is vital to the selection of a slab type, such as flat plate or waffle, relative to specific programmatic requirements.

‘Walls’ discusses assembly types oriented around the many plies that define the multiple layers of an enclosure system. Both the structural and insulating properties of wood, metal, masonry, concrete, and glass components are considered. For example, wood is a material with limited load bearing capacity compared to steel, masonry, or concrete, but its ease of on site workability make it a common selection for small structures. Also, relative to the other materials, the cellular composition of wood acts as a thermal barrier reducing a temperature exchange from one side of a wall to the other. Metal framing has the capacity to carry great loads while having the advantages of being lightweight, noncombustible, and damp proof. The capacity of structural steel shapes to carry greater loads makes them a frequent selection for large structures, however the performance of the components under high heat requires added layers of fire protection. Load bearing masonry walls perform well in compression, but a reduced capacity to transfer tensile forces requires the inclusion of lintels to form openings. With the pairing of steel and concrete walls perform well in both compression and tension, however the process of forming and curing is often not cost effective and beyond scheduling constraints. An understanding of the structural role a component can play and how it responds to environmental conditions is key to questioning why it is applicable to a particular use.

Comparable to ‘Walls’, ‘Roofs’ are assembly types that can also be described as a series of layers in the composition of an enclosure. The oblique surface, with a minimal required slope to manage runoff, must transfer dead and live loads and protect against environmental conditions. Questions of where a wall ends and a roof begins are critical to adequately shedding water off a building and preventing inundation. The parapet is the resolution of this meeting and can result in a range of connection details from the unnoticeable to the profound. Roofs are constructed by way of both tectonic and stereotomic systems. The selection of a technique has as much to do with local culture and traditions as an economy of means. A roof can be viewed as the culmination of a building proposal, take on many forms, be both structurally and environmentally responsive, and conceptually guide a design inquiry from formulation to constructed outcome.

Fig. 4 Exploded roof assembly
Assignments

The assignments intend to link the course learning objectives and activities through the application of knowledge in a series of drawings that respond to specific architectural questions. The questions are presented as sequential investigations toward the development of drawings that begin by exploring material attributes, then incorporate assembly techniques, and culminate with the inclusion of environmental conditions. The goal is to put into practice presented knowledge, approaches, and circumstances in the formulation of unique architectural proposals.

The initial inquiry is based on the development of a wall section drawing that communicates the integration of systems required to meet the specific needs of a design generated by each student in studio coursework. The wall section is intended to be holistic and include all necessary components in the composition of foundation, wall, floor, and roof assemblies. Special consideration is given to questions of materials, structure, enclosure, and construction. Drawing explorations focus on materials with unique qualities and how they are assembled to communicate a clear architectural proposal. Ideas of structure and enclosure are advanced relative to one another and take into consideration specific site conditions by way of drawn layers in each assembly composition. The processes of sequencing construction and assembling material components are researched and expressed through conventions of line styles and weights. This initial set of drawings strives to investigate the integration of and relationships between site conditions, material qualities, structural forces, and construction processes.

Continuing the focus on a unique design generated by each student, the subsequent inquiry is established on the development of a series of detail drawings that present the interface between primary building components. These details include the connections of foundation to wall, wall to floor, and roof to wall. The details aspire to show the connections between components as part of the multiple systems necessary in the articulation of a design proposal. Attention is now given to questions of materials, structure, enclosure, and construction at a finer scale. Drawings seek to emphasize the connections between materials and why certain affiliations are appropriate. A series of joints between the structure and enclosure are included in the drawings as an expression of exterior and interior environmental conditions. The process of installing connection fasteners is understood through the drawing of spaces and gaps to illustrate construction tolerances. This iteration of drawings develops enlarged detail connections in the demonstration of a tectonic language equally responsive to material logics and environmental conditions.

The culminating inquiry is positioned on the generation of a comprehensive exploded perspective drawing that includes the specific components of foundation, wall, floor, and roof along with the necessary connections to define and communicate the process of assembly. The exploded perspective continues the design exploration into the unique proposals of each student based on materials and techniques and orients the process of assembly within an exact contextual framework. The final series of drawing iterations works with the following questions that strive toward a synthesis of previous investigations and incorporates the complex set of contextual parameters deep-rooted in the practice of constructing architecture.
Material attributes profoundly define the experiential process of building. The human scale of a brick allows it to be placed and set by hand. The heavy weight of a beam requires mechanization for alignment and placement. The soft density of a stone necessitates a delicacy of handling. The hot temperature of asphalt defines the temporal extent of application. The sharp edge of glass mandates cautionary and protective measures. Why is the ability to develop a sensibility for the application of materials, linked to their distinct properties, critical to architectural drawing?

Assembly techniques delineate the construction sequences in the performance of building. Connections are an outcome of the actions utilized in placing materials and the detail is the confluence of these histories. Joinery describes a relation between specific surface conditions and an understanding of tolerances. Fasteners elucidate material properties through the movement and resistance of securing. Why is it pivotal for architectural drawing to foster a comprehension of the necessary assembly sequences relative to specific construction techniques?

Environmental conditions impact the routine and course of actions in the feat of building. Temperature can make unavoidable the restrictive use of additional layers that slow movement. Moisture and temperature impact soil consistency and the ease of workability. Wind can impinge precision causing hazardous conditions and increased production time. Why is it vital for architectural drawing to demonstrate an understanding of the physical context that guides building construction?

Concluding Results

The opening question proposed by the course, "Why is it paramount to have an understanding of material attributes, assembly techniques, and environmental conditions fundamental to constructing architecture immersed in the process of developing architectural drawings?", inspired drawing investigations founded in an understanding of natural order, a system of repetitive takes, and an aspiration for conclusive results. The assignment outcomes are a materialization of the goal to simultaneously investigate materials, assemblies, and context intrinsic in the act of building through the act of drawing. Knowledge of material properties, fabrication practices, and component standards gave way to design proposals grounded in actual real world parameters. Along with illustrating the relationship between dimensioned architectural components, the drawings also represent projected interactions between adjacent materials and environmental conditions. The drawings are enriched with a myriad of surface textures, hues, and values that bring to light a series of both temporal and performance questions.

Fig. 8 Exploded floor to wall connection

An understanding of assembly methods and precise construction sequences resulted in the development of buildable connection details with an allowable amount of room for fabricators to maneuver. The effect of drawing connection fasteners installed and then pulled apart along sequential lines
of assembly brings in an understanding of the necessary tolerances to the picture. The drawings visually illustrate the means by which an assembly goes together. Realization of contextual factors allowed for appropriate design strategies relative to specific environmental and cultural conditions. Geographic location is annotated as ‘degrees North’ with probable atmospheric conditions both rendered and reflected in the materials. This approach sheds light on the individual experience of putting together components within a variety of contextual factors. The methodology of staging assignments with complimentary objectives innately reinforces a cyclical process of applying knowledge, reflecting critically, and then reapplying design strategies with a revised awareness. The series of drawings that commence with wall sections that address architectural components, then move to details that speak to connections between components, and then advance to exploded axonometric diagrams that articulate sequencing allow for a continued focus on a subject through the perspective of multiple frames. The resulting architectural drawings reveal a gradual refinement of initially proposed design and construction strategies. This systematic application of knowledge acts as a linkage between the learning objectives and the learning outcomes that are inspired by the individual inquisitiveness of the students. The iterative process of questioning the subject and developing the drawings shifts the course focus from teaching to the eccentric learning of each individual design student.

Notes:

Fig. 1 Henry Bein, LSU School of Architecture.

Fig. 2 Grayson Boullion, LSU School of Architecture.

Fig. 3 Kaitlin Schuette, LSU School of Architecture.

Fig. 4 Henry Bein, LSU School of Architecture.

Fig. 5 Fernando Chavez, LSU School of Architecture.

Fig. 6 Fernando Chavez, LSU School of Architecture.

Fig. 7 Fernando Chavez, LSU School of Architecture.

Fig. 8 Madeline Luke, LSU School of Architecture.
Beginning with Collage:
Towards an Open, Collaborative, and Interdisciplinary Way of Making

Sanda Iliescu, Candice Vanderhorst, University of Virginia

As design foundations instructors, we all face the question of how to foster innovation and creativity in our students. Almost inevitably certain barriers seem to hold our students back; certain normative or stereotypical ways of working or conceiving of the design process seem to lock them into themselves and cut off possibilities for growth. The authors of this paper believe that a pedagogy that stresses collaboration, interdisciplinarity, and an embrace of both tactile and virtual methods can free students from habitual ways of thinking about design, and nurture their intellectual development. This paper highlights one particular pedagogical tool—collage making—that, we argue, offers an especially productive way of encouraging these diverse new energies in students’ thought.

The Radical Potential of Collage

Each sited [collage] element breaks the continuity or the linearity of the discourse and leads necessarily to a double-reading: that of the fragment perceived in relation to its text of origin; that of the same fragment incorporated into a new whole, a different totality. The trick of collage consists also of never entirely suppressing the alterity of these elements reunited in a temporary composition—Jacques Dubouis.

Collages typically convey a sense of rupture and paradox. On one hand, a collage offers a dramatic break with the past: the collage-maker transgresses prior normative boundaries and disrupts past traditions. Whether working digitally, by hand, or both, the collagist begins with destruction: by cutting, fragmenting, and destabilizing pre-existing materials. Literally she slices up the old order. On the other hand, collage entails an imaginative re-thinking and re-making too. Gluing, weaving, and stitching together constitute that second half of the “cut-and-paste” process. After destruction, the collage maker constructs a new sense of order. Yet this new order is assembled from the cut-up fragments and the debris of the past. Still recognizable, these old fragments and debris are tangible evidence of a complex and richly layered past. While breaking with the past, the collage-maker thus also re-connects us with the past.

In western art, collage emerged from the collaboration of two painters: Georges Braque and Pablo Picasso. In a letter to Braque, dated October 9, 1912, Picasso wrote: “My dear friend Braque, I am using your latest papery and powdery procedures. I am in the process of conceiving a little guitar and I use a little dust against our horrible canvas.”

When Picasso threw “a little dust” in the face of his “horrible canvas,” he ruptured a centuries-old tradition in western art: the illusionistic continuity and consistency of the canvas upon which only paint was applied. Yet, along with this startling new kind of composition, old methods were also at work. In their startlingly new collages, such as Braque’s Tenora, and Picasso’s Guitar,
both of 1913, the artists also incorporated traditional drawing: delicately rendered and highly nuanced surfaces, and naturalistically rendered overlapping planes.

Perhaps most provocatively, Braque and Picasso deliberately introduced un-artistic and un-aesthetic materials in their collages: fragments of newspapers, wall-paper, fake “wood-grain” paper, bits of twine and rope, as well as literal dust, sand, and earth. Symbols of quotidian, every-day life, these crude, non-artistic elements are incorporated within sophisticated artistic compositions. Braque and Picasso thus broke with the old tradition of drawing and oil painting, while they simultaneously re-invigorated that tradition by opening it up to the materials of every-day life. The prior boundary between art and non-art was boldly trespassed. In breaking with the rules of what had been considered artistic, Braque and Picasso created a dynamic new way of thinking about, and of making art. From this act of rupture, and the sense of surprise that it engenders, collage derives much of its liberating creative energy to this day.

The list of artists, architects, and designers who have embraced collage is a long one. At its best, collage can open new pathways for creativity for many people. To give but one example, in the seminal Hafeninsel project (Island Park in Saarbrucken, Germany) landscape architects Peter and Anneliese Latz (Latz und Partner) used old fragments from a ruined industrial site to create striking new park features: new pools, walkways, and garden walls. At Hafeninsel, new planting beds are edged with old bricks, cement fragments, and rusted steel beams. New allees reinforce and extend the lines of pre-existing roads. As in the combines of Robert Rauschenberg or the assemblages of contemporary American artist Jessica Stockholder—the park designs of Peter and Anneliese Latz trespass the once traditional divide between old, decayed materials and newly designed parks. In the Latz’s projects, past and present overlap in compositions that are open not only to the past and the present but also to future possibilities.

Collage and Abstraction

Collage is such a powerful design tool in part because it encourages students to abandon preconceptions they might have about design, and in part because it teaches them to think abstractly. The collage maker can “cut” and “paste” anything, according to any internally coherent system that she can imagine. How the collage maker cuts, and how she re-assembles are global and conceptual decisions that concern processes, not objects. These decisions cannot be fully determined by representational subject matter alone.

The collagist “cuts” according to abstract cut-lines, and she “pastes” according to some overarching system. When she cuts a surface into two parts (one to the left of the cut-line, the other to its right), she must think of her material in very simplified, diagrammatic, and concise ways. She must ignore fine details and distinctions. She must discern the essential features of her material. She must invent ways of simplifying and condensing the original subject matter. These are abstract conceptual processes.

Even if a collage’s “cut and paste” system is based on chance, or “aleatoric,” the collagist works according to an abstract system, and she conceives of her subject in abstract terms. She decides what she cuts and what she leaves intact. Additionally, the cutting cannot go on endlessly. She must stop cutting at some point, and begin pasting—begin constructing a new sense of order. Inevitably, to create this new sense of order, the collagist must focus, at least partly, on essential formal qualities—for example on how the geometry, texture, or color of one cut shape might relate to the geometry, texture, or color of another cut shape. Learning to recognize such relationships and realizing their power can be very exciting and liberating for a young student seeking to free herself to think and see in new ways.
Physical and Virtual Collages

Foundations instructors often face the dilemma of reconciling virtual and tactile ways of exploring design concepts. It is a hard problem to resolve since both are relevant and potentially useful. Manual or haptic processes provide irreplaceable multi-sensory and embodied contacts with actual physical materials. In today’s digitally immersed world, they provide invaluable ways of enhancing students’ sensitivity to, and appreciation for our natural and constructed physical environment. At the same time, students thirst to begin exploring new and exciting virtual possibilities. It is natural for a professor to privilege one or the other skill: the task of doing both in a meaningful way can seem daunting. Collage, however, can offer a bridge between these two equally valuable approaches to design.

On the one hand, as a tactile process, collage provides visceral experiences that emphasize the use of the human hand, and dynamic, multi-sensory encounters. The collage maker literally goes out into the world searching for, and creating evocative fragments. Often, she literally and intentionally takes apart found materials. For instance, she may cut, tear, or destabilize existing compositions. These destructive acts are followed by similarly visceral acts of re-construction and re-composition. A new sense of order emerges not as an abstract and disembodied schema, but as a multi-sensory and embodied experience.

On the other hand, the collage process is eminently suited to digital media. Whether the collagist works in simple software programs such as Illustrator, In-Design and Photoshop or more complex digital platforms, the basic technique of “cutting” and “pasting,” as well as layering configurations on top of one another can generate exciting digital montages. New orders emerge as one cuts, pastes, and overlaps digital fragments. As with physical collage, what was once bounded, centered, closed, and simple becomes expansive, multi-centered, open, and complex.
This paper’s authors have crafted beginning design assignments that use both tactile and virtual methods—assignments that typically start in one realm and are elaborated in the other. We have each, for example, asked our students to begin by drawing on a digital drawing tablet (a physical activity, that is digitally supported), then manipulate these line drawings through cutting, pasting, and overlapping (digital operations), then print the emerging collages (a physical act), and then manually cut and paste the printed artifacts. Going from one realm to another and then back again encourages students to think of their creations not as fetishes—not as perfect or polished displays of manual or digital skills—but rather as open-ended processes of exploration.

**Collage as a Bridge Between Disciplines and Between People**

If abstraction is the key to collage, it is also what makes collage accessible to diverse design disciplines. The painter creating a representational collage of a still-life must simplify and abstract that still-life. He must think of it as a collection of interconnected shapes. Similarly, the graphic designer must conceive a collage for a poster in abstract ways, as an ensemble of intertwined shapes and patterns. When designing a plan or cross-section, the architect sees the drawing as both a representation of three-dimensional spaces, and as a meaningful sequence of interrelated solids and voids—of dark and light areas. Like the painter and the graphic designer, the architect simplifies. He cuts, pastes, and overlaps pure geometries: complex curvilinear shapes as well as simple circles, squares, and triangles.

Because it involves such a clear process—the cutting and pasting of fragments—collage can bring together very different collage makers. Nothing more is needed than a pair of scissors and a few colorful scraps. This initial ease—this child-like clarity, directness, and simplicity—makes the collage process extremely approachable to all. The kindergartener can collaborate with the graduate student. The architect can collaborate with the painter or the printmaker. The openness and interdisciplinarity of collage is also embedded in the artifact itself. A collage is a “flat,” two-dimensional composition, but it is also a bit of a sculpture or spatial relief. Collages are made of layered strata and, in the case of physical collages, material, textural and other multi-sensory qualities.

Compared to a painting or drawing, a collage is less personal: less bound up with an author’s own unique “touch” and individual taste. It is therefore relatively easy to work on someone else’s collage: to continue the cutting and pasting process. Cutting and reassembling someone else’s collage is not as personally invasive, and not as emotionally charged as changing someone else’s painting or drawing. After all, the collageist is simply emulating what another collageist had already begun. She is respecting and echoing the rules of the game that have already been set by another. Because of this, collaboration in collage comes easily. Because of the simplicity and clarity of the cut and paste process, because of collage’s capacity to abstract and depersonalize its subject matter and even its author, and because of its ability to defamiliarize and startle us, collage is an ideal medium for collaboration.

**Case Studies in Collage Pedagogy**

Two authors wrote this paper collaboratively. Our beginning design courses, which we individually describe in the following sections, reflect and embody our shared design philosophy and pedagogy.

In designing and implementing these exercises, we sought to highlight the open and inclusive ethos of collage. Our beginning students considered both aesthetic precedents of “high-design” and “high-art,” and vernacular forms and the patterns of their everyday life. In crafting these collage exercises, we sought to use the methods of collage to foster our students’ tolerance for ambiguity, and to increase their sensitivity to a multiplicity of complex and diverse meanings.

![Fig. 4 Leaf Collage, Lauren Hackney](image-url)
1. From Still-Lives to Fields [Iliescu]

Abstraction poses difficult challenges to beginning students. The processes of simplifying and diagramming an object or space—of selecting and representing only those aspects and relationships that are most essential—are not easy for young students. Over the years, I discovered that collage, and especially the papier-collé variant can become useful stepping-stones towards abstraction. For this assignment, I asked students to compose simple still life arrangements using folded, curled, or creased sheets of 8.5 x 11 in. paper, and a variety of common, every-day objects that are easy to hold and grasp by the human hand (cups, bottles, fruit, cell phones, etc.). Each student then represented his still life as a series of collages using both new and recycled paper.

The boldness of collage's “cut and paste” method demanded that students simplify and synthesize what they saw. Not having the luxury of using a nuanced medium (such as line or tonal drawing), students had to cut their way through layers of uniformly colored or textured paper. They used scissors—a blunt, decisive, and relatively crude instrument. Constrained by the limitations of “cutting and pasting,” they began to see differently. Rather than minutely detailing perceived forms, students learned to recognize and document only the most important formal and contextual elements. They focused on alignments, resemblances, contrasts, and other geometric and textural relationships. The depicted space in these collages inevitably became intellectually charged. The negative forms or voids—the ground—became as important as the positive, solid figures. (fig. 1)

Although the collage space was often simplified and rationally mapped as a collection of interrelated patches of color, it also gained a strong textural and even tectonic quality through the visceral process of making. I encouraged students to use expressive methods of attachment: to sew with different kinds of thread or twine, to staple, to weave or otherwise interlock layers of paper. The technique of construction—the joining and assembly of parts—became both visible and meaningful. Occasionally, a line of stitching or a small tab of paper joining two shapes became an important element. As it often happens in architecture, the joint between one part and another became critical—to use Louis Kahn’s words, the “ado-

2. Leaves of Grass [Iliescu]

Like most American college campuses, my own university has many courtyards and other kinds of expansive grassy areas. These literal fields or lawns are often seen as unified, even monolithic swatches of grass upon which we tread as we move from one building to another. The grass itself lacks individual character and is regarded as a neutral background. Yet, if we look at these fields more closely, we discover they possess great variety and individuality (there are many kinds of grass; some lawns are mowed more often, some have greater patches of dirt, etc.).

For this exercise inspired by Walt Whitman’s poem Leaves of Grass, students picked individual blades of grass and studied their formal geometries and inner relationships. After several group discussions, we decided to work with only one kind of grass: onion grass, which is fairly uniform in thickness and thus closely resembles a drawn or cut line in a collage, and which has a very distinctive flavor and scent. Through sketching and diagramming, students investigated the unique qualities of individual blades of grass: their weight, flexibility, taste, scent, color, and geometry.

Each student began the collage process with a stack of three square-shaped, colored pieces of construction paper. She repeatedly dropped the blade of grass onto the stack of papers. Each time the blade was dropped, the student documented the blade’s particular shape by tracing its shadow onto the topmost piece of paper. After ten shadow tracings, each student cut along some of these shadow lines. The student worked negatively, sometimes cutting through
two colored layers to reveal the color of the lowest sheet of paper. Cut paper shapes were then moved or slid with respect to each other to reveal different layers and to adjust the width of the cut lines. The student further developed the collage by making more cuts and by again shifting the colored layers.

Each student engaged in a unique process of synthesis and abstraction. He was not seeking to replicate the appearance of the blade of onion grass, but rather to emulate and suggest its peculiar sensual and geometric qualities. I encouraged students to express the nature of the collage making process: the cutting and the sliding of colored paper shapes. Many finished collages have a dance-like playfulness that expresses the repeated dropping and tracing of shadows. They also possess a dynamic tectonic quality because of the three, stacked paper layers that were shifted with respect to each other, and then joined by using different attachment methods such as sewing, stapling, and weaving. (fig. 2,3)

In response to the first-year collages, students in my painting studio created their own compositions. Some emulated the visceral qualities of the first-year collages by making tactile assemblages using pressed blades of grass or leaves in combination with other recycled materials. (fig. 4) Others created collaborative montages using the layering capabilities of Photoshop and other digital software. By using transparent layers, students made the depth of the collage visible in a single view.

The digital medium rendered the collaborative process especially fluid and exciting. As students worked on digital files stored on the same server, all members of a team could see instantly the results of others’ cutting and pasting process. The digital document was continuously evolving as different collaborators worked on it at various times and in different locations on campus.

**3. The Figure-Ground Problem [Vanderhorst]**

“The Process of Architecture” is a two-week long course I developed for high school students enrolled in a summer enrichment program at my university. The course introduced students to fundamental design skills: sketching, diagramming, model-making, digital and analog drawing. As I taught this course, I explored different ways in which I could encourage young students to begin formulating design concepts. Collage emerged as an especially inspiring way of working. Through the investigation of their own collage making process, students were able to free themselves from pre-conceived notions, and to formulate creative design ideas.

On the first day of class, we discussed the following quote by Leonardo da Vinci: *To develop a complete mind, study the science of art; study the art of science. Learn how to see. Realize that everything connects to everything else.*
I then presented black and white collages that showed prominent figure-ground reversals. We had a rich dialogue about what the white represented, and what the black represented. We reached no definitive answers, but the discussion left each student curious about what he saw.

I then gave each student two 8 ½ x 11 in. papers, one black and the other white. Each student developed her own individual way of composing by designing three limitations for her own collage process. The student determined two sizes for her square or rectangular shapes. She decided if she was going to apply black paper on white, or white paper on black. She also decided if she was creating a figurative image, or a background, or something more ambiguous that could be read as either figure or ground.

After the first iteration, each student added a third shape to his collage. This posed many questions. How did the new shape relate to the initial squares and rectangles? Did the various shapes share the same scale? Did shapes share common edges? How could the collagist successfully embed a new shape into an existing collage? Since in architecture, as in all creative visual disciplines, nothing is created from a tabula rasa, these questions are fundamental to education in all the design disciplines.

Once the second iteration of the collage was complete, each student pinned up in a randomly assigned location on the classroom’s large display board. After all the students pinned up their collages, the overall effect was that of 24 very different and unrelated compositions. How could we transform this into one cohesive and harmonious collage?

Each student paired up with a neighbor, and the two worked collaboratively to blend and integrate their two collages. This step encouraged students to imagine potential relationships between figures and grounds. Students completed this exercise twice with different partners, thus ensuring that both collage edges became integrated. Some students faced especially difficult yet exciting adjacencies. For example, a student who glued black paper onto white, had to collaborate with a student who glued white paper onto black. Each student needed to decide how to trespass onto the adjacent collage: whether to extend her original black to white scheme, or to reverse this relationship. Through an iterative collage process—a process during which joints or intersections between individual collages became increasingly complex—students discovered important lessons about relationships. (fig. 5, 6, 7)

4. Reconfigured Space [Vanderhorst]

Designers are constantly faced with the question of how much to respond to an existing site condition. Whether it is the dominant height of the urban fabric, or the scale of an adjacent building, or a material palette, the investigation of preexisting conditions and relationships is crucial to the design process. In this collage exercise each student began with a black and white rendering of an existing architectural project: Anthony Ames’ Garden Pavilion, Alvaro Siza’s Boa Nova Tea House, Peter Zumthor’s Therme Vals, and Morphosis’ Vintage Car Museum. All these projects have exciting juxtapositions of diverse rooms, wall thicknesses based on materiality, and varied sectional volumes.

We began in the digital realm. The students brought their chosen architectural project into Photoshop to manipulate scale, invert colors, and create figure ground reversals. Once printed, each student evaluated all her prints. Some students cut and glued fragments from the original plan or section, while others cut and glued a plan or section that had been enlarged to 400%. No matter how each student started, as pieces were cut and pasted, new relationships emerged. Students quickly became immersed in the

Fig. 7 Collaborative Collage (The Figure-Ground Problem)
collage making process. They lined up edges, continued implied lines, and created oppositions as well as transitional passages. The reconfiguration of an existing architectural project, revealed the endless possibilities of collage’s two basic “cut” and “paste” operations.

5. un-PAINTING: from Yellow to White [Iliescu]

We paint and repaint walls all the time in our houses, workplaces, and public spaces without giving the activity that much thought. For this large-scale collage installation, twenty students and I slowed down this everyday, utilitarian process and explored its artistic potential. Our “canvas” was a bright yellow wall in an entrance lobby at the Architecture School that was going to be painted white by the building’s maintenance team; my students and I took on the job, gradually “un-painting” the colored wall in a careful, step-by-step and very public aesthetic process that resembled a performance.

We began by testing colors, as well as composing small sketch collages made with standard blue painter’s tape and colored crayons. Eventually, we settled on a bold and colorful design inspired by the wall’s intense yellow color, and by the reverberating sounds of people walking and talking in the space. The design resembled a musical score, with a series of vertical graphite lines establishing repeated rectangular spaces or “measures” along the length of the wall. A series of “blue notes” made out of standard blue “painter’s tape” and of varying heights and inclinations provided an abstract musical notation. As a counterpoint to the incessant repetition of the blue notes, students added a number of specific collage and painterly interventions, some celebrating the intersections of blue notes, while extending them in different colors. Other students added a system of green bands made with the kind of green tape that is used by auto-mechanics.

“Un-Painting” unfolded over 14 days, and consisted of 14 temporary one-day murals, each of them a simple song in graphite, paint, and blue tape. On the project’s 8th day, we started laying down the first transparent layers of white paint. The wall grew progressively paler, its bright yellow color gradually draining away over the course of the following seven days. This very slow, steadily unfolding process extended and dramatized the simple, every-day act of re-painting a wall. Much as a collagist uses common bits and pieces, so too we used the quotidian wall-painting process to create a series of large-scale collages.

One surprising and bright note colored the final days of our composition: on the morning of day 14, we peeled off the strips of blue tape running up and down the wall and watched as our pale blue notes turned suddenly bright yellow. The removal of the tape had exposed the brilliant, golden yellow of the original wall.

After the completion of our installation, we produced digital collages that show the wall’s gradual progression from brilliant yellow to pure white at the end. One of the students in our class had taped the sounds of our painting and collage-making process. He used these sounds to compose a musical piece. His sonic collage, which incorporated the sounds of tapping
paint rags and brushes, as well as the sounds of our overlapping voices, became the sound track to a short animated visual montage of our 15-day un-Painting project. (fig. 8)

Why Collage?

Why collage for beginning art, architecture, and design students? The preceding five collage exercises freed students from the normative, uncritical forms with which they were familiar. They encouraged collaboration, creativity, and curiosity. The students’ collage making process also fostered serendipity and the trespassing of pre-existing boundaries. As a multi-media and multidisciplinary medium, collage brought together students interested in a variety of design disciplines: painting, architecture, urban planning, and fashion.

The ethic of collage—its particular ethos—is especially relevant in our contemporary environmental situation. In an age of unsustainable over-consumption and crass consumerism, collage encourages us to save and recycle. It teaches us that what is “trash” has value: that the odd bits and pieces of every-day life may be salvaged and transformed. The ethos of collage fosters empathy for the past, as well as openness to the future. It is an ethos that tolerates failures and mistakes, and that encourages re-considerations, as well as radical change. Ultimately, the collage process celebrates multiplicity, while acknowledging ambiguity and vulnerability.

Notes


6. Nell E. Johnson, Light is the Theme: Louis I. Kahn and the Kimbell Art Museum—Comments on Architecture by Louis Kahn (Fort Wroth, TX: Kimbell Art Foundation, 1975), p. 43. Kahn’s full quote reads: “I put the glass between the structure members and the members which are not of structure because the joint is the beginning of ornament. And that must be distinguished from decoration, which is simply applied. Ornament is the adoration of the joint.”

7. According to ancient Greek and Roman myths, both drawing and painting originated with the tracing of the shadow of a form (a horse or a human being) onto a flat surface such as a wall, floor, or smooth area of ground. For a compelling description of these etiological myths, as written down by writers such as Pliny the Elder and Calderón de la Barca, see David Rosand, Drawing Acts: Studies in Graphic Expression and Representation (Cambridge University Press, 2002), pp. 220 - 221.
Terrains and Territories: Agency in the Spatial Design Process

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Abstract

Beginning design students’ understanding of the built environment often originates with the assumption of site as a given, a visual and quantifiable asset, occupied by buildings that perform a function and users who experience them. Design activities are then limited to managing a series of parameters in the hands of the designer as the sole enabler and source of ideas. This paper discusses how agency, the capacity for action or transformation, when perceived as attribute of all objects and subjects within a spatial setting, can be accommodated in the Beginning Design curriculum as a vehicle for a relational approach to the spatial design process.

Introduction

A fundamental agenda of many Foundation Studios is developing the ability to employ identifiable organizational principles in various spatial instances at multiple scales. In his Introduction to Form, Space, and Order, Francis Ching states that “the basic elements, systems, and orders that constitute a work of architecture... should be interrelated to form an integrated whole having a unifying or coherent structure”\(^1\). Such formal interventions predicate much of the introductory approach to architecture by means of developing a basic vocabulary and spatial syntax that enables students to analyze the work of others by reductively applying general principles to various constructs in order to identify their underlying structure.

The author explains further: “When these relationships are perceived as mutually reinforcing and contributing to the singular nature of the whole, then a conceptual order exists – an order that may well be more enduring than transient perceptual visions.”\(^2\) While the focus on integrating form, function and context remains clearly articulated through the rest of Ching’s work, the notions of perception and experience remain only an external validation for the conceptual integrity of architectural work and as such, offer limited opportunities for enriching the design process with spatial phenomena outside of any given formal framework.

Following a Foundation Design Studio based on Ching’s normative approach to architecture, a subsequent second semester Studio reverses the approach to understanding architectural space and introduces an inductive process of inquiry rooted in perception and experience. As many beginning design students experience difficulty understanding the objectives of non-representational compositions, the design projects ask students to begin their investigations by studying the sensorial experiences of phenomena in the context of actual sites, ranging from landscapes to buildings spaces and individual artifacts, without preconceptions of formal compositional logic. As a form of empirical questioning, the site is approached as a situation composed of physical material with tactile and visual properties, animated by spatial phenomena.

Robert Smithson’s notion that “perception is prior to conception”\(^3\) reveals that there are multiple spatial transactions already in place that need to be discovered and ‘exposed’ in order to generate ideas. In much of his ‘nonsites’ work of the late 60’s, Smithson sought to uncover perceptual information within post-industrial terrains by combining cartographic, experiential and physical material from the area later defined as a “metaphorical representation of an actual site... three dimensional picture that did not look like a picture.”\(^4\) (Fig.1)

This pedagogical approach of extracting design opportunities eliminates the common distinction between site and architecture. It engages the students’ understanding of the environment as a synthetic human experience where multiple agencies, natural and constructed, have a reciprocal and interactive relationship mediated by perception. Subsequent spatial interventions following this process become impregnated with native truths that originate potential design trajectories while the site negotiates the resultant juxtapositions of the evolving spatial logic.
Perceiving Space

In Beginning Design, students often treat site as a base for a building with its physical boundary determined by the edge of the drawing or a line on the page. Remaining physical characteristics of the site serve as an environmental backdrop of topographic form and climatic data to be analyzed for the benefit of finding design solutions that are compatible with the site’s general characteristics. The building design process then takes place within the parameters established by functional, contextual and aesthetic requirements only to seek mitigation at a later stage of the design when the building concept gets reintroduced to the site in pursuit of spatial and structural integration. This linear approach produces a single narrative at the hands of the individual designer and often short-circuits the complex integral relationships between humans and nature, building and place.

The first half of this Spring 2012 and 2013 Foundation Design Studio curriculum focuses on introducing site of any given setting as a continuous autonomous terrain to be explored free of preconceptions or formal expectations. As actors in a scene, the elements discovered across the terrain embody the phenomenology of place and reveal the perceived dynamics between the existing conditions and potential transformations and interventions. The ability to animate any given setting establishes a strong agency embedded in the design process itself.

Extraction and Abstraction

In Project I – Extraction and Abstraction: Site, Space and Material, the notion of site is expanded to any spatial setting that can be experienced, observed, documented and investigated. Students engage in a series of speculative mapping exercises of found space and learn to extract significant spatial conditions, physical and implied, in order to gain understanding of the various elements in relation to one another. The resulting studies of various scale and subject are sourced in situ, documented photographically and illustrated iteratively to reveal perceived textural, spatial, optical, structural and generative qualities of the select setting. These investigations are further abstracted to three-dimensional constructs with a focus not on composition but rather on the operative function between key actors in the original extractions as they embody or occupy space. The resulting graphic representations and three-dimensional manifestations are neither purely morphological nor metaphorical but seek to uncover the state in which perceived form and meaning are manifested in order to envision possibilities for further exploration. (Fig. 2)

Fig. 1 “Six Stops on a Section” by Robert Smithson, 1968. Detail: one bin 8 x 8 x 24”, map section, photos.

Fig. 2 ‘Shard’ by Castell Gordon, 2012. “Derived by extracting the formal and spatial potential inherent in the deep cracks and sinews of the tree bark, ‘Shard’ investigates the complex tectonic and spatial dialogue that would occur from forms and structures that have succumbed to powerful forces acting on them. The resulting shards cove inwards and dynamically pierce and reshape space.”
**Imagined Terrains**

In Project II - Constructing Space: Imagined Terrains, students interpret and construct a site as part of one continuous terrain occupying five landscape zones: beach, marsh, meadow, woodlands, rocks. This imaginary landform is laid out in a framework of basic topographic rules that allow students to modify the terrain while maintaining continuity with adjacent sites (Fig. 3).

![Fig. 3 Continuous imagined terrain of connected sites within a topographic framework of beach and marshland (0'-12'), woods and rocks (12'-96' with <1:1 slope for woods and >1:1 slope for rocks) with meadowlands as connective tissue.](image)

Initial site investigations involve observation, extraction and abstraction of visual and spatial characteristics including texture, density, light form, etc. as well as transitions between the various landscape zones. Sourcing inspiration from the work of Maya Lin, Andy Goldsworthy, Tara Donovan and Noriko Ambe, these findings are interpreted in three-dimensional collage using white paper of various thickness, texture and transparency combined with cutting, tearing, folding, stacking, twisting, stitching, weaving and other manipulations that express the perceived qualities of the various parts of the imagined terrain (Fig. 4).

![Fig. 4 Collage interpretations of the imagined terrain explore the spatial relationships and material qualities of the various landscape zones in each individual site.](image)

At this point in the process, students have developed an intimate familiarity with the qualities of their site and operate comfortably within the observe-extract-abstract method introduced via the ‘Perceiving Space’ exercises.

**Connected Structures**

The last part of Project II - Constructing Space: Connected Structures provides a transition point between the notion of terrain as a field of spatial interactions and territory – the capacity of actors within the terrain to inform spatial opportunities and provide a level of control over possible interventions. Students are asked to conceptualize and locate on the site three basic forms of inhabitation – work, live and play, following the perceived qualities and opportunities within key moments on each individual site.

Using a modest functional program of 200-400 square feet per space and unrestricted use of outdoor spaces, emerging spaces and structures must touch the site lightly using limited amount of connection points and foundation walls and slabs defined for the marshlands, woods and rocks respectively. As prompted, spaces must grow from the structural and experiential qualities of their immediate surroundings, address the inherent degrees of collective and private activities and if not adjacent, navigate the landscape through connections within their own terrain as well as pathways to adjacent sites. The previous collage...
explorations get translated into physical models that construct the imagined terrain in plywood, canvass and chipboard alongside the proposed structures and the respective site connections. (Fig.5)

In the latter part of the course, the site explorations land at a real terrain on the Chesapeake & Ohio Canal Nation Park along the Potomac River in Virginia. Project 3 Constructed Landscapes: Spatial Events takes the students through a series of site investigations at Locks 15-20 along the canal. Constructed over the course of over 20 years, the 184-mile long structure intended to connect the coal mines of the Allegheny Mountains to Washington DC. With 74 canal locks, multiple aqueducts, culverts and an old towpath, the canal’s construction was superseded by the Baltimore & Ohio railroad, soon outperformed and rendered industrially obsolete. Largely adapted for recreational use, this important landmark holds rich histories that leave a lasting mark on the natural landscape and lend important conversations about the relationship of land to structure, history to time.

**Constructed Landscapes**

The project challenged students to extract the existing geographic, climatic and cultural elements that define the terrains around the chosen canal locks by photographing visual elements, recording sounds, traversing the landscape, sampling artifacts and using related immersive techniques. (Fig 6)

(Fig 6) Textural and environmental studies of canal lock terrain. The idiosyncratic spatial characteristics of the principal canal structure at the locks and the auxiliary buildings and spaces created were studied alongside all natural features as a

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**Terrains and Territories**

Inspired by Peter Zumthor contemplation on ‘completed landscapes’, this studio pedagogy explores a method that can be applied holistically and does not always follow an expected trajectory but provides a powerful tool for deep discovery and critical intervention: "I have a passionate desire to design such buildings, buildings that in lime, grow naturally into being a part or the form and history or their place. Every new work of architecture intervenes in a specific historical situation. It is essential to the quality of the intervention that the new building should embrace qualities which can enter into a meaningful dialogue with the existing situation. For if the intervention is to find its place, it must make us see what already exists in a new light."^5

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(Fig 5) Study models of spatial juxtaposition between programmatic and contextual elements.
Terrains and Territories

complete landscape of manmade and natural landform. Familiar observation-extraction-abstraction techniques were used to capture all findings in drawings and physical models. Individual studies culminated in the construction of 2’ x 2’ x 6’ Site Sections model/drawing hybrids embodying the graphic, textural and spatial definitions of each canal lock. (Fig. 7)

Further interrogations of the six canal lock project sites probed for opportunities to introduce a set of actions and experiences that engage in dialogue with the existing terrain. Spatial interventions deliberately avoid programmatic preconceptions common in building types and focused on functional and spatial determinants:

actions: sit & engage, sit & contemplate, stand & observe,
move through, perform, explore, climb

experiences: compression, expansion, confinement,
exposure, procession, reveal, immerse

As aspects of programmatic function and human behavior enter the stage, perceived space and boundaries introduce the notion of territory as controlled terrain. Potential physical interventions and habitation forces establish a strong hierarchy of values that enable and/or constrain the capacities for action of the original terrain through designed artifacts. In a series of proposed spatial events, students sought to reveal inherent opportunities born out of careful observation and interpretation of the existing environment.

Successful strategies involved meaningful interaction with the existing canal and towpath, clear connection between natural and built elements in form and material, strong integration of the programmatic and experiential agenda within the proposed spatial event and careful intercession with the natural environment. The resulting constructed landscape offers a fertile ground for spatial negotiations and contains the embodied and situated characteristics of all actors discovered during the design process.

Conclusion

This relational approach to design suggests that ideas come from perception of conditions that can be represented, analyzed and manipulated as beginning design students search for a greater understanding of the integral relationship between humans and nature, building and place. The ability to discover and utilize the agency in the terrains and territories of the constructed landscapes we inhabit can provide resources and mechanisms to deal with the unexpected, recognize and support the different and marginalized conditions and maintain an open and inclusive design process away from disciplinary preconceptions and impositions.

Notes
Pavlina Ilieva


2 Ibid., p X.


4 Ibid. p 77.

Drawing Vocabularies

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Introduction

On the one hand, as beginning design faculty, it remains our responsibility to impress upon our students the value, strength, weight, economy, pluralism, complexity, and potential of a point and a line in space. However, in order to accommodate new ways of making, it is also our responsibility to add new vocabulary to our efforts in the teaching of drawing. (Fig. 1)

Technology has blurred and expanded the definition, vocabulary and media of architectural representation. While traditional drawing techniques continue to play a vital role in beginning design education; technological and cultural shifts require a reinvestigation of the role of the drawing in the design process. We must redefine the way in which we teach drawing as well as the way in which we talk about drawing to beginning design students.

Each of these drawing exercises in this essay purposefully anticipates digital thinking and digital processes of making. However, the projects are not designed as translations from analogue techniques to digital media. In fact, the drawing medium is somewhat irrelevant. Instead, these projects are designed as problem solving exercises which foster a conceptual understanding of computation as a medium through process and discovery.

All of the case studies presented here are rooted in the traditions of 1:1, technical drafting. However, in each of these case studies drawing is celebrated as a physical act. The opportunity of these case studies is the focus on the performance and process of drawing as opposed to the drawing artifact. The methods presented in this essay are ongoing experiments1 in how to introduce the beginning design student to ways of seeing and ways of thinking through a computational approach to design as well as new ways of communicating.

Methodology

Architectural drawing is often seen simply as a medium for architecture. However, one can argue that architectural drawing and architecture share more than the connection that puts one in service of the other: each is dynamic, technological, and spatial.

The performance of drawing is itself a complex spatial investigation. However, conventional architectural drawings are static
representations and the act of creating them is the process of flattening information. Introducing performance, time and event into the drawing process encourages the beginning design student to see drawings not as flattened representations but as complex, dynamic spatial ideas. In addition to gaining skills in graphic communication, students should develop ways of thinking in which choices of how to draw are as vital to design as what is being drawn.

The impact of the computer on architectural drawing and representation has changed the way architects design and think about space and has opened up many possibilities for the creation of complex geometries and advanced visualization techniques. However, more important to beginning design education is that computer drafting programs change the way drawings are created.

These case studies evolved out of the challenge to teach beginning design students how to understand the concepts of computer drafting—the systems used to create digital drawings. In order for a designer to have control over his medium, he must first understand the procedural logic behind the interface. Students must be taught to think, observe, analyze, and construct differently to anticipate the way in which the computer “draws”. If students fully understand these concepts, they will be able to think critically about the process and regain control over the tool. In most of these case studies, the actual drawing is hand-crafted; however the way in which the drawing process is introduced is though the vocabulary and methodology of the digital medium.

The authors do not see this as a debate of the value of analogue versus digital means. As Malcolm McCullough suggests a tool remains subject to our intent. The challenge is, therefore, to teach beginning design students both skill and intent.

Computational thinking must be introduced to beginning design students in critical ways independent of the medium. However, while drawing methods should anticipate computational logic, drawing exercises should also be designed to increase the ability to think and to understand the visceral and iterative power of the craft of drawing.

In all three case studies, the analytical potential of drawing is revealed through directed efforts of making. These projects focus on the act of drawing not necessarily on the drawing itself. We have found that we have updated the vocabulary we use to communicate the drawing process. In each case study, the complexities and abstractions of the drawing process are visualized physically. Drawing is understood as information—a tangible system of relationships.

The Narrative (Case Study 1)

Simultaneous to teaching students traditional methods of representation: plan, elevation, and section; the students are asked to diagram performance and to explore the concept of memory diagrammatically. Although useful as documentary tools, conventional drawings alone fail to explain event or performance. By simultaneously teaching the students both conventional methods and basic analysis diagramming, one does not separate out the two processes, but conditions the student to think critically in both design languages.

In one exercise, diagramming was introduced as an overdrawing technique. Students were asked to experiment within representational drawings that narrated the performance of their objects experienced over time. (Fig. 2) Diagrams described time-based systems of enclosure, volume, sequence, assembly, speed/pace, orientation/position, process, and experience.

The students have to invent a notational system and system of logic in a discipline that does not have a standard graphic system of recording time. While a difficult exercise, the act of problem-solving heightens the student's awareness of his or her object in space much more so than a simple proportional study. The freedom from a preconceived solution develops the beginning design student’s patience, curiosity, and confidence.

The students were asked to compose a drawing that communicates the potential movements of and forces on an object over time. The students must establish a compositional strategy considering negative space and hierarchy. They must also define a sequence of movement and an organization to the narration. The narrative composition was created by exploring techniques
of composition, orientation, position, measurement, repetition, graphic line hierarchies, and notational strategies. The question presented was: how in (static/graphic) two-dimensions can you communicate the (dynamic) three-dimensional space your object takes up in time? The students must, therefore, define a process of design research as a means of generating the drawing as well as translating an abstract idea into a spatial strategy.

As students attempt to introduce dynamic ideas through over-drawn diagramming, they question how to make the planer drawings more legible. Students are forced to think critically about information graphics and eventually adopt a more hybridized system of communication. Diagramming allows the beginning design student to effectively organize and communicate information. Consciously linked to the design foundation ideals of craft, composition, and ordering systems—diagramming further emphasizes the development of critical thought. In addition, the ability of diagrams to dissect, layer, and process complexity makes them a successful generative tool. Engaging in this discourse advances the design process beyond representation.

In another recent exercise, we had the students draw a series of unfolded diagrams of three dimensional "wraps". (Fig. 3) While this was the first attempt at this project and we need to develop it further, this type of drawing method proved valuable. Since traditional architectural drawings are static representations of space and experientially flattened, the act of diagramming parallels the beginning design students’ innate desire to story tell. The translation of three-dimensional space into flattened orthogonal drawings can be challenging to both learn and teach. Time-based drawings and the “wrap” drawings force students to observe, articulate, and communicate dynamic conditions and narrative diagramming techniques allow the student to tell the story of their objects experientially.

Diagramming is a more natural organization method and is, therefore, a useful tool for fostering the student’s natural enthusiasm for creating, exploring and narrating. Introducing performance, time and event into the design process from the beginning encourages the student to see architecture not as flattened representations but as complex, dynamic spatial places. Through the act of drawing experientially the students are inventing a new language which is a more complete and powerful representation than drawings that are singularly focused.

**The Measuring Machine (Case Study 2)**

This exercise focuses on the spatial translation from three-dimensions to two-dimensions. These projects creatively and intensely engage students in the act of drawing in a tactile and visual way. This exercise involves accurate measuring and the transcription of measured objects onto the ‘site’: the regulated drawing space. (Fig. 4)

In its current state, the project has evolved into a new drawing typology. What began as a way to visualize orthographic projection and how one would measure a three-dimensional object...
for two-dimensional drawings has become the motivation for the analysis. The apparatuses started as a way to secure the object into an active state and visualize section and have developed into complex, kinetic machines for measuring.

Privileging the process of measurement instead of the representation of the object challenges the limitations of two-dimensional drawings. Physically constructing the process of the dissection event allows for a complex understanding of three-dimensional, spatial relationships beyond compositional layout.

In this case study, the act of drawing is understood as a network of data. Anticipating both manual and digital methods of articulating and generating space, the discussions focus on the concepts of systems, geometry, and order in spatial investigations.

Throughout the investigation students are required to draw a series of sections and elevations whose composition and construction have a memory of the measuring device and the object. Each student has to develop a consistent system of measurement, mapping, drawing, and line weights to reveal the object. The sections are chosen in such that they investigate spatial relationships, construction, materiality, and topology. Success is measured by the individual’s conceptual complexity, level of understanding and agility in exploration as well as the level of craft. (Fig. 5)

Additional variations of this exercise have been used to introduce complex geometries and projection theory to beginning design students. These machines are physical representations of the act of drawing. (Fig. 6)

These machines serve as complex problem solving exercises with infinite unique solutions, yet a clear function and set of constraints. Its construction requires a 1:1 design build, material research and accuracy. The machine, which uniquely reveals both process and idea and is also purposeful, is an opportunity for the students to directly experience the process of making. The machine not only has to be a well-designed, well-crafted object but also has to be actually used by the student to accurately measure the profiles. The character of the student is evident in the personality of the final result of the machine.

Assembly and Dissection (Case Study 3)

Case study 3 is also a variation of a traditional 1:1, technical, analysis project and the idea of dissection. An added challenge was to immerse our beginning students in digital modeling and drafting techniques in order to understand drawing, modeling, and assembly not as events disconnected from the design process, but rather as a layered system of active, spatial relationships. Although architecture convention is that the drawings precede the built work, current technologies offer a reversal of that process. Drawings are now constructed from digital three dimensional models. The concept of dissection – moving from three to two dimensions – and in the reverse -- anticipates this digital process.

We have recently experimented with teaching these drawing concepts through methods of process, assembly, and dissection in several different ways.

In one method, students dissected a series of section contours which inform the design of a hybrid three-dimensional drawing and model. (Fig. 7) Students must confront issues of material thickness, digital precision, dimensional tolerance, and assembly techniques throughout the development of their final project. By introducing digital workflows and fabrication as part of the design and drawing process, students are able to discover and understand the relationship between drawing, construction, material, and craft.
In another method, (Figures 8 and 9) students used balloons and plaster to first make complex spatial objects and then dissected them both physically and through drawings. Drawing analysis and an introduction to the spatial qualities of sections was coupled with process, making, ownership, anticipation, and discovery.

In yet another method, (Fig. 10) students evolved projects based on spatial section drawings. Teaching students to see three dimensional space as flattened representations can be tricky. In these three methods, instead of understanding planar line drawings as abstractions, students are forced to think critically about relationships in three dimensional space.

Furthermore, contouring/dissection provides an essential graphic tool for understanding the manipulation of a surface and the concentration on the section cut allows the students to investigate the ways in which drawing can reveal topologies, spatial relationships, and construction information. Drawing the process of the dissection event allows for a complex understanding of three-dimensional spatial relationships and anticipates digital modeling.

Sequential sections are an important tool for students to understand the temporal conditions of space and more complex spatial relationships. Not only are the final constructs calibrated descriptions of the object, they also expose the productive, representational, and temporal possibilities of the section drawing.

**New Conclusions**

This is an on-going experiment in how to communicate the potential of drawing and three-dimensional thinking to beginning designers. One of the variables that we have recently changed is to make the drawing object more simple (and slowly increase its complexity) in order to privilege the methods, logic, and process of drawing more completely. In some ways, it used to be understood that the complexity of the subject played a large role in the complexity of the drawing. In reality, it is the
duality of both abstract and concrete logic that makes architectural representation inherently complex regardless of the medium or subject.

In conclusion, these case studies presented here are investigations into ways of introducing architectural drawing to beginning design students. The projects reveal the complexities of the process of drawing and acknowledge the value of drawing and anticipate the influence of technology. While most of the projects are hand-drafted, each of the methods encourages a conceptual awareness of computing as a medium.

The most important outcome is not each project’s artifact (the drawing) but the descriptive process of drawing. Through these active, multi-layered, problem solving exercises and definitive abstractions, the students understand drawing as an analytical tool. The potential of every line is revealed. Complex processes are rigorously engaged through thinking and making in a highly tactile and tangible way; defining, and perhaps evolving, the relationship between drawing and thinking and between tool and intent.

Notes

1 This paper is an update of “The Potential of Drawing” presented by the authors at the NCBDS32 Conference in March 2016 and “Object Analysis: Process and Performance Diagramming” by Meg Jackson and Cord Bowen presented at the NCBDS Conference is 2013.


Selected Bibliography


The New Human Factor
Meg Jackson, Michael Gonzales, University of Houston

Introduction

The rise of sensor technology has redefined the way people engage with their environments and interact with each other. This gives designers a new medium to study, design and communicate with the built environment and challenges the way in which the human relationship to space is generally understood. There is now the possibility for new types of physical space, ones that consider human interaction, perception, experience, time, and behavior.

“The way we interact with the world has never before undergone such rapid change… the world we inhabit is no longer only a physical environment, but also a landscape that we occupy virtually. What was already false—the perception that the physical limits of our body define our personal space—has been clearly exposed as a fiction.”1

As our world becomes increasingly connected and interactive, communication with our spaces, objects, and each other becomes progressively mediated through intelligent devices and interfaces. When considering this dynamic human factor, technology increasingly blurs the limits of the body’s territory as it becomes integrated into our biology. Our digital media course considers the design implications that result from our spatial territories expanding to include both our physical body and our personal data sets. The emerging field of sensorial spatial design explores how we can augment and expand our perception and how this changes the experience of space.

Methodology

Using a graphic programming interface (Grasshopper and Firefly), beginning design students are introduced to concepts of mechanics (making things move) (Fig. 1), sensors (making things sense), networking (making things communicate) and basic AI (making things think/learn) to develop interactive/responsive architectural prototypes. (Fig. 2) Each week students are challenged to solve a design problem by designing and building responsive prototypes that integrate human interaction with weekly tutorials on the themes outlined above. These working prototypes vary in approach and scale, some of which include strategies that are physically responsive to their cellphones, mind, heart rate, physical movement, light, and sound. Class discussions are rich with excitement and curiosity about design, interaction, and the applications of responsive spatial design. (Fig. 3)
actual efforts of making which encourages students to bridge between digital simulation and physical making, allowing them to connect with these concepts in a concrete way. Students are challenged with issues of material behaviors, assembly logics, and construction constraints at the same time reinforcing the fundamentals of design relative to the human body and experience. (Fig. 4) Through this design process, they understand these forces not as separate elements – abstracted from digital media - but rather as a layered system of complex interrelations. This hands-on, incremental approach to problem solving is important because it allows the students to demonstrate, as opposed to simulate, their design ideas and intentions.

The final spatial prototypes promote cross-disciplinary exploration encouraging students to develop an architectural language based on aural, visual, physical, and anthropomorphic relationships while simultaneously communicating complex ideas of interaction. Throughout this process, students have to rethink previous assumptions on human behavior and space. The results are interactive applications that reinforce design as the relationship between scale, form, materiality, perception, and experience while addressing contemporary questions about the role of technology in culture and design.

The Dynamic Human Factor

“The materials that surround the human body, including clothing and shelter, function as boundaries that mediate between the body and its environment… The spaces between the boundaries are architectures, ranging in scale from the most intimate – the space between the skin and clothing – to the most grand – the space between body and building. This indicates the potential for architecture that emphasizes the dynamic quality of materials – perhaps an architecture defined not by permanent partitions but by dynamic boundaries that choreograph movement by engaging and responding to human activity……By triggering or inhabiting these boundaries, the people who move through them also define them.”

Interactive architecture, regardless of its physical size, is an extension of the body. This field of inquiry operates in the poché (the in-between space) between body and boundary. These projects explore the potential of spatial relationships between a dynamic body and a dynamic boundary (Fig. 5)

As in a conventional design-build studio, our seminar students are tasked with the challenge to build full-scale. They must address anthropometric relationships between their spatial constructs and the human user. However, interactive architecture expands the discipline of architecture by acknowledging a departure from the traditional architectural notions of space and user. In this emerging context, architecture is “to become sensitive, intelligent, interactive, responsive, and adaptive” in which the user is an active participant. There has also been a gradual shift away from the notion of timelessness to the notion of time-based. “There is a crystallization of a desire for architecture to be thought of as an active, evolutionary, and interactive being.”

The students have to investigate not just the physical occupation of space but also the physiological occupation of space. In Toshiko Mori’s Phenomena essay she states, “Sound and scent
can perform, inform and transform: their impact is strongly felt even in the absence of material artifact in the traditional sense, making them some of the most efficient “immaterials.”

In addition to creating architecture that is responsive to human movement, our investigations broaden Mori’s definition of ‘immaterial’ to expand beyond the five senses and into human’s emotive, behavioral, and physiological states. Although not all of them are physically tangible, these human behaviors have physiological consequences, which can be measured and manipulated with current technology. For example, brain waves emit electric signals that can be quantified with a numeric value, which can then be used in an algorithm to control a mechanical movement. Therefore, architecture, when married with this technology, can have a spatial response to the behavior and activity of the body. (Fig. 6)

These conceptually complex, often abstract and intangible, dynamic human relationships are introduced to our students through very concrete methods of making at 1:1. The creative process involves experimentation, risk, constraints, testing, trial, error, intuition, failure, and curiosity. Our students must not only imagine the possibilities of interaction and response, but also design the physical mechanics and the procedural logic of the systems that quantify the behavioral data. In this way, interactive architecture represents a third pedagogical shift. In addition to evolving the traditional notions of space and of user, since design is understood as performance, the designer is not only a creator of objects but also is the designer of the system. (Fig. 7)

**Making Things See & Move (Case Study 1)**

Playscape and Kinetic Wall are a series of student projects that use computer vision and servos to interact with a user. Playscape engages participants through 3 interactive modes: mimicry, avoidance, and attraction. (Fig. 8) This case study began as a series of dynamically controlled pattern studies exploring variation within simple geometric systems.

Kinetic Wall engages participants by occluding or revealing views based on a user’s proximity, speed, and direction of movement relative to the wall. Kinetic Wall is constructed using a Microsoft Kinect, 30 servomotors, a mountable aluminum frame, and a series of styrene panels. This case study initially began as a series of investigations exploring perspective, motion, and the mechanics of simple machines. Through a series of rigorous models and scaled working prototypes, the students developed a simple system that could achieve the dynamic effect they wanted with a minimal amount of material and mechanisms. (Fig. 9) In subsequent prototypes students were asked to analyze, adapt, and calibrate their initial studies to include a kinetic response to a stimulus - the body.

Throughout these later exercises students had to confront issues of human factors, ergonomics, and user interaction. These exercises are designed to build upon students’ existing
knowledge of parametric design and fabrication methods while introducing new concepts of interactive control and response. Students are challenged with calibrating the formal logics of their system with the physical constraints of material, construction and assembly. We have found that the communication between digital simulation and physical making early in the design process gives students the insight required to develop full-scale interactive prototypes. (Fig. 10)

For these particular case studies, the students explored the concept of Computer Vision. Computer Vision is a field of study that is interested in the processing, analysis, and understanding of images, similar to the abilities of human vision, by electronically gathering and understanding image data. The teams used Microsoft’s Kinect for Xbox which tracks human movement and skeletal data through an infrared camera embedded in the device. Iterations on the working prototype require students to use a participant’s skeletal data as the primary means of controlling movement. The added layer of human interaction challenges the students to analyze and calibrate their prototype to respond to the scale of the human body, complexity of interaction, and human behavior-issues applicable to contemporary practice in architecture and interactive design. It is exciting to see the students realize the scale of the body and recognize their own behaviors relative to the space and objects around them.

Making Things Sense (Case Study 2)

The Mind Manipulator is an interactive wall that senses a user’s attentive or meditative state to control a kinetic skin. The Mind Manipulator uses NeuroSky’s Mindset, CNC foam insulation, LEDs, and an MDF base. (Fig. 11) Similar to Playscape, this case study began as an investigation in dynamically controlled geometric patterns. Once a catalog of patterns had been developed students were asked to analyze and translate their systems into physically responsive prototypes. Through several material and kinetic studies, this team developed a system that was able to reduce the amount of parts used while maintaining the resolution of the pattern. The final prototype used stretched fabric, controlled through a series of hidden servos, to reveal a CNC patterned relief. This process challenged students to consider issues of material efficiency, fabrication, and assembly while maintaining design intent.

In subsequent research the team investigated the concept of brain-computer interfaces (BCI) as a method of interaction. BCI is a field of study investigating the communication between the brain and external devices. BCI gives designers the ability to analyze and rethink the relationship between the mind and its environment. For this case study the team used NeuroSky’s Mindset. The Mindset is a commercially available EEG, electroencephalograph, headset that records and monitors users’ brainwaves through a single dry electrode. Included with the Mindset is NeuroSky’s proprietary algorithm which calculates user’s attention and meditation levels. The team was challenged with understanding the relationship between one’s mental state and the environment or objects around them. Through a series of interactive brain training games and physical models the team was able to calibrate their initial prototype to allow seamless communication between a participant’s mental activity and the servos controlling the tension of the fabric. As a participant enters into an attentive state servos pull on the fabric revealing the patterned relief. The more attentive a participant is the greater the resolution of the pattern. Conversely, as participants enter into a meditative state the fabric is relaxed,
returning to its unstressed state. This case study reinforced the concept of the body as an extension of space. Throughout the process students were able to acquire, visualize and monitor a participant’s brain activity relative to their environment, requiring the team to rethink previous assumptions on human behavior and interaction.

Pulse Pavilion is an interactive spatial installation inspired by the effects of anxiety and stress on the body. For this case study students were interested in understanding how to spatialize data and how to form a closed feedback loop between the body, emotion, data and space. Throughout the team’s initial investigations students focused on parsing multiple sample data sets to test a variety of visualizations that could inform the final project. As the complexity of human interaction was introduced, students were challenged with gathering data based on a user’s anxiety and stress levels in addition to developing an intuitive interface for interaction. After much research in sensor design and biofeedback strategies, the students developed a glove that could monitor a user’s pulse with the use of an integrated optical heart rate sensor. The glove is attached directly to an Arduino microcontroller that feeds the data in real-time to Grasshopper. Once the data is parsed in Grasshopper, students can use this data to control their visualization studies. (Fig. 12)

For this collaboration our team used a wireless 64 electrode EEG (electroencephalograph) skullcap that collects and transmits a user’s brainwaves to a laptop. This investigation began by researching Laban’s Movement Analysis, which is a method of visualizing, interpreting, and notating various types and degrees of human movement. In this method, movement is categorized by a combination of action efforts Laban labels as float, punch, glide, slash, press, etc. Our research team developed a series of algorithms and graphic representations that paired the brain’s emotive state with physical movement based on Laban’s action efforts. These algorithms and graphic representations were then translated and used as commands to control the hue, saturation, and intensity of the stage lighting providing a real-time interactive environment based on the dancer’s emotive and physical states. The software developed for this research forms a closed –loop system that allows the audience, performer, and environment to all become participants in this collaboration. (Fig. 14)

Furthermore, students were interested in presenting their data as a spatial construct to form a closed loop between the user, data, perception, and space. During this investigation the students tested multiple projection, sound, and material strategies for representing their data as a fully immersive experience. It is the balance between technology, behavior, and human interaction that allows the project to communicate effectively with its participants.

**Making Things Think (Case Study 4)**

Brain on Dance is an interdisciplinary collaboration between the fields of Architecture, Neuroscience, and Dance. This interactive performance uses a dancer’s brain activity to create a real-time emotionally responsive environment. Similar to the Mind Manipulator, Brain on Dance uses BCI. In this case, BCI gave us the ability to analyze and rethink the traditional relationship between the body and space. (Fig. 13)

For this collaboration our team used a wireless 64 electrode EEG (electroencephalograph) skullcap that collects and transmits a user’s brainwaves to a laptop. This investigation began by researching Laban’s Movement Analysis, which is a method of visualizing, interpreting, and notating various types and degrees of human movement. In this method, movement is categorized by a combination of action efforts Laban labels as float, punch, glide, slash, press, etc. Our research team developed a series of algorithms and graphic representations that paired the brain’s emotive state with physical movement based on Laban’s action efforts. These algorithms and graphic representations were then translated and used as commands to control the hue, saturation, and intensity of the stage lighting providing a real-time interactive environment based on the dancer’s emotive and physical states. The software developed for this research forms a closed –loop system that allows the audience, performer, and environment to all become participants in this collaboration. (Fig. 14)

**Outcomes**

The final spatial prototypes promote cross-disciplinary exploration encouraging students to develop an architectural language based on aural, visual, physical, and anthropomorphic relationships while simultaneously communicating complex ideas of interaction relative to human behavior, which can be physiological, physical, and oftentimes unseen. All of the projects reinforce the concept of the body as an extension of space while
confronting previous assumptions on space and human behavior.

“The generalist designer must be able to meet the unforeseen demands of tomorrow and, thus, must be better prepared, and better educated and trained with a broader knowledge base including research, experiential experimentation, and an understanding of phenomenology. Just as earlier theories emphasized the need for building as a complete experience... life’s activities are not to be seen as segregated or compartmentalized, but are to be understood as pervasive networks and systems. This requires an interdisciplinary and interdependent approach... Design education must embrace the interconnectedness of art and science, incorporate social and foundational knowledge and recognize the essential role of collaboration and teamwork.”

These case studies illustrate a process of design research that integrates cross-disciplinary exploration in computation, user interaction, and engineering with methods of architectural thinking, making, communication, and fabrication. Combining interactive strategies with traditional design techniques as a method for introducing students to interactive environments has proven to be effective in several contexts. In the hybrid design process, students understand these forces not as separate elements but as a system of relationships. The work in this seminar encourages students to think innovatively about the future of the built environment and the future role of the designer.

Conclusion

“It is not enough to balance form and function, and it is also not enough to simply ascribe meaning. Design must now imagine all its previous tasks in a dynamic, animated context...”

“The promise of our evolving supernatural facilities – thanks to a myriad imaginative prosthetic applications of digital technologies – demands that creative practitioners fully involve people in their development on both subjective and objective levels, enabling them to make their own connections between what are increasingly permeable cultural thresholds of perception and being.”

Interactive architecture has the ability to transform the way people interact with those around them and the space around them. These projects rely on the performance of the participant and in doing so create new social relationships. We can imagine environments that are responsive to our actions, that communicate with us, and that communicate with each other.

Looking ahead, those of us who teach beginning design students need to acknowledge the shift of the discipline to include expansive definitions of space, user, and designer. We need to prepare our students to think and to design architectural spaces as time-based, live, networked, dynamic organisms.

Notes

4 Ibid. P 250

Selected Bibliography


In Search of Implementing Simulation Tools in Early Design Education

Negar Kalantar, Alireza Borhani, Texas A&M University

Abstract

Over the last decade, Computational Fluid Dynamics (CFD) software has attracted considerable attention. This paper aims to add a step on the route to provide conditions of comfort by altering wind flow patterns and speed through the implementation of simulation programs in the education of future architects. As a platform for discussion and consideration of the best method of utilizing CFD to support early design stages of architecture students’ work-flow, this paper opens with a review of a studio-based project on the notion of a self-regulated Breathable Wall system. The Breathable Wall Project exemplifies broad reach that students can have on passive solutions to purify air, incorporated into the building’s structure. Conducted in the form of an intensive four-week design assignment offered to first and fourth year architecture students at Texas A&M University, the Breathable Wall Project helped students to gain factual knowledge of the dynamics of wind. By incorporating a small-scale wind box and wind simulation software into the design process, students utilized these powerful tools for exploration of their concepts in the early design stage rather than just validation or representation of final designs (see Figure 1). Via computational and physical simulation, the Breathable Wall Project was a step toward improving the process of understanding the wind effect in building design. This paper presents a summary of the evidence on the benefits and risks of employing simulation tools in two design studios.

Figure 1: Wind simulations of the breathable wall system and tourist information center. (Simulation by Ashlyn Wilt & Esteban Armenta)
Introduction

Advances in learning technologies, the proliferation of educational options, and shifts in social and cultural norms have created unprecedented opportunities for the education of future architects. By expanding students’ awareness of the changes in architectural practice and equipping them to cope with today’s rapidly evolving technologies, education in the field of architecture should incorporate those changes into the overall architectural pedagogy. For instance, with close ties to the currently available simulation programs as design tools, educational institutions can gain knowledge in the core competencies of sustainability as an imperative priority that is essential for inventing new futures and bringing more designs to fruition.

Analytical Investigation in Architecture

In the practice of architecture, the demands raised by contemporary awareness of sustainable concerns to be more environmentally responsible, and the acceptance of analytical software by architects as design tools to support early design explorations call for improving simulation programs, resulting in a more sustainable built environment. In architecture, the advantages of having simulation tools can be leveraged by reinforcing the imperative to design a building in response to considerations of energy efficiency when the building sector make significant contributions to energy use, accounting for more than 40% of energy consumption in the United States.  

Simulation Tools in the Architecture Schools

Although there is an increasing pressure on schools of architects to adapt and use simulation software as potential generators of advanced sustainable designs, for some educators, the potential advantages of experimenting with simulation software are less undoubted. Despite the possible environmental advantages of using analytical tools, it is atypical for architecture students to accommodate performance inquiries in the primary design phases of a Curriculum. In specific, for some educators that work with beginning design students, the consequences of using digital simulation tools in schools of architecture have been grounds for more concerns. There are some reasons for such caution. For example, the complexity of simulation tools can act as deterrents to a freshman student who seeks to develop her design concept. Since running simulation programs has been challenging, even some educators come to believe that students at their early days of their education cannot get benefit of the programs around the way they want.

During the past few years, extensive efforts have already been devoted not only to make new simulation programs or modify the existing ones, but also to simplify the implementation of such programs, being much more accessible, easy to learn and easy to master. In the last decade, the reduction of the complexity of simulation tools in architecture have mainly paralleled the opportunities afforded by advanced computing platforms for big data analysis. The new generation of simulation software has more capacity to minimize the challenges, subjected to design and performance constraints.

As the literature shows, the line of investigation into architectural design induced by simulation tools can constitute an opportunity for making long-term changes in relation to the
In Search of Implementing Simulation Tools in Early Design Education

Apart from being mostly sophisticated and highly technical software that require extensive labor, time and expertise to generate and interpret an appropriate data set\(^5\), there is a need to work with simulation programs to integrate decision support software\(^6\) into the early stages of architectural design\(^7\). Fortunately, in contemporary activities in architecture education, the use of Computational Fluid Dynamics (CFD) software presents much of interest\(^8\). Much of the appeal of simulation software to some design educators stems from the fact that a new generation of simulation software is easier to operate and provide rapid feedback for understanding the effect of wind and other environmental forces in an interactive fashion\(^9\). Since simulation software permits students to examine different scenarios on a wide range of conditions, these tools will be more available to beginning architecture students in the coming years.

In the spring semester of 2016, first and fourth-year architecture students at Texas A&M University were asked to design a building as a small information tourist center in the hot desert climate of Dubai in the U.A.E to accommodate human lives. By permitting the indirect passage of clean air through, it was imperative to empower the space to breathe when sandstorms occur. Here, the concept of “Breathing Architecture” intends to allow strong winds carrying sand to enter the building in a very controlled way, providing the natural ventilation of the building and therefore the thermal comfort of its occupants.

The objective of the Breathable Wall design is to tie down sand and dust by preventing the outside sand-transporting or dusty winds entering into the interior. Via using wind pressure and the temperature differences in inside and outside of the Breathable Wall units, the units draw in air from outside the building, slow down incoming air, filter out sand particulates, and circulate clean air through the building (see Figure 3).

**The Breathable Wall Project**

To better understand the combined effect of wind pressure and speed on a project in the heart of desert, a cross-disciplinary design project provided an opportunity for experimentation with the design of different permeable building skins that can purify air as a “lung” for a building when sandstorms occur. In other words, what if a building skin itself could function like the organ to breathe and filter the air? (see Figure 2)

Here, instead of using a unit equipped with conventional filters to screen out sand, the main question is how the Breathable Wall units can turn the building into its own air filter when dusty winds pass through them (see Figure 4). Having no conventional air filtration system, the outside air is introduced to the building in a controlled manner predominantly via flow through wall units.
Air filtration for the proposed information tourist center is carried out by stackable units that form the structure of walls. As a part of the building’s ventilation system, the units themselves feature sloped surfaces which disperse the air to create a filter effect. In most of the students’ projects, to direct airflow into the small opening of a unit that serves as inlet, the units are sculpted as faceted, curved, or smooth slopped surfaces. As wind blows towards the unis, the slopped surfaces are designed to help capture sand by creating a drag that slows the wind. Since the wind cannot carry heavy sand particles at lower speeds, the particles are deposited on the slopped surfaces (see Figure 7 & 8). Then, cleaner air can be shunted through the inlet. At the base of the wall, the trap blowing sand remaining on the sloped surface drops into a removable gutter that might span more than the wall length.

In the studios, most of the proposed Breathable Walls offer a relatively low-tech, inexpensive, long-lasting, and quiet filtration systems that can save energy. In most of the students’ projects, their low-maintenance Breathable Wall systems have no operating costs, except being cleaned occasionally, but not constantly. Cleaning needs depends on the frequency of sand storms in the desert.

Acting as an electricity-free system to take most of the fines and all of the coarse particulates out of the air, the Breathable Wall system can reduce indoor air pollution that affects the health and wellbeing of people, allowing its use for domestic dwellings in developing countries specially if someone has respiratory ailments such as dust allergies. To raise occupants’ comfort level, the breathable wall can be used in conjunction with native vegetation and adding humidity.

**Performance Evaluation Process**

The Breathable Wall Project started off by the students venturing into a new field of knowledge followed by experimentation with both computational and physical simulations that accompanied the analyses of the students’ projects (see Figure 5). The simulation methods gave the authors a better grasp of the students’ understanding on the performance of their designs. While both methods of simulation inherently improved students’ understanding of particle filtration, students were inducted into a new way of designing buildings to take advantage of natural ventilation that
the Breathable wall can offer. Here, the simultaneous use of simulation software and physical wind testing expanded the virtual design environment back into physical realms and helped students with the comprehension of the consequences of various scenarios relating to the constituent elements of their designs. Here, digital and physical simulations integrated with the design process to increase the likelihood of an optimal resolution of conflicting parameters\textsuperscript{10}.

**Physical Simulation**

Filtering its own air, the wall passively blocks the introduction of sand particulates into the interior space to improves the air quality for inhabitants inside a building. By observing the mechanisms of wind-sand movement and tracking sand particle trajectories, the students made small wind boxes with dark-colored background to physically simulate atmospheric dispersion of sand over their Breathable Wall models. A hair drier was used as a wind source to lift sand grains into the air and blow them towards the box. To examine how the form and related dimensions of a Breathable Wall could empower it to meet its function\textsuperscript{11}, the students observed the apparent effect of their design on wind flow, sand transport, and dune morphology over the windward and the leeward sides of their study models. In the sand box, sand particles bounced around when they hit the front side of a Breathable Wall model. Sand which passed through the model eventually collected at the back of it due to gravity.

Although, the students could not accurately quantify their observations and measure the wind velocities at the inlet and and the wind speeds at the outlet, they experimentally understood how a simple design decision might play a great role in the lift-off and sand particle saltation. The investigations on how their models work were conducted by considering several scenarios with different wind speeds to actively acquire information.

**Digital Simulation**

The Breathable Wall Project allows students a potential means of experimenting with the possibilities and restrictions offered by Flow Design as an easy-to-use CFD software with little or no preparation required. To able to visualize the main wind flow behavior around their proposed building, Flow Design helped the students to conduct the graphical simulation of a physical environment with wind-blown sand movement.

Flow Design offered both freshman and senior students a virtual sandstorm environment in which they undertook experiments to examine complex behavior and scenarios on a broad range of settings, being very uncommon or even impossible to conduct in real life. When most of the students looked at what accomplished by Flow Design in relation to various parameters, they were happy working with this simulation tool since their Breathable Wall projects were developed around the way they think about the behavior of their project over time.

by permitting both groups of students to observe the performance of their proposed designs, Flow Design assisted
the analysis and comprehension of the wind behavior around the information center far more quickly, inexpensively, and accurately than with physical systems.

**Conclusion**

Since the goal of design education is to help students reach their potential, the Breathable Wall Project was an attempt to elucidate how architecture students could be made aware of why, what, and how they were employing simulation software.

In the authors’ eyes, the objective of using simulation tools is rooted in how to educate students and do not merely train them. The Breathable Wall Project disclosed how students might be persuaded to engage in a creative search for new design possibilities offered by simulation tools and focus on new ways of looking at problems, rather than just solutions themselves.

The Breathable Wall Project aimed to identify and meet a need that exists for a basic simulation design tool in environmental design education. In addition, the projects attempted to reveal some benefits, challenges, and risks of employing simulation tools that educators should address in order to support simulation software to be involved early on in the design process. For instance, in view of the students’ challenges in confrontation with simulation software, it is required to mention that the students’ problems of simulating their design mainly arose from inadequate knowledge of the topics under environmental design principles, insufficient expertise to operate software, or lack of curiosity.

In the Breathable Wall Project, by considering the basic principles of environmental design and passive ventilation in general, and the information from computational and physical simulations in particular, the students attempted to learn how the architecture of a small scale project in the heart of the desert can be shaped (see Figure 6). This study did not obtain sufficiently detailed information on the exact form of the building and its components in correlation with the wind movement at the exterior environment. But the results of the investigation into a simple Computational Fluid Dynamics simulation in Flow Design shows a new way of dealing with analytical information that affect architectural design process to address building form optimization and different morphogenetic prospects.

**Figure 7:** A Breathable Wall can be made out of stackable units that form the structure of walls. By changing the size of inlets and outlet and the angle of shaft between them, the goal is to disperse the air to create a filter effect. (Designed by Kimberly Lambeth & Linda Reyes)
In Search of Implementing Simulation Tools in Early Design Education

The process of understanding of how the natural ventilation of buildings functions not only affected the design process of the students’ Breathable Wall units, but it was at its very core. Thus, the Breathable Wall Project involves a shift of focus away from inventing new forms based on purely visual concerns to exploring the process of creating a form that is justified by its performance\textsuperscript{12}.

When design goes beyond its formal appearances or sculptural aspects, the behaviors and qualities of buildings that emerge from the privileging of performance within their design processes should be elevated to a more prominent position in the education of future architects. By slipping from the purely visual approach to one that is more vigilant to the climate-related aspects of space, the invisible drivers of the climate system such as air flow, velocity, direction, temperature, and solar radiation take precedence over the visible variables\textsuperscript{13}.

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Notes


Inside / Out
Gabriel Kaprielian, Temple University

Introduction

In this age of ocularcentrism, architecture has been increasingly defined by the exterior building form and façade. There has been a lack of emphasis on interior space, tectonic assemblages, and the relationship of the parts to the whole. This may be the result of advances in construction technology to create increasingly more complex forms or the proliferation of architectural images on the Internet. Or, perhaps there has also been a lack of attention in architectural education instructing students to develop their designs with an emphasis on the interior space and integration of building components?

With advances in computer modeling and rendering, there seems to be an increasing reliance on the exterior image of a building to “sell” the design. Like back seats in a sports car, the program often appears to be stuffed into spaces that are not well thought out, with circulation that is disorganized, and structure that has a blatant disregard for the laws of physics. By designing from the exterior form first, buildings often act more as a billboard rather than as a functional and inspiring interior space inhabited by people.

I ask that we consider how architectural pedagogy contributes to or challenges the design of exterior dominated buildings by students. I will describe a process that I have taught in beginning architecture studios that focuses on the design of a building from the inside out. This approach is two fold: to focus attention on the building interior and components as the primary design driver and to relate the studio project to concurrent core-curriculum courses of Architectural Practice and Structures.

By designing from the inside out, students are tasked with exploring the building as an interrelated system of parts that make up a whole. The assigned modules include: tectonic/stereotomic, programmatic massing, structure and partition, circulation and egress, and lastly, building envelope and façade, with additional exercises that included light box studies and figurative sketches exploring the interior quality of space.

I will describe my observations and critical findings from this design process, when and why I feel it is appropriate and useful in architectural design education, and how it can successfully reinforce support courses. I hope to open the conversation about architecture pedagogy by looking inside to ask how we can celebrate the design of the habitable space in the building and its relationship to a complex system of parts.

Fig. 1 Final Model Interior Space, Christopher Hague, 2015

Inside / Out

By taking the approach of designing a building from the inside out, the dialog can certainly be framed as a form follows function debate. The studio structure operates on the assumption that form generation derived from the function and relationship of internal building components creates an effective design methodology. My intention in this paper, however, is more in broadening the conversation to consider how pedagogy can be structured to focus the student’s attention to a particular aspect of architecture as a design driver and the role coursework has in defining a rigid or open-ended methodology in studio. This
opens up larger questions of how the architecture studio should frame the design process, what level of autonomy should students be given to determine their own approach, and what amount of course structure is appropriate for each level of education?

I will share coursework conducted by a 2nd year architecture studio from two consecutive years, 2015 and 2016, at the California Polytechnic State University (Cal Poly) in San Luis Obispo. This studio takes place during the winter quarter and represents the second architecture studio that the students take. At Cal Poly, each studio instructor chooses the site, building program, and develops their own coursework. In this way, studio development is quite pluralistic. As a group, 2nd year instructors meet to discuss learning objectives for the studio and general scope of the projects. For the winter quarter, the studio project is generally in an urban site, around 3,000 – 5,000 square feet, and a 3-story building. Additionally, there is an emphasis to connect the studio project to content from the Architectural Practice lecture and lab, which focuses on building systems, structural assemblages, material properties, and building code.

The idea to focus the studio coursework design on the interior space had a number of influences. This was in part a response to the proliferation of form-based architecture projects that pay little mind to the human-centered experience of being inside a building. Another factor was the reality that many urban architecture projects are primarily infill, where the majority of the design work is inside of the building and less about the relatively small exterior façade. I was interested exploring how design pedagogy could begin to develop sensitivity to the design of interior spaces, in addition to an understanding how various building components and design decisions come together. The later relates to a greater awareness of a systems thinking in architecture that seeks to bridge intuitive and analytical design by combining a holistic knowledge of architecture as both an art form and craft.

The choice to develop the building design through physical models relates to my interest in hands on learning and spatial awareness. I have noticed that students have a different understanding of structure, form, and space when working with physical, rather than digital models. This also relates to the haptic learning process that Richard Sennett describes in his book, “The Craftsman,” where artists learn to create work in a mind and body relationship through the hands. 2 When digital models replace the physical, students tend to examine their design from an exterior and aerial perspective. Design conducted by making a physical model, puts the “thinking hands” to work, relating design intent to active construction.

I will describe the coursework modules and results of the studios from two different years. The first studio was created as a mostly analog course, with the design process focused on handmade physical models. The second studio, while utilizing most of the same modules and course content, combined both
a digital and physical approach. In each year, there is a focus on process and craft. Design for each module begins with hand sketching, quick rough modeling, and construction of process models that pay attention to craft. By elevated the status of process models the intent is not to keep the design static, but rather build representation skills.

**The Art of Making Part I**

The architecture studio project involved the design of a 3-story building on an urban infill site in San Francisco’s Mission District. The program was an Artist-in-Residence, the type of the student’s choosing, combining programmatic live and workspace with public and private areas. The studio title, “The Art of Making,” referenced both the program and also the design process. Art is often viewed only in its final form, a painting hanging on the wall of a gallery or a sculpture in the courtyard of a museum. What is often overlooked is the process with which the art was made. Architecture, like art, involves the refining of craft to achieve successful work, allowing the hand to inform the mind on the possibilities the work may accomplish. This iterative process involves a conversation between the student and their work through continuous making and remaking.

“Practicing architecture is asking oneself questions, finding one’s own answers with the help of a teacher; whittling down, finding solutions. Over and over again.” – Peter Zumthor

For the studio project, I choose a particularly confining site to emphasize designing the building from the inside out. The site measured 26 feet wide and 90 feet long, with buildings on either side. The front of the building faced a major commercial street, while the back of the building connected to a service alleyway. This meant that there was a relatively small front façade and that it would be difficult to fit the programmatic areas, circulation and egress, and bring in ample natural lighting.

**Surface Unfolding**

I began first with a warm-up project that focused on the unfolding of a found object’s surface. The goal of this project was to first wake up the student’s creativity after a long winter break and to attune their attention and skills in right/left brain awareness, abstraction, and composition. By unfolding the object’s surface, the students were conducting an exercise in descriptive geometry. While students were not asked to utilize mathematical formulas, they were tasked with unfolding each surface as accurately as possible and drafting the final result by hand using pen on Mylar paper.

Students began first with thumbnail sketches of the unfolded surface, each a unique composition starting from a different part of the object. A requirement of the exercise asked that each surface unfold from the next, accounting for all visible surfaces. For instance, a cylinder would have a top and bottom surface and the sides would unfold flat; a circle could unfold in many ways, like the pealing of an orange. If students had difficulty determining the method of unfolding, they were asked to draw it, cut it out, and see if it folded into their shape.

**Programmatic Massing**

The first studio module relating to the project brief asked each student to determine the type of Artist-in-Residence that they would design. A general program with square footage was given, however, students were required to research the particular type of art that would be made in their building and determine spatial needs. To add further complication to the program, I introduced a requirement that there be both living and working space and public and private areas. I asked that they consider the adjacencies of each program and spatial connections. Students began their analysis by diagrammatically sketching out programmatic areas and spatial relationships horizontally on each floor and vertically between floors. Students were asked to then create a rough draft of their three-dimensional programmatic massing model using first folded paper and then ultimately color-coded wood blocks that would assemble and stack together.

**Structure and Partition**

In the next module, we began first by exploring the use of a modular grid as a spatial organizing principle and as it relates to
Gabriel Kaprielian

building structure. Students researched the use of modular grid systems such as those developed by Frank Lloyd Wright, Le Corbusier, and traditional examples such as the Japanese tatami mat. These grids have been used in architecture to create organization and simplicity in design, while referencing proportions of the human body and relating to structure and wall placement. After developing a modular grid design, students then researched the structural materials, concrete, wood, or steel. After researching the material properties, students created a structural grid that related to their modular grid spacing, while considering their programmatic areas.

Since most of the students in 2nd year were taking a Structures course, I asked that they get input from their instructor. Each student created a rough structural model with applicator sticks and paper partitions to represent load-bearing walls. Most of the feedback from the Structures instructor involved simplifying and being bolder in their design, much to the surprise of the students. After receiving feedback, both structural and aesthetic, students created a final structure and partition model. Some adjustments to the programmatic areas were made, however, structure and partitions were mostly shaped around the design intent of interior space.

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Architectural Practice course. One week of the lecture is devoted to the study of building egress systems.

Students were asked to research code requirements for egress in their building typology. They used this research and their current programmatic and structural design to develop a circulation plan for their building. The previous design of the modular grid, structure, and partitions, assisted the students in creating a clearly organized circulation plan connecting to each programmatic area and egress exits. The physical model required that students show the egress pathway for each floor and the vertical stairways and elevator connecting them.

Envelope and Façade

The last model in this part of the design process involved designing a skin for the building. Once again, this was considered as much from the interior perspective as from the exterior. Students were asked to consider the location of programmatic spaces, structure, and circulation when developing the building envelope. Attention was paid to the role of the envelope as both a barrier to the outside and opening for light and views, referencing once again material from the Architecture Practice course. There was particular focus given to the experience of being inside of the building and the appropriate location of fen-
ereation and subsequent quality of light. With such a constrained site, it was important to explore the potential for light apertures on the front and back façades, light wells on the sides, and skylights on the roof. Students were also tasked with regarding the façade as the “face” of their building. In this way, the façade played a role in representing their Artist-in-Residency in form and material.

Before beginning the design of the building envelope and façade, students researched the quality of interior light that they wanted to achieve and explored precedent studies. They created experiential sketches illustrating a cinematic progression through major areas of the building, described in light, shadow, and materiality. Students made a rough light box model to investigate the quality of light at different times of the year and day using a sun peg diagram. The subsequent envelope and façade model was made in response to the light box study and previous module designs of the interior building components. The final model and section model were made for the end of quarter review, representing the culmination of the design process developed through hands-on model making from the inside out.

Building Unfolding

For the final review, students unfolded the interior of their building as a two-dimensional drawing. In part, this was a return to the first assignment; in this case their building had replaced the found object. Interior section elevations unfolded from all four sides of the first floor plan and continued to unfold, including exterior elevations. Using multi-media techniques, students combined text, collage, shading, and entourage to visually represent the interior space of the building. Text was used to create a design narrative and describe the building experience. Collage represented views out of the windows, materiality, and the atmospheric intention of the interior space. Shading was used to depict light and shadow from the building apertures. The combination of unfolding and multi-media composite created a drawing rich in visual representation, while focusing attention on the relation of the parts to a whole.

The Art of Making Part II

In the next year that I taught this studio, I reflected on the strengths and weakness of the course structure and made some alterations. While keeping the studio intent to design a building from the inside out, I decided to combine both digital and physical methods to develop each module, while also choosing a more complex site and adding a new module focused on site analysis. The program and scope of the project remained the same, designing an Artist-in-Residence. Also title “The Art of Making,” student once again focused on developing their design through a series of modules related to different components of the building design.

Digital / Physical

The incorporation of digital modeling and drafting opened up new possibilities, while losing some of the benefits of the analog handmade design process. It replaced much of the hand drawing and rough draft models with a more streamlined process of digitally fabricated physical models. The digital model was used both as an iterative design tool and for representation. Students were asked to create an axonometric drawing of each module design. This was done for review before the digital model was cut and also to serve as visual reference for construction and as an archive of the design process.

The ultimate result of developing a digital model for each module component was to have a complete digital building model at the end of the design process. This was useful to visually represent the building design through an exploded axonometric of components, sections, elevations, floor plans, and renderings. I believe the combination of digital development and physical
process models allowed for a more complete building design and representation compared to the previous year. This was most evident in the final poster boards.

**Tectonic / Stereotomic**

For the studio project, I choose a larger corner site with two street facing facades to add complexity. I began with a new module that focused on site analysis to better inform the building design. The result was a three-dimensional tectonic and stereotomic response to the site factors. This began first with an in person site study where students annotated surrounding observable site factors as lines on a base map. These lines may include reference to physical attributes of adjacent buildings (windows, doorways, façade extrusions), public space (sidewalk, telephone pools, bus stops), and important view corridors. Back in studio, students added unseen temporal climatic site lines such as sun angles, shadows, and wind direction at different times of the day and year.

The next step involved the creation of a compositional hierarchy of the lines using different line weights and types based on a site analysis system developed by each student. Students then began to edit the lines, deleting some and trimming others with existing geometry, while important nodes of intersection were highlighted. Through a series of operations, students transformed these lines into a three-dimensional construction, utilizing different size basswood for tectonic expression of line types, while creating planes and solids to form stereotomic features. Tectonic lines may represent sun angles, circulation, or an entrance, while stereotomic walls and solids may indicate a major interior area or spatial divide. The result was an abstract representation of the site analysis and spatial configuration. This exercise led to a more dynamic and site responsive building form in the Programmatic Massing module and continued throughout the design process.

**Reflections**

At the end of each quarter, both the students and myself were amazed by the amount and quality of work that was produced. I believe that this was proportional to what was learned during the course of the design process. It seems clear to me that the studio structure was successful in focusing attention on the interior space and the system of components in a building as the primary design driver. The integration of content from concurrent Architectural Practice and Structures courses into the studio work was also successful. Instructors of these courses reported that the students performed better than average. Additionally, student feedback indicated that applying this knowledge directly into studio work reinforced their interest in these courses.

The regular weekly modules allowed students to delve into a particular task and not get lost in the process of architectural design. The deadlines kept students on pace and focused their creative energy. This led to a prolific amount of work created by the students. Keeping the students motivated was essential. Borrowing a line from a colleague, it required “suspended disbelief" to trust in the process. At the end of the quarter, most students appreciated the regular deadlines that kept them on pace throughout the quarter. Some did not. Although, I will say that most had a more positive outlook on the process at the end, rather than in the middle. Overall, both studios as a whole produced a high quality of work and stayed on task. This was particularly noticeable in students that were not strong designers. The structure of coursework and regular deadlines seem to assist them in their design process.
Another critique by students and faculty was the rigidity of the process. The specific guidelines in each module and a linear process did not allow for much experimentation of alternative design methodologies. This also extended to the design representation. A result was that students were less likely to radically change their building concept throughout the process. This may be seen as a design limitation. From another perspective, students were more likely to work through design problems rather than try something completely new.

Most students ultimately had a positive view of the process by the end of the quarter, understanding that this was just one approach among many. The structure of this course is certainly more on the side of an analytical approach rather than intuitive. In that regard, this studio lacks some poetics in its exploration of interior space. I personally feel that it is beneficial to balance open-ended exploration in studio with instruction that teaches a particular process and methodology. To that end, I feel that the format of this studio was particular useful in the 2nd year curriculum for winter quarter as it represents in many ways a prequel to the comprehensive studio taught in the 3rd year.

By designing through physical models, students developed a greater spatial awareness in their design process. I believe that this was particularly noticeable in their understanding of interior space and the relationship of building components to each other. The result was evident in their final models and drawings when they combined the work of each module and synthesized it into a final design. Of course, the modules were themselves part of an iterative design process. By making a physical model of each component, students were forced to get their ideas out of the head, off of the paper or computer, and into a tactile three-dimensional form that was then able to create a dialog with the student.

**Conclusion**

This studio can be deconstructed into a variety of discourses; exploring building design from the inside out, integrating concurrent course content into the studio work, designing through physical models, and the benefits and disadvantages of a rigid studio structure. While the title of this paper indicates an emphasis on developing architecture pedagogy that focuses on design of a building from the inside out, I believe that a discussion of the methodology to achieve this result is equally as important. How do we train the next generation of architects to look beyond skin deep building aesthetics, to consider the interior experience of a building as equally if not more important than the exterior, to understand the relationship of building components as a system of interrelated parts? In my opinion, this will take a pluralistic approach to design education. While I believe that the studio structure was highly successful in achieving its outlined goals, if all studios were like this one, it would certainly create unbalanced and perhaps uncritical architecture students. However, I feel that it is important to take chances in this regard and consider the individual studio in relation to the larger educational experience.

**Notes**

Site Analysis as Design
Gabriel Kaprielian, Temple University

Introduction

To begin with why, we often start with a study of the site, the people, history, and environmental factors that make each place unique. While the physical site serves as the base of the project, analysis provides the basis for an informed and meaningful design approach. The Architect’s Handbook of Professional Practice states, “Site analysis is a vital step in the design process” to identify “constraints and opportunities” that led to “good building design [which] responds to the inherent qualities of the site.”

Why is it then that site analysis is so quickly discarded after the design process begins? Architecture students often approach site analysis as a passive and objective endeavor that is required in order to get to the exciting part, designing a building. Sometimes they view the site with contempt that it may actually hinder their creativity, rather than inspire it. Is this due to purely formalist tendencies of the architecture student? Could it be the dominance of other design factors such as program, structure, and materiality? Or, is it perhaps that our approach to site analysis is disconnected with the design process?

I propose that we reframe site analysis as a design exercise, one that involves active and subjective work through investigation and representation of contextual information. I believe that this will provide an opportunity for architectural designs that are more connected with the site and whose form is developed in response to a narrative of place. By critically thinking about site analysis as a beginning phase of the design process, students can better tackle complex relationships between the built and natural environment, observable and unseen factors, and social issues that more thoroughly place a design response within the continuum of history and culture imbedded in a site location.

In an attempt to frame site analysis as an integral part of the architectural design process, I will discuss series of exercises that I have used in beginning design studios and the literary prece-

Site Thinking

Site is not easily defined in architecture, as it represents both a physical place and a conceptual construct. Site is never a blank canvas or tabula rasa, but a rich tapestry of embedded
knowledge and dormant potential. Site is more than “constraints and opportunities” from a suitability analysis. It is more than an analytical process of categorizing geological and climatic information, real estate value, or demographics. It is at once measurable and comprehensible only through analysis of its parts. Sites incorporate multiple realities simultaneously and can be represented through diverse perspectives and subjective interpretations. Site analysis offers fertile ground for an engagement with the architectural design process.

While Site Planning and Design remains a core component to licensure examination, like professional practice, it contains a narrow view of the relationship of site to architecture. This view has been primarily focused on the physical, rather than the conceptual understanding of site; more concerned with defining what is “important” and “valuable” information, outlined in prescribed deliverables. Architectural pedagogy has mirrored practice, often approaching site through an analytical and scientific approach. This paper proposes that it is time to explore innovative approaches to incorporate site analysis as a design exercise. This begins with site thinking to question and redefine site in relation to architectural design.

In Site Matters, Carol Burns and Andrea Kahn describe site thinking as “continually oscillating between material and conceptual, abstract and physical, discursive and experiential, and general and specific points of view.” This varied and contradictory interpretation reconfigures site as a dynamic process and places it in a broader discourse. With both physical and conceptual identities, site offers to participate in a dialog with the designer. Site gains meaning through analysis and the designer gains knowledge through its representation. Andrea Kahn states that, “ideas of site come through making. Designers confront the challenge of defining sites through a creative process of representation.” It is precisely the process of discovery through site analysis and representation that I am most interested in.

Site Mapping

The work and writing of James Corner has brought site analysis into the foreground of the design process. Like Kahn, Corner has come to a similar conclusion in his essay on the “AGENCY OF MAPPING,” where he states “… mapping is perhaps the most formative and creative act of any design process, first disclosing and then staging the conditions for the emergence of new realities.” Mapping is a subcategory of site analysis that as Corner describes is itself a design process. It involves the geo-spatial representation of information, which must be selected, organized, and abstracted for visual clarity. As Corner says, “Maps present only one version of the earth’s surface, an eidetic fiction constructed from factual observation.”

Mapping, as a component of site analysis, derives its meaning as a creative practice. Maps are able to layer information to highlight areas of convergence; they can uncover unobservable site factors and visualize multiple time periods simultaneously. In this way, maps can “reveal and realize hidden potential” and “by showing the world in new ways, unexpected solutions and
effects may emerge.” However, it is the mapping process as a design activity, rather than the map representation, which I see as the most important aspect to incorporate in site analysis pedagogy.

Site Experience

In contrast to mapping, direct site experience allows the body to observe the site through the senses. A site visit literally puts the site in perspective view. Rather than the predominantly planometric view of most maps, walking through a site allows for another form of mapping that can record temporal moments and phenomenal characteristics. Elizabeth Meyer has called this experiential perception of site “haecceity.” The sights, smells, sounds, tastes, and feel of a site recall a corporeal knowledge that is often referenced in a phenomenological understanding of the world. Furthermore, this type of intimate site knowledge begins to define a sense of place.

The philosophy of experience found in a phenomenological approach to architecture offers an important counterbalance to site knowledge mitigated through the computer screen. Heidegger’s concept of “dwelling” ascribes meaning to site or a locale when it is built upon. He describes the process of defining a boundary, which I take as a reference to site analysis, as “that from which something begins its essential unfolding.”

Christian Norberg-Schultz continues this ontological perspective as it relates to a sense of place in the built environment. His concept of “genius loci” is described, as “representing the sense people have of place, understood as the sum of all physical as well as symbolic values in nature and the human environment.” A reading of the site in these terms cannot be easily reduced to a representative form. However, this personal and experiential understanding of site is a wellspring for design inspiration. I believe that Juhani Pallasmaa says it best, “My body is truly the navel of my world, not in the sense of the viewing point of the central perspective, but as the very locus of reference, memory, imagination and integration.”

Site Representation

As a practice, architecture is primarily concerned with design representation. Similarly, the process and product of representation in site analysis serve as an act of disclosure. Andrea Kahn says that “site representations construct site knowledge; they make site concepts manifest by design.” In this way, site analysis becomes a design process that is connected to architectural production. Nevertheless, it is the process of site representation rather than the product that is the most generative aspect. Kahn continues by adding that “representations such as drawings and models, do not simply illustrate what designers think; more profoundly, they reveal how designers think.” This reflects my own interest in understanding how students learn to design, and in this case, how the site can inform their approach.
Site Analysis as Design

Where and how do architecture students begin their design? What informs their design process? What determines whether their design is an appropriate response to place? How do they conceive meaning and develop an argument to justify their design approach? I will share examples of how I have attempted to address these questions by incorporating site analysis exercises as a core component of the design process. This includes a broad view of site definition that recasts its boundaries, both physical and theoretical. A variety of mapping techniques are utilized to uncover hidden site information that cannot be observed, while experiential site visits form a basis of corporeal knowledge and complement the geo-spatial studies. Ultimately, the exercises that I will describe explore the way students make meaning from site analysis and incorporate it into their design.

Site Analysis as Architecture

At Cal Poly, I taught two consecutive years of 2nd-year Architecture Studio and the corresponding activity session for Environmental Control Systems (ECS). When developing the curriculum for the studio, I sought to incorporate knowledge from the ECS lectures and labs directly into the design process. However, student attempts to integrate a traditional approach to site analysis into the design process often appeared more of an afterthought than a design driver. What originally began as an attempt to integrate concepts from the ECS class into the studio led to a much larger exploration of site and how it is perceived and taught.

The architecture studio project was a small monastery sited in the Carrizo Plains of California. The monastery was required to be off the grid and without electricity and central heating. As an externally load dominated building, this foregrounded issues of site location, climatic conditions, orientation, and passive systems covered in the Environmental Control Systems lab and lectures. The labs for ECS take an analytical and scientific approach to understand concepts such as solar angles for fenestration and how this can inform building orientation, aperture size, and appropriate shading devices. In an attempt to incorporate these topics into a beginning design exercise, I realized it becomes a subjective and exploratory investigation with a multitude of potential meanings and outcomes.

The first exercise was to create Sight/Site Lines. This began with a field trip to the site in the Carrizo Plains where students were asked to demarcate observable phenomena as lines. These lines may include views to distant geographical features, such as a mountain peak, or more immediate topography such as rock formations and trees. They were asked to take photos of these views, while also recording images that created a “palette” of the site’s colors, textures, and patterns. In addition to the sensorial aspects of the site analysis, students were asked to consider what they were not able to experience directly. This included temporal factors such as climatic changes over the course of the day and year, how the site has transformed throughout history and geologic time, and the relationship of the immediate site to the larger region.

Back in studio, students transcribed their fieldwork onto a digital site map and added to it with Site Lines that were not visible during the visit. Using Climate Consultant and a sun path diagram, students mapped the predominant wind directions and important sun angles at different times of the year. The combination of the Sight/Site Lines subsequently served as a scaffold for the next three exercises, Site Lines Collage, Site Morphology and Monastery Mash-up.

The Site Lines Collage exercise asked students to combine on-site observation with historical, geological, and cultural research of the site. Using the Sight/Site Lines as an organizing principle, students were tasked with visually composing their site research, with focus given to representation and compositional hierarchy. The final production was a complex reading of the site mapping and layering of information that revealed new site knowledge and manifested ground to build upon.

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to be considered a building, but rather a design response to the site factors, allowing for a diversity of interpretations. This approach involved allowing the intuitive “thinking hand” to collaborate with the “analytical mind” to develop a meaningful and compositionally compelling response to the site analysis. For example, the wire may start as the angle of the sun on a summer solstice and then bend into alignment with a view. The folded board could follow the line of the wire or be considered a separate element, deciding to enclose an area and block predominant winter wind or create an opening to receive the sun and reveal a view. While there was no scale in the model, students were asked to consider the scale of parts to each other in the composition.

The final exercise to incorporate the *Sight/Site Lines* involved creating a deconstructivist mash-up from a Cistercian monastery case study. Students were asked to draft the floor plans of an assigned monastery in order to understand an ascetic program, building organization, and scale. Like a mash-up song, the programmatic parts of the monastery could be cut and rearranged using the *Sight/Site Lines* geometry to create a new composition. The resultant *Monastery Mash-up* combined site analysis, representation, and precedent study together, establishing a framework to inform further design.

*Site Analysis as Urban Design*

At Temple University, I taught a 4th year Urban Design studio this past fall, where I employed similar site analysis exercises to see how they would work in a larger urban context. The studio project was to redesign the Northeastern Embarcadero waterfront of San Francisco for the year 2040, accounting for sea-level rise by the mid and end of the century and projected population growth. The studio was tasked with creating a resilient waterfront plan for the entire waterfront site from the Ferry Building to the Cruise Terminal. For the first half of the semester, students focused on the urban design scale and were paired up to redesign one of seven piers and the corresponding waterfront area. The second half of the semester focused on individual architectural design of a single building on their pier.

Given the complexity and scale of the project, I incorporated a variety of new exercises that utilized mapping to uncover the interrelationships between social, ecological, and infrastructural factors. Additionally, the importance of urban transformations along the waterfront was vital to an understanding of the current and future conditions. Therefore, students researched the local urban morphology and historical ecology to inform their *Sight/Site Lines* and *Narrative Mapping Collage*.

Since the students were unable to visit the site in person, an experiential aspect of the *Sight/Site Lines* exercise was missing. To compensate for this, students conducted extensive mapping of the surrounding area using Google Earth for views and ArcGIS to layer data. With digital mapping software, each team layered current city data and geo-referenced historic maps to investigate the urban transformations along the waterfront and on their assigned pier. In addition to transcribing important view sheds, climatic factors, and the present built environment, the *Sight/Site Lines* also layered past transformations and future sea-level rise scenarios.

The *Narrative Mapping Collage* represented site analysis research of the past, present, and future. Beginning with ArGIS, students created a scaled geo-spatial map as the base of their composition. Their collages combined photomontage techniques with geo-referenced maps and data, uncovering a layered understanding of complex and intertwined site factors.

The second phase of the *Sight/Site Lines* exercise involved creating a compositional hierarchy by defining major and minor lines, deleting and trimming geometry, specifying important nodes of
intersection, and defining spatial relationships. While abstract and relatively subjective, students were asked to consider the meaning of each operation as it related to the site factors.

Students conducted case studies of similar waterfront projects around the world, which they drafted as scaled figure ground projections. Again, students created a Case Study Mash-up, where they arranged building footprints from precedent studies and then edited them with their Sight/Site Lines geometry. This gave the students an understanding of scale and how buildings might be situated on their constructed site design. After a refining of the resultant figure ground footprint, students overlaid a programmatic word collage to represent design intent of each interior and exterior built space.

Given the wealth of information in the urban context, the site analysis exercises proved to be highly successful in generating site knowledge and formal representations. Each team usually focused on a few Sight/Site Lines as major organizational factors, whether they were based on a connection to the existing pattern of development, climatic orientation, or views. Some teams were inspired by their Case Study Mash-up compositions, while others focused more on an infrastructural or formal pattern of development.

**Site Analysis as Past, Present, and Future**

The last example of site analysis integration in design that I will share is from a summer program that I directed at UC Berkeley called Design and Innovation for Sustainable Cities. In this intensive five-week program, students explored an interdisciplinary and multi-scalar approach to design and analysis in the urban environment. Through lectures, urban seminars, workshops, field studies, and studio work, students engaged in discourse and design aimed at addressing the challenges of urbanism with innovative and sustainable solutions. In response to the San Francisco Resilience Plan for 2040, students worked in teams to develop resilient urban design proposals in four neighborhood corridors within the city. Their task was to respond to several interconnected challenges posed by the city including, climate change, infrastructure, social inequity, and housing.

With only a quarter of the students having a design background and the vast majority coming from abroad or across the country, the importance of site analysis was paramount to developing an informed design response. Site analysis was framed in both physical and theoretical terms. The urban seminars and lectures allowed for discourse into the meaning of site and a critical examination of methodological tools for design and study. Field trips to the sites with guest lectures combined an
Site Analysis as Design

experiential understanding with a deeper framework of site knowledge. Students worked in groups to create analog mappings of their sites, examining the observable factors, categorizing and geo-referencing photographs and notes on the wall.

Students had a robust introduction to mapping with ArcGIS to compare with their analog mapping observations and investigate the unseen ecological, social, and infrastructural factors, past, present, and future. Teams were asked to consider the urban transformations of the past, how this affected the present, and how it can be used to inform future design proposals. The studio result was an urban design proposal that sought to address the challenges posed by the San Francisco Resilience Plan, while responding to the unique conditions of their neighborhood. The final production included a model that combined analysis of the past and present urban environment and speculative future design.

Fig. 8 Past, Present, Future Models, Design and Innovation for Sustainable Cities (UC Berkeley)

This Past, Present, Future Model incorporated a light box in the base that illuminated the historic maps printed on a transparency sheets. The current urban form was depicted by a laser en-graved acrylic base with a massing model of existing buildings cut out of basswood. The speculative design proposal was then 3D printed and overlaid on top. Besides creating a compelling physical artifact, the Past, Present, Future Model sought to make visible both the final design and the process of site analysis as one composite assemblage.

Reflections

What is clear from my experience attempting to develop site focused design coursework, is that there are a vast number of approaches and comprehensions of site possible. Methods and perceptions of site analysis that are currently incorporated in the practice of architecture are only scratching the surface and may not equip students for the future trajectory of the profession. Rather than mirror practice, I believe that it is essential to challenge the normative approach to site and expand our methodologies and perception of what is “useful” site information. I see new potential directions for architectural pedagogy to incorporate site thinking and site representation as a primary design driver.

The exercises that I have presented represent a modest step at incorporating site analysis as a design activity in the architecture studio. It is clear to me that these exercises have been successful in foregrounding site as a primary factor in the architectural design process, while at the same time they are idiosyncratic, flawed, and bias in the approach. The question of how to begin the design process is a complex and divisive one. We often develop “tricks” in our design methodologies that allow for an abstraction of variables and system of problem solving that is both analytical and intuitive. Architecture is neither a clear nor linear process, as design decisions are worked on and reworked through an iterative process.

The Sight/Site Lines exercise represents one methodology to incorporate a variety of site factors to begin determining relationships between the building and surrounding context. This abstraction allows for a level of subjectivity and intuitive design thinking, while incorporating analytical and measurable factors. The ambiguous relationship between the two is often confusing for students at first. However, in the process of editing the Sight/Site Lines, students make a vital leap from transcribing site factors to developing a hierarchy of relational qualities that make a path for site thinking. In this way, students begin to actively participate in creating a mapping of the site rather than a “tracing.”
The planar approach of the *Site*/*Site Lines* and *Collage* exercises are certainly bias toward a planometric design. This is a limitation to the formal arrangement of a design process that looks primarily from a single vantage point. By beginning in the plan view, students tend to base much of their design on floor plans. The *Site Morphology* exercise is an attempt to begin translating the two-dimensional work into three-dimensional form without simply extruding the plan view. In many ways, I believe this exercise is more successful than traditional massing models for its formal constraints and abstraction. However, students have often expressed similar confusion in translating a three-dimensional abstraction of the site analysis, while not directly designing a building. I feel it is precisely this tension that leads to design breakthroughs.

The use of mapping in the site analysis exercises, while also bias toward a planometric view, is a rich process of “gathering, working, reworking, assembling, relating, revealing, sifting, and speculating.”14 Mapping is itself a design activity that makes sense of layered information through abstraction and representation. The use of mapping in the architecture studio is far more than creating a base map. Rather, it is a process of uncovering multiple layers of information and making them visible through representation. James Corner reflects on the “maker’s own participation and engagement with the cartographic process” as a vital aspect of developing new insights in developing a discourse with the site to inform appropriate design solutions.15 Incorporating the composite montage of the collage adds another layer of agency in uncovering and representing site meaning. This technique breaks from the conventions of the geospatially referenced information and allows the students to layer alternative site imagination, which can convey multiple subjective realities.

In the seminar class that I am currently teaching, called appropriately “Site Analysis as Design,” I have been incorporating a similar theoretical framework for course reading and discussion, while utilizing many of the site analysis design exercises. However, in this case, there is no architectural design project in the course. The design is the representation of the site analysis itself. The course is set up to explore and question what it means to construct knowledge through design and discussion of the site. Students have expressed how little they have focused on site in previous design studios, or how this type of investigation is not typically taught in architecture, but rather the disciplines of landscape architecture, planning, or geography. However, they have already shown a deep interest and aptitude for exploring concepts and representational techniques that manifest site knowledge. Many have discussed how they might incorporate this understanding into their design studio project, while others simply describe how the focus on site analysis as design allows them to see the world in a new way.

**Conclusion**

Architectural pedagogy should not remain static in an approach to site analysis that mirrors the profession, but rather explore new tools and techniques that aim to incorporate site knowledge directly into the design process. This may come from rethinking the relationship between conceptual construct and physical condition of the site, leading to what Carol Burns and Andrea Kahn refer to as “concrete theorizing.”16 New approaches may also be informed by interdisciplinary cross-pollination. I believe mapping, as described by James Corner, is still a relatively untapped potential in the architectural design process, which can open new worlds of knowledge, past, present, and future. There is no blank canvas for architecture. The site is a rich and fertile ground of information, stories, and haec-city. By finding innovative ways to uncover what is imbedded in each site, architectural responses will be all the richer for it.

**Notes**


3 Burns and Kahn, Site, xxi.


Introduction

Design Innovation (and Entrepreneurship) is generally praised for contributing to society, economic development and sometimes for improving the human condition, at least in the short term. Innovators, likewise, have enjoyed “rock star” status in the media. Apple for example, the often cited leader of design ingenuity and taste, along with its CCO Jonathan Ive, have inspired a generation of design innovators. Technology startups with a design focus have flooded the market with new products from Nest to Fitbit and so many others -many have generated great profit in acquisitions and IPO’s. More recently, the allure of innovation and entrepreneurial success has spread to academia where innovation centers and curricula have been founded to capitalize on student and faculty inventions. In some cases, these efforts have helped increase budget-strapped University revenue through Technology Transfer offices. In short, Innovation has become an academic virtue in the educational landscape and curricular programs have been eager to promote and advance its benefits.

But what happens when innovations such as the Smart Phone and others, harm the user after they help? Undoubtedly Smart Phones and other innovations have transformed the way we live, but at what cost? Our Smart Phones have also arguably impacted our attention, social skills and posture, sometimes negatively.1,2 Too often we adopt innovations with immediate fix benefits without considering the longer term impact they have on our health, the environment and other parts of our lives and communities.

At the University level, there is the unique opportunity to raise these critical questions with students in Innovation and Entrepreneurship curriculums before they encounter the market pressures of the workplace. This paper will present a series of lectures and exercises that were offered in a cross-disciplinary design, innovation and entrepreneurship class “Managing Technology Commercialization,” which was offered at Virginia Tech, in the fall semester of 2016. This class was an experiential learning capstone with a team invention-driven term project at its core. The goal of the these exercises was to challenge students to ask hard questions about how their team invention projects might impact society around them beyond providing their core value propositions to their customers and profit to their creators. In short, students were asked to address fundamental ethical questions: how many steps forward and how many steps back might their proposed innovation make? The result is an initial platform for critical thinking in design, innovation and entrepreneurial education- one that cultivates a richer student understanding of social responsibility by analyzing the tradeoffs between offering value and creating harm. Innovation examples such as the automobile, smart phone, plastic water bottle and Biolite Stove, amongst several others, are considered to develop this critical perspective.

To help clarify our discussion in this paper, we will differentiate between the terms “invention” and “innovation.” “Invention” will be used here to refer to a novel technology or design that could be the basis of a entrepreneurial startup. “Innovation” refers to something more abstract and has multiple meanings and associations in language and culture. We will not attempt to define the breadth of its usage; Instead, we will use “innovation” to refer to an “invention” that has been widely adopted commercially such that it has had impact on society in some manner.

Managing Technology Commercialization: Background

While focus on Innovation and Entrepreneurship at the University level has been strong, following success stories at Universities like Stanford 3,4 (figure 1) not a great deal has been written about the unintended impact of innovation. Karl Sveiby and his colleagues from the Helsinki School of Economics found that 1 of 1000 articles about innovation are critical in nature.5 Unsurprisingly innovation and disruption remains a heroic topic in society and Universities in particular have seized innovation and
entrepreneur as a potential savior for their capital budget woes. Some innovation curriculums, however, have included studies about Social Entrepreneurship, B Corporations and humanitarian driven startups and the value to society they foster. This paper outlines how innovation impact, both intentional and unintentional, as stated before, formed a key learning objective in our class “Managing Technology Commercialization,” an evolved capstone offered in the Fall of 2016 at Virginia Tech.

Managing Technology Commercialization: Class Mechanics

The class met for 3 hours once per week in the evening and was taught by the author and Professor Marc Junkunc of the Management Department of the School of Business. Omid Bagheri, a doctoral student in Department of Finance assisted in the mechanics and logistics of the class. The class was established as a partnership between Industrial Design (College of Architecture), the College of Business and the College of Engineering. Part of the impetus to do so was supported by broader University initiatives to promote technology transfer to the private sector. Three years prior, in 2013, the class began as an NCIIA-funded pilot called “The Startup Class” but the focus has continually evolved. The Fall semester 2016 was the first time it fulfilled the required Professional Practice course requirement for the Bachelor of Science degree in Industrial Design. As a partial result, the class was disproportionately filled with Industrial Designers; 30 of the 49 students were Industrial Design juniors and seniors. Seven (7) were from the College of Business and the remaining twelve (12) came from various departments in the College of Engineering. Because the class was slightly imbalanced, some students expressed concern that Technical and Business perspectives would not be adequately represented in the term project. To counteract these concerns we leveraged the Doctoral student’s involvement and required teams to meet more regularly with technical resources for their assignments.

For the first 10 weeks of the semester, classes consisted mainly of lecture materials based on contemporary innovation and entrepreneurial literature and coursework from texts like the Business Model Generation, Change by Design and elevator pitch and communication books like Made to Stick. These texts supplemented invited lectures from current entrepreneurs, intellectual property experts and class alum, some who were embroiled in the startup funding process.

The central graded deliverable for the class was a team project that explored the potential user value and commercial potential of a University owned intellectual property. Most often a professor had created an invention in a lab and subsequently disclosed the details to the University Technology Transfer office (VTIP). In most cases, these disclosures were of a technical kind, but the variety of projects was wide. Many had been successfully patented. Projects ranged from building sensors, to 3d printing vending machines and miniature gas chromatography technologies. Other kinds included a wearable women’s safety device and wood construction toy.

Projects Fall 2016
1. Micro Gas Chromography Device
2. Women’s Safety Wearable Technology
3. Micro CT Scanning Technology
4. Wireless Charging Technology
5. Social Fitness Wearable Device
6. 3d Printing Vending Machine
7. Modular Wall Planter
8. Low Tech Wood Block (Zebra Blocks)
9. Natural Language Educational Programming UI
10. Dementia Testing Software Technology
11. Integrated Building Sensing Technology (GAITE)

Many of the technologies that were used in the class had no immediate plan for commercialization despite having secured patent protection. Moreover, despite patent protection, many of the inventions had unclear benefits to customer groups or solid cases of business viability. In all cases of the student projects, user/ customer value propositions and business viability were assessed given the presence of their technical possibility. Following contemporary startup practices and supported by the required readings, a principal assignment was to use Design Thinking and Customer Discovery techniques to explore who the customer might be – teams would identify, interview and explore the value of their invention with potential customers. Finding a “product/ market fit” was a key...
Considering Unintended Impact of Innovation in Design Education

deliverable for the class. Many of the projects ended up targeting a far different user/customer group by the end of the semester. Some teams concluded by the end of the semester that their technology would be difficult to commercialize.

Business modeling was an equally important task where students explored deeply how their invention might be commercially viable. These components of design innovation reflected the Design Innovation framework popularized at the D.School and used in Design, Engineering and Business programs globally. The framework generally consists of three interlocking parts: Technology Feasibility, Business Viability and Human Desirability/Usability (figure 2). Overall, this framework addresses immediate human interests but can overlook longer term impact on people and communities as we will show next in the discussion.

**Impact: The Fourth Design Innovation Criteria**

To explore the theme of unintended consequences in innovation, a fourth circle, “Impact” was proposed as an addition to the well known 3-part Design Innovation framework (figure 3). To present the case, a broad lecture titled “Innovation, Entrepreneurship and Impact” was offered in the third week of class. The lecture was divided into two main topics: Innovation and Society and Unintended Consequences of Innovation. Innovation and Society covered social impact innovation and social entrepreneurship; briefly put, innovation that is focused on community level issues, including health, economic affordability and sustainability. Established social impact-focused companies like Biolite, Warby Parker and others were summarized.

The Biolite stove was cited for its ability to charge small electric devices, such as mobile phones for those without grid electricity in very different cultural cases of use and socio-economics. For a “developed” economy user the technology has proven useful for campers without electricity wishing to keep their phone charged for convenience and safety whereas developing economy users use it to compensate for lack of grid electricity. In these regions where landlines never existed, mobile phones are a crucial means of finding employment. Biolite was also founded as a “Buy one, Give One” company. In other words, every stove or product they sell in the USA helps subsidize a stove for a family in a developing economy. This model, while not as profitable, balances humanitarian impact alongside earning potential. As a result, Biolite’s model squarely fulfills the four elements of Design Innovation by considering immediate impact, which is substantial: the stove has made important advancements to the health, economics and social inequities faced by their users. But what about unintended impact?

Building on the spirit of optimism embodied in intentional social impact in Design Innovation, focus turned to examples of the unintended social, physical and environmental impact of well accepted innovations in developed economies, including the Automobile, the Compact Fluorescent Light Bulb, Metrocards, plastic bottled, the Smart Phone and even the Biolite stove. Each example was introduced in general terms, to spur conversation in a lecture sized class and each example was compared with a product that it replaced (Subway Mobile tickets vs. Metrocard vs. Tokens) The smart phone, however, was the example that we focused on the most, given its relevance to the students’ generation and given the enormous recent economic growth and societal transformation it has had. Students were
asked to reflect on areas where mobile phones have generally improved their lives and those of others. Examples included helping us stay connected with our friends, loved ones and business colleagues where we are and at levels never experienced before. Other examples included access to information about our location, weather, health and lastly, other examples pointed to the future: their ability to control our lives remotely whether our thermostats, door locks and many other things. Everyday new smartphone devices emerge that extend their utility and it was unanimously agreed that there are no signs of this trend slowing down.

To contrast, we discussed emerging areas of concern about the smart phones from social, physical and sustainability points of view. More than 5 students shared stories of friends and family disengaging from dinner conversations to check their emails and text messages and a rich dialogue ensued about the effects of these distractions on attitudes about manners in public. Furthermore, a lengthy discussion followed about the dangers of distraction when crossing streets and about emerging data connecting car accidents with simultaneous smart phone use. From a Human Factors point of view, the recent concept of “Text/Tech Neck” or cocking your head downward to read you phone while walking has become a new posture issue just as slouching in a chair has been for decades. One student interested in physical therapy asked whether data had been collected about the physical effect of excessive tapping on a touch screen. The presumption is that such touch-screen repetitive behavior has potential to become a new “carpal tunnel syndrome” health concern as younger generations move their computing usage to tablets from desktops and laptops. Further discussion mused about the future effects of voice recognition computing, embodied in the Amazon Echo and Google Home.

A final area of discussion covered the environmental impact of phones which are highly complex to disassemble, are full of toxic heavy metals and which have only a few years’ shelf life. Images of disassembled 1970s Bell telephones were compared with current E-waste concerns.

Altogether, the message was not to emphasize the failures of smart phones; rather, we sought to encourage students to critically evaluate how their inventions might have unforeseen negative impact – and to mitigate this as a part of the development and commercialization process.

Student Project Case Studies with Impact Consideration

As mentioned before, a total of eleven (11) teams were formed around a given technology or invention that had been disclosed to the Virginia Tech Technology Transfer Office (VTIP). Similar to Tech Transfer Offices in other Universities, VTIP’s goal is to try to successfully monetize inventions for University inventors and, of course, for the University’s benefit as well. In almost every case here, professors had disclosed an invention to the University but few of the inventions had proceeded into licensing agreements with outside companies or in translation to startup companies. Generally, the professors did not have time or were not interested in pursuing them despite their potential. Therefore, many of the intellectual properties were languishing and the professor/inventors along with VTIP were more than happy to let our students try to figure out what to do with them. For the educational benefit of the students, it was a condition of the class project that the inventors be present and available to work with the student teams to share knowledge and explain the technology. Sometimes, this did not transpire as intended.

Nevertheless, these types of inventions were great fodder for the class projects because there was little student conflict of ownership in the original invention idea. There was also minimal sense from students that they were working on someone else “idea.” Although two of the eleven projects were student inventions, only one of the teams experienced internal friction in determining ownership of the idea by the end of the semester.

Throughout the duration of the 15-week class, 3 critical deliverables were assigned to ensure the students were addressing impact in their term project trajectory:

1. Midterm Report
2. Ethics overview presentation
3. Final presentation and Report

Overall, at first the students struggled for an impact perspective with their invention, probably because they had not yet figured out what kind of product it really should be to meet user/customer demand. By the end of the term when they knew how their invention could be realized in the real world, they had...
a much clearer idea about the potential impact, positive and negative, that it would have.

For our discussion here we will examine the outcome of two very different inventions: One “high tech” patented sensor technology called GAITE that had been through Venture Well’s iCorps program, was in the process of understanding what customer segment(s) they should target strategically. They came to the class with their technology to benefit from the design visualization, Design Thinking, Customer Discovery and market research skills of the students. The second project was an unusually “low tech” invention surrounding a humorously simple but easy to produce wood building block toy.

GAITE LLC

GAITE is a “Smart Building” network sensor technology developed in the Smart Infrastructures Lab by Dr. Pablo Tarazaga at Virginia Tech. Its purpose is to be installed in new buildings to gather information about the people inside, whether inhabitants or visitors. The technology is able to identify the presence and some measure of the identity of people throughout the building based on the vibrations created as they walk. Additionally, the quality of someone’s walking “gait” can also reveal deeper information about the individual: not simply their direction and speed but also their weight, sex, even elements of their psychiatric state. Interestingly, one’s sex is measurable by the vibration signature created underfoot as one walks. GAITE’s Research had proven that deep insights could also be revealed about people and their intentions. This knowledge was at least partially explored as a reaction to the Virginia Tech shootings of April 2007 wherein law enforcement officials and administrators have debated how these events could have been predicted and prevented after the fact. GAITE’s technology is remarkably powerful: other information could also be extrapolated about individuals that were not shared with the student team for Intellectual Property protection reasons.

Given the abilities of their technology, from the outset of the project, GAITE LLC had used contemporary methods (Business Model Canvas, Lean Launch, Change by Design) to help identify potential customer segments to target. At the time of the classes’ inception, they had considered scenarios of use in Elderly Care homes, to help predict and report debilitating falls and for home security reasons. Overall the conclusion was that they would target developers as “customers” to use this technology in their new housing developments to benefit resident “users.”

Ultimately questions of cost and cheaper competition made GAITE reevaluate whether this was their best path forward to market. As a result, they brought their technology to the Startup Class to help uncover alternative possibilities for customer groups that would better make use of GAITE’s benefits and value proposition.

Final Design and Impact

By the end of the class, the student team reframed GAITE’s focus toward brick and mortar retail shopping and used Target stores as their chosen example to demonstrate their case. Taking cues from click history advertising on Amazon and other online E-tailers, they concluded that GAITE could provide similar targeted advertising in store to help customers find products they might more likely consider (figure 5). In a more complete set up, targeted advertising along with newer retail store concepts like Amazon Go could combine to potentially deliver a superior user experience to customers than what they experience online- a boon to traditional retailers that have been losing sales to online shopping.

Figure 5. Student representation of GAITE in retail environments showing proximity-based advertising based on gender and age.

While many of these ideas showed initial promise for appealing to conventional and hybrid retailers like Target and Amazon, the final presentation and report required students with analyzing the ethical impacts inherent in their proposal. As a mostly new technology that would provide novel benefits and information, students were charged with forecasting what reaction to the technology there might be. Mainly, they raised the concern that GAITE could be seen by many as an invasion of privacy. They cited the film Minority Report which forecasted what a future state like this would look like at a GAP store. While GAITE’s founders had discovered that some users would avoid stores or web sites that practiced this, privacy concerns were held by half of users surveyed. As a consequence, the student
team recommended that GAiTE be somehow optionally shut off, like cookies and other privacy settings online, to respect the concerns of shoppers. Importantly, they identified the need for a “window shopping” wandering mode, wherein shoppers could experience the excitement of random in-store discoveries without being targeted with advertising.

Additional important impact considerations raised questions about “stereotyping” customers based on elements of weight, race and other areas of human diversity that might lead to uncomfortable scenarios in public that are not as much of a concern yet in the privacy of online browsing. By the end of the term, the students concluded that all of these issues could be mitigated and also pointed out that providing more reasons to shop in person as opposed to online had societal benefits. As sad as it might sound, walking through a store provides some with the limited physical activity they have each day. As fewer people walk or get much exercise and obesity rates are on the rise, such a benefit could be valuable. Keeping traditional brick and mortar stores active also preserves low wage jobs that might be threatened by automation, as is starting to appear recently with the “Just walk out” Amazon Go stores.17

Zebra Blocks

The aforementioned “Wood Blocks” project was invented by a faculty member in the Department of Music who, as a parent of two young children, had been frustrated by the cost of simple toy wood blocks. He had visited a toy store with a large wood block installation composed of 2000+ blocks and realized the cost of buying that many blocks would be prohibitive to the average parent’s budget. As such, he came up with the idea of a do it yourself block cut from simple wood 2x4s bought at local hardware, lumber or Home Depot stores. His initial simplistic idea was taken on by Managing Technology Commercialization to explore how such a basic premise could be translated commercially into a viable product. For the benefit of the students, it was a fantastic contrast to all of the technological inventions that were offered: GAiTE, a micro CT Scanner, a miniature Gas Chromatography technology, a 3d Printing vending machine, a few wearables to name a few.

Not long into the semester, team Zebra Blocks (they defined a new brand identity for their inventor) focused on the principles of cost accessibility and eschewing digital device usage with children and tweens. This message resonated broadly with their interviewed customer group: parents both in the college town where the University is located but also in denser areas in the state where many of the students were from.

Zebra Blocks tried to find some kind of hook or protectable trait that would help enable them to secure some form of robust intellectual property, like a patent, to help deter copycats, if there were any. Even the design’s simplicity was difficult to design patent (figure 6). Ultimately they decided to avoid additional features that would drive up costs, and thereby compromise their originating principles of accessibility. In the end, they emphasized making the blocks accessible to all users regardless of income and also advocated a “buy one/ give one” option. Had the goal of the project been simply to maximize profits, the outcome, brand and mission for Zebra Blocks would have likely been entirely different.

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Another possibility that Zebra blocks explored was sustainable production. After considering options for minimizing cost by producing overseas in places like China, they relented. Ultimately, they realized they could produce the blocks economically in the USA of a plentiful local lumber source: Southern pine. This decision added an educational dimension to their product, further supporting their established mission. The wood grain influenced the brand name Zebra Blocks.

Currently, the student team has partnered with their unlikely inventor and is passionately engaged in exploring a first production run to assess if Zebra Blocks could sustain itself in the marketplace. Altogether the team is very passionate about moving ahead.

Conclusions

Overall as we demonstrated in GAiTE and Zebra Blocks, the term projects successfully addressed themes of unintended impact while leveraging potential entrepreneurial opportunity.
In coming years, the class will continue to seek out a variety of invention types for the term projects but with some minor changes to the syllabus and deliverables.

After piloting impact as a fourth formal design innovation criterion, we will ask student teams to introduce at least two “rough prototype” business models by mid-semester. Here, students will be tasked with balancing the four criteria in different meaningful ways (User, Technology, Business and Impact). We would also like to see the inventors, amongst other stakeholders, provide feedback to these business model prototypes earlier on.

Some only saw the final presentation. Additionally, we will also have at least two teams focusing on a single invention such that more than one possible business model will result from each invention. As an outcome, we will be able to compare and contrast different paths to commercialization for the same invention. To help this work, we will require more class involvement from the inventors during the semester, who were often hard to reach.

We would also like to further broaden the participation of other disciplines both from a faculty and student perspective. In years past, there was a dedicated faculty from Mechanical Engineering or Computer Science which provided an essential role alongside Business and Design. Finally, as discussed early on, getting a more even representation of students from the three discipline areas will be critical as well.

Looking forward, there are and will be many cases where the impact of innovation is impossible to predict. Some of the class inventions would invariably produce results that would be unforeseeable until after they are commercialized. Nevertheless, it is worthwhile in the relative safety of the University environment to take the time to ask these questions more openly in a class exercise before students enter the higher pressures and demands of the business world where such issues are less likely to be raised.

It should be added that there have been some University innovation faculty who have voiced criticism of our added focus on ‘negative’ (unintended) impact, contending that it conflicts with traditional entrepreneurial practices of promoting ideas for maximum commercial outcome. We stand by our approach.

For this class, our goal has been to cultivate a sense of responsibility on top of these goals to give students a deeper understanding of what commercialization and invention really entails. By no means do we intend to discourage entrepreneurship. More broadly, our approach also aligns with the public service goals of our Land Grant University charter. As such, final impact-focused deliverables, both in the term presentation and report, will expand in forthcoming years of “Managing Technology Commercialization.”

At present, some of the projects including GAiTE and Zebra Blocks are advancing to a funding stage, moving closer to commercial endeavors and the students and faculty alike are all excited about the opportunities they may bring.

This project would like to thank Professor Marc Junkunc and Omid Bagheri for their partnership in this class.

Notes

Beginning with ‘Environmentality’

Elisa Kim, Washington University in St. Louis

In light of the Anthropocene, which prompts us to understand humans as geologic agents, contemporary architectural pedagogy has witnessed another swing of the pendulum from disciplinary autonomy to extra-disciplinary drift. If writing a studio brief can be characterized as a function through which a given input is transformed by students into architecture, then it is perhaps common practice today for critics to choose inputs which venture well beyond the limits of the discipline. It is within this context of pedagogical extra-disciplinarity and anthropocenic thinking that the beginning design curriculum at Washington University in St. Louis can be located. This paper briefly re-traces the pedagogical dissociations initiated first at The Cooper Union in the early 1970s, and later at Columbia University in the 1990s, as groundwork for a beginning design pedagogy which privileges the Earth and its phenomena as beautiful material and visual effects connected to larger social, cultural, and spatial issues.

Dissociations from Traditional Architectural Pedagogy

If extra-disciplinary pedagogy at the Cooper Union relied upon analogic thinking, Columbia’s project could be characterized as much more performative in nature. At Cooper, language played an integral role in the design process, whereas at Columbia University, the logic of the diagram became the primary pedagogical input.

The Cooper Union

Seminal projects at The Cooper Union from John Hejduk’s studio include “The Cube Problem,” which reversed conventional processes by which program and space were generated, and the “Juan Gris Problem,” which asked students to generate space, program, and structure by analyzing a series of paintings. Both problems relied heavily on the poetic and translational, or analogic role of language in the design process. Here, analogy, metaphor, simile—and other rhetorical devices—provided not just a bridge to spatial and programmatic investigations, but created, from a single point, “polyvalence”—multiple readings and relationships from which to develop complexities in the thinking of architecture. In the two decades which followed, extra-disciplinary inputs at Cooper “went through three phases: painting, the visual, literature, the audial, the sounding and then the medical or the internalization of spaces.”

Columbia University

In contrast to the Cooper Union, the extra-disciplinary framework at Columbia University reflected the ubiquity of the digital revolution both in practice—with the introduction of the paperless studio, and in theory—applying Deleuze and Guattari’s “nomadic” and “rhizomatic” alternatives to architectural thinking. Pedagogical inputs in the studio such as weather patterns, flocking, or migratory behaviors were thus necessarily freed of hierarchical conventions, and became architectural when translated, not through language, but through the logic of the diagram. The turn away from the literary to the literal meant that merely representational inputs which were analogous to architecture, or “like” architecture, no longer sufficed. Rather, inputs necessitated specific performative characteristics which were distilled, through the diagram, into architecture.

Environment as Inputs for Beginning Design

“The most dangerous worldview is the worldview of those who have not viewed the world.”—Alexander von Humboldt

The beginning design curriculum in the College of Architecture at Washington University builds on the tradition of curiosity, exploration, and observation undertaken by explorers such as Alexander von Humboldt. Engaging the phenomena of our world—ground, air, light, vegetation, and water—as pedagogical inputs, the studio sequence can also be read as a
hybrid approach to extra-disciplinarity, one that returns at once to the poetic and language-driven pedagogy of the Cooper Union and the performative project at Columbia University.

Divided into four introductory-level studios and a fifth, advanced-level studio, and alternating between purely analog methods of production during the fall semesters and purely digital methods during the spring semesters, the studios also oscillate between analogic (fall) and performative (spring) modes of thinking. In the first semester, students are asked to engage the ground as territory—of both literal and cultural inhabitation—and to probe ways in which this space becomes both a social and material construct. In the second semester, students are asked to engage the performative and dynamic qualities of air by producing a flying machine. Students move once more through this oscillation between analogy and performance, analog and digital, this time by engaging light (third semester) as material and spatial input, and by designing a terrarium (fourth semester) which sustains plant life through the duration of the semester. In the fifth and final core studio, students begin to develop their own frameworks for working fluidly between both the analog and the digital, and of thinking about architecture both metaphorically and literally.

The brief studio descriptions which follow outline the general curricula for each five core studio semesters.\(^7\)

### Semester One: Ground—Analog/Analogic

![Fig. 1 Basswood Model, Semester One—Ground](image)

Semester One probes the material, organizational, and spatial qualities of the ground—a shared territory inhabited by plants, people, and buildings; a territory that is as much cultural as it is natural. Through a series of iterative steps, the students’ work integrates drawing, making, and thinking as they constantly move between two and three dimensions, translating their ideas from drawings to models and visa versa. They begin by studying natural patterns through drawing and making, translating them into a series of basswood and wire models. These geometrical explorations then represent a depository of ideas that are later appropriated as potential architectural spaces. The semester culminates with a design proposal for a small observatory at a nearby city park, which engages the ground as its main reference, altering it subtly to frame particular views and phenomena. This elevated ground thus becomes an observatory, a beautiful device to experience the surrounding landscape as both a visual and cultural construct.

### Semester Two: Air—Digital/Performative

![Fig. 2 Flying Machine Prototypes, Semester Two—Air](image)

In the second semester core studio, students move from the hand to the machine, engaging digital media to study air. This phenomenon is illuminated through a studio project that centers on the design and construction of a flying machine. Students acquire a basic understanding of the kinetic properties of airflow, use analytical drawings to study flight, from kites to aircrafts, from the myth of Icarus to other cultural metaphors from around the world. Various assembly techniques are used to investigate performative aspects of form and material relative to the movement and properties of air. These prototypes probe the interaction of surface and structure with airflow to study various structural systems, joints, and geometries. The final iteration of the kite represents a revision of earlier flying prototypes and is executed both through physical and digital modeling. The project is complemented with analytical drawings that describe the kite’s flight path, construction technique, and components through 2d and 3d orthographic projection. The semester culminates on Art Hill in Forest Park, where students come together as a class to test their designs and participate in a collective performance of flight.
Beginning with “Environmentality”

Semester Three: Light—Analog/Analogic

The third semester focuses on light through a series of sequential projects revolving around the design of an urban chapel for the DeMun neighborhood in the community of Clayton, Missouri, near Washington University in St. Louis. The project focuses on an integration of the symbolic and spatial qualities of light as a driving force for design decisions. The chapel is a spiritual space open to all yet belonging to none—a center for cultural, religious, and philosophical exchange and for individual and communal prayer of all faiths. As students engage the broad concepts of either the chapel of playground program, they study and investigate light as texture, material, and spatial construct; scale, relative to the human body; site, as a generative ground for intervention; enclosure, through an articulation of structural and material thicknesses; and thresholds, which mediate interiority and exteriority, lightness and darkness, public and private space. This semester’s studio develops a deepened understanding of architectural design as a form of social and cultural production by probing the expansive horizontality and programmatic complexity of a given site. The studio nurtures increasingly complex understandings of design processes through the act of making by hand and the extraordinary degree of specificity required to engage a site with a variety of spatial, social, and natural characteristics.

Semester Four: Vegetation—Digital/Performative

The fourth semester Core studio focuses on atmospheric conditions and represents yet another transition from the hand to the machine by exposing students to an advanced set of digital rendering and fabrication tools. Students begin their explorations by creating a miniature terrarium, which acts as a self-sustaining ecosystem that supports plant life. They are challenged to nurture their terrariums at their desks for the duration of the semester, developing a formal and ecological understanding of the relationship between space, climate, and atmosphere. These small-scale constructions gradually lead to a final design proposal for a vertical greenhouse in Soulard, a historic neighborhood within the city of St. Louis. Situated on a leftover site squeezed between existing streets, highways, and buildings, the project contrasts the horizontality of the preceding semester by exploring architecture’s capacity to stack programs and plants vertically. The project necessitates a deep understanding of plants and ecosystems through research and observation of atmospheric conditions, both inside and outside of built environments. As environmental performance becomes a vehicle for architectural intervention, it results in proposals that challenge traditional divisions between interior and exterior spaces, between habitation and transportation, between the weather and the building. In the end, these structures resemble the terraria with which students began their semester, acting as complex environmental vessels for people and plants to coexist.

Semester Five: Water

The fifth and final of the Core Studios draws its technical, ecological, and cultural inspiration from water. It applies each student’s accumulated knowledge of digital and analog craft to the design of an observatory of environmental effects on the historic Chain of Rocks Bridge, which spans the Mississippi River north of downtown St. Louis. The project begins with a series of material studies whereby students develop devices that expose and manipulate tangible effects of water, such as sedimentation, flow, and bubbles. Students analyze and represent these material qualities and site phenomena through models, drawings, and diagrams at a 1:1 scale. They then turn to the spatial and physical requirements of observation, which in turn informs their design of a research station located on and
integrated with the bridge on which it sits. Envisioned both as a home and a workplace for a single on-site, researcher, the environmental station is a “dwelling” that accommodates diverse habits and activities of everyday life. The project aspires to refine an understanding of the role of observation in the interpretation of environmental factors, echoing the larger questions of observation and environmental phenomena laid out in the first semester Core Studio. While students begin the Core studies by designing an observatory in a park setting as a structure situated on and made of solid ground, they complete their Core experience by designing an observatory inspired by the liquid tectonics of water flow and the constantly moving Mississippi River below.

**Ethics + Aesthetics in a New Geological Age**

The privileging of the environment as pedagogical input—through study of the Earth’s phenomena—engages the need to reevaluate the emblematic modernist project of drawing lines between nature and culture. As humans have become a geologic force of change, rapidly contributing to an altered climate in addition to increased migration and cultural exchange, traditional architectural typology, structure and program are consequently challenged. Within this context, an environmentally privileged pedagogy requires students to develop conceptual and spatial frameworks, while simultaneously researching aspects of environmental phenomena on a need-to-know basis. Their intellectual and intuitive inquiry is therefore both cultural and environmental, and the relationship between craft and the ability to comprehend the nuances of complexity—be it spatial, social, or environmental—nurtures a more implicit ethical conversation about how architects might approach materiality, structure, and social and cultural networks within a changing environment.

**Notes**

Learning from Life: Instilling an Ecological Ethic in Early Design

James Leach, Kristin Nelson, University of Florida

Beginning with the Beginning

Design is an extremely complex field of study, often taking decades for a practitioner to reach a sense of mastery. That being said, the education of designers must begin somewhere, and the assertion of this conference is that beginning design should be based in ethics. If this is true, as we believe it to be, then the framing of the initial design courses will set the conceptual foundation upon which every successive project in the academy, and later in practice, will be built. It is then critical to carefully select the introductory concepts and the processes to which students are first exposed to instill a worthy point of departure for designs.

Reyner Banham describes the impetus for building as a means to allow man “to flourish, rather than merely survive,” by using “the deployment of technical resources and social organizations, in order to control the immediate environment: to produce dryness in rainstorms, heat in winter, chill in summer, to enjoy acoustic and visual privacy, to have convenient surfaces on which to arrange one’s belongings and sociable activities.”¹ This essential drive to create a controlled environment of more comfortable space, separated from the larger surroundings, remains at the core of contemporary building. Prior to industrialization and mechanization, place specific strategies capitalized on material and form to moderate the environment without constant consumption of energy. The predominant current strategy to control the interior environment is derived from the relatively recent development of energy intensive, mechanical methods. An overreliance on these systems as the primary solution to occupant comfort has led designers to create spaces that are disconnected from the logic of the surrounding environment. The maintenance of this ill-fitting architecture of disconnection comes at a great cost: pollution, climate change, and physical and psychological harm to occupants.

With the 2030 Challenge, both the American Institute of Architects and the United States Green Building Council, have called for architects to lead the efforts to reduce and eventually eliminate the negative impacts associated with the built environment. Buildings and building activity consume nearly half of all of the energy produced in the United States, and are responsible for nearly half of all CO₂ emissions.²

![Fig. 1 US Energy Consumption by Sector](image)

² U.S. Energy Consumption by Sector

Source: ©2013 2030, Inc./Architecture 2030. All Rights Reserved.
With this understanding of the magnitude of negative impact tied to environmentally disconnected methods of building, a case can be made that this disconnection represents the greatest ethical failing of architectural practice. Given that designers begin to form their priorities and processes in the academy, it is the duty of the academy to reframe basic design education in a way that imparts a sense of environmental responsiveness and responsibility to all students. Design students must be prepared to work in a world where finite resources and climate change are fact, and where the responsibility to comprehend the impact of buildings on the local and global environment is a fundamental design concern.

Current conventional design and construction practices are predicated on the false assumption that fossil fuel resources will be inexpensive and available to operate the building throughout its lifetime, with the highly-developed portions of the world consuming per capita the vast majority of the available means. These same highly-developed portions of the world possess the technology and strategies to dramatically reduce their impact, but have largely failed in their responsibility to do so. We propose that elevating the awareness and capacity for action in our students is one of the imperative issues of our time.

This approach necessitates a reorientation of the prevailing basic design studio approach, descended from the Bauhaus Basic Course, which favors siteless, occupant-less experimentation with material and formal abstraction. This approach, designed to reprogram students to strip away the reliance on a catalogue of historic forms, materials, and ornament, led to an emphasis on formal systems and manufacturing innovation, but failed to anticipate the long-term impact of over-riding the natural systems of site, climate and local response. In lieu of the abstract, siteless, occupant-less design prompts based on the Basic Course, this reorientation requires concrete, sited, occupant-focused design prompts geared to elicit spatial responses that integrate into the natural systems of the region, climate and site.

**Pedagogical Approach**

This paper suggests an approach to introducing an awareness of ecological concerns and passive environmental control strategies as foundational design drivers for beginning design students. As a fundamentally responsive process, an understanding of the circumstance which is being responded to must be developed to form a valid response. This development requires research into the numerous parameters which will provide direction and constraint to the design.

The process described is demonstrated in an accelerated eight week course offered during summer session as a vertically integrated studio, including first-year graduate students with non-architecture undergraduate degrees, as well as fourth-year undergraduate architecture students. The first year graduate students are the primary focus of this paper, but outcomes of vertical integration for both the novice and the more experienced design students will also be discussed.

**Development of the Design Brief**

The compressed timeframe necessitated a focused design brief. In this case a small building program on a remote site in an extreme environment was selected to both limit and clarify the design concerns. Students were challenged to design a remote desert research station (RDRS) located in Saguaro National Park, west of Tucson, Arizona. The brief anticipates seasonal inhabitation, to coincide with the more active cycle of the desert, following the typical research season of the National Parks employees. This avoids occupation of the site during the most extreme summer months, and also imposed a need to secure the site during the off-season. The isolated and unimproved site lacked significant landmarks or built context, and was not grid-
connected. Coupled with the extreme demands of the climate, this directed students towards formal, spatial and material design solutions informed primarily by response to climate and the simple program: work, cleanse, eat, and sleep. The facility was envisioned for a home base for field researchers, with the occupants leaving for a period of days to gather samples and data before returning the RDRS to store and input the gathered data before departing on the next field excursion.

It is important to note that this was the first graduate studio to focus explicitly on technical drivers and new construction. The previous two studios focused on skill-building, including manual architectural representation through documentation of existing historic barn structures, and digital representation through precedent study and an interior insertion into a historic building fabric. Additionally, the graduate students had no previous experience in climate analysis, environmental control or building energy courses, so the introduction of that material was, by necessity, integrated into the studio instruction. An intensive workshop began with an introduction to concepts of human comfort and comparative analysis of the familiar, temperate Midwestern climate, contrasted to the conditions of the Sonoran desert, typified by intense heat and solar energy, scarcity of rainfall and a large diurnal temperature swing. The clear, elegant, and illustrative text, Building to Suit the Climate by Hausladen, Liedl, and de Saldanha formed the core of this instructional unit.

Generating a Common Research Base

A series of case studies followed, focused on precedents demonstrating adaptation to these conditions through studies of plants, animals, and the architecture of the early inhabitants of the Sonoran Desert. This served to not only reinforce the particular conditions and concerns of the region brought to light in the climatic study, but also illustrated various proven strategies for reacting to them. As examples, animals burrow to avoid and moderate temperature extremes, cacti expand to hold water and self-shade with their needles to avoid losing moisture, and early inhabitants utilized building materials and formal-spatial strategies elegantly and efficiently tuned to place, that allowed them to not only survive, but flourish in the challenging environment.

Due to the compressed timeline, the research format included crowd-sourcing elements, with each student deeply researching a single animal, plant and native building strategy. After gathering, editing and prioritizing the information, simple black and white infographic posters were created and hung to cover the primary wall of the studio as resources for all.

Fig. 3 Student Biological Precedent Study

Students also completed an assigned reading for each studio period, with selections from Janine Benyus, Reyner Banham, and Lisa Heschong creating an intellectual context for the course.

Field Research

At Iowa State University, student travel is integral to each design studio. This studio capitalized on the educational potential of travel to expose students firsthand to the topics researched during the first two weeks of the course.

The fieldwork comprised of four days, in which students and faculty traveled from Ames, Iowa to Phoenix and Tucson, Arizona in early May. This timing coincides with the tail-end of the research season anticipated for the RDRS in the design brief, and allowing students to experience the same extreme conditions faced by the station occupants. During the first two days of the trip, students studied the plant and animal life of the desert at the Desert Botanical Garden and the McDowell Sonoran Conservancy. The group also observed a variety of responsive architectural strategies firsthand. These ranged from the traditional vernacular strategies for desert life displayed at Pueblo Grande Museum and Archeological Park, the remains of a 1,500 year-old Hohokam settlement within Phoenix, to contemporary strategies at the Burton Barr Public Library, Taliesin West, and several libraries by local firm Richard + Bauer.
During the travel to Tucson on the third day of the trip, a side excursion was incorporated to visit Casa Grande National Monument, the remains of a 650 year-old desert farming community based on a vast system of irrigation canals. A late afternoon arrival at the Arizona-Sonora Desert Museum, a botanical and zoological park located within the broader project site of Saguaro National Park, coincided with an evening astronomy program allowing the students to remain in the park while experiencing the substantial diurnal shift. During the course of the evening, temperatures dropped from an afternoon high of 103 degrees Fahrenheit to an evening low of 65 degrees Fahrenheit.

**Operational Design Drivers**

The combination of the shared preliminary research reinforced by the firsthand field research resulted in a substantial body of community knowledge. Upon return to the studio, students were tasked with selecting a group of complementary climatically-responsive biological and architectural precedents from the community knowledge. This group of precedents provided a framework for the development of a spatial-formal-material strategy to guide the project.

![Fig. 4 Student Building Form Strategy Diagrams](image)

Examples of the plant and animal precedents selected include: intensive water storage as demonstrated by the barrel cactus, earth coupling as demonstrated by the burrowing behavior of the desert tortoise, selective heat rejection as demonstrated by the desert hare, and the water collection strategies of the fogstand beetle. Examples of the climate-responsive building strategies chosen include: selective occupation of spaces to suit the season or time of day, thermal mass to take advantage of the diurnal shift, water collection for drinking and micro-climate courtyard cooling, self-shading, and cool roofs.

**Spatial Response Methodology**

The studio progressed within a framework of frequent deadlines and presentations, including weekly updates to a studio tumblr visual blog. One week after returning from the fieldwork, each student presented the group of strategies guiding their project and three potential massing studies. Each massing study was clearly illustrated with diagrams noting the integration of the precedent strategies. Feedback was offered from a group of faculty and practicing architects. The schedule allowed a week and a half to incorporate the feedback from the initial review, and to identify and further develop the most promising strategies into a design scheme. Updated precedent integration diagrams as well as building plans and sections noting occupancy, orientation and adjacency were required for the second review, which was able to take advantage of the same group of professional and faculty reviewers.

![Fig. 5 Student Building Form Resolution](image)

Through interest generated by the studio tumblr and the early faculty and professional reviewers, a substantial list of faculty and regional professionals volunteered to serve on the final review. This allowed the students multiple opportunities to present their projects in a salon style review format.

**Vertical Integration**

The primary focus of this paper is education of the graduate students in beginning design, but enrollment and scheduling circumstances resulted in a vertically integrated studio, including a small group of undergraduate students entering their final year of
study. Although this was not an initial or primary consideration, several notable results were observed during the course. The cohort of graduate students offered a mature and nuanced voice that benefitted the entire studio in the readings, research, analysis and group discussion portions of the studio. Their serious engagement with the preparatory work of the studio encouraged the undergraduate cohort to elevate their efforts during this phase. On the other hand, the small undergraduate cohort had completed their building technology sequence and digital design courses. Their fluency with technical knowledge and digital design tools rapidly advanced the abilities of the graduate students. The exchanges between the two student groups resulted in added benefit to both, and this structure has been adopted as the official structure of the summer studio delivery at Iowa State University, following feedback from faculty and professional reviewers.

Outcomes

Outcomes within the Studio

When tasked with teaching the summer graduate studio, the graduate director noted a history of challenges in teaching the accelerated studio. Rigor, production levels, and skill-building were noted shortcomings of the course. The design of the project brief was conceived to provide a clear agenda for the studio, with strong environmental design drivers shaping a rigorously investigated, considered design solution for a manageable program. The pacing of the studio dedicated an unusually large portion of time, three out of eight weeks, to understand the context, define the problem, and determine the success criteria for the project. Perhaps counter-intuitively, this generous early investment in grounding the project within a clearly understood framework resulted in more productive, confident and rapid development of the project in the later phases.

Outcomes beyond the Studio

In the following semester, the graduate students from this course continued their education in the Net-Zero design studio. This course asked the students to develop high design, low infrastructure solutions to support redevelopment efforts in Old North Saint Louis. This historic area of Saint Louis has experienced loss of population and building density over the past 60 years, but benefits from an active neighborhood redevelopment organization. This studio was formatted around the ACMS COTE Student Design Competition. Out of the ten teams selected nationally, three of the teams were from Iowa State, and every team had at least one member from the RDRS summer studio. This high level external recognition in a national sustainable design competition demonstrates the effectiveness of the described adjustments to the summer course pedagogy in instilling a value of ecological awareness and environmental responsiveness as foundational design drivers. Additionally, out of the seventeen students in the course, several work for recognized sustainable design firms, and two are pursuing graduate study in elite building science programs. These two students developed their projects further into poster presentations for the College research symposium for students.

The grounding and outcomes noted in this case study are offered as a compelling argument for the inclusion of sustainable, climate-responsive principles as a foundational component of early design education.

Notes


Figures

3 Kruse, Benjamin. Student Biological Precedent Study, ARCH 503, Iowa State University, 2014.
James Leach, Kristin Nelson

1 Kruse, Benjamin. Student Building Form Strategy Diagrams, ARCH 503, Iowa State University, 2014

5 Kruse, Benjamin. Student Building Form Resolution, ARCH 503, Iowa State University, 2014
Don’t Just Sit There: Furniture Design, Social Justice, and “Thingking”

Zeke Leonard, Syracuse University

Introduction

Too often, design projects in the classroom are experienced in a vacuum. The parameters of the project are form-based, material-based, or even process-based, but they are not introduced with an understanding of the context(s) within which the parameters of the project might apply. Increasingly these contexts have wide-reaching social, economic, or even political repercussions, and it does our students a disservice to work to remove these contexts from the projects that we assign. In fact, an argument can be made for compelling ourselves to set socially, economically or politically relevant frames for all of our projects, as a way of pushing this conversation with our students and introducing them as early as possible in their design education to the reality of their own agency as change-makers.

I should point out that I will not be making this argument in this paper. What I do intend to do is to document a design partnership between a class that I teach and local social-change organizations in a way that supported both the pedagogy of my class and the socially relevant agenda of the client.

Syracuse History and Regionality

Syracuse, New York is a small Rust Belt city of about 145,000 residents. Built up around salt springs in Central New York state, this city has a long history as an industrial center, being the point of genesis of the Smith-Corona Typewriter Company, the Carrier air conditioning company, and the Porter-Cable power tool company, among many others. As industrial work was increasingly outsourced overseas in the late 20th century the inhabitants of this historically industrial city (many of whom were third or fourth generation factory workers) found themselves without employment. The once-bustling city began to decline, following the model of many sister cities in the Rust Belt with urban flight populating suburbs and emptying the city center.

In the early 2000’s, regional, State, and Federal monies began to be spent on rehabilitating Rust Belt cities. In Syracuse, several neighborhood development organizations came into being from a variety of funding sources, many with similar aims of reviving the city and combating decades of decline and depopulation. Among these neighborhood development corporations were the Northside Urban Partnership (Northside UP), with funding from St Josephs Health Center and the Catholic Charities of Onondaga County and the Near West Side Initiative (NWSI), with funding from Syracuse University and the Gifford Foundation. These two organizations have worked collaboratively on many projects, one of which was titled “Green Train.”

Green Train was a job-skills training program with a job-placement rate of more than 80%, an unheard-of statistic for this type of program. Better yet, the retention rate was similarly high. Working in conjunction with a local community college, students in the program were taught jobsite safety, tool usage, and construction techniques. Because Syracuse is a resettlement city, many of the students were refugees or recent immigrants. Because of this, language barriers were addressed and life skills were taught. Upon graduation, students were placed in construction jobs, and many became model employees.

Raw Material: Phoenix Rising
Because of its industrial roots, Syracuse has an overabundance of empty (and in some cases derelict) factory and warehouse buildings. Many of these were built in the mid- to late-nineteenth century, and in many cases they were actively used until the end of the 20th century. Several of these buildings stand in an historically working-class neighborhood called the Near West Side. This neighborhood was (and is) chronically low-resource, prompting the philanthropic Gifford Foundation and Syracuse University’s then-Chancellor Nancy Cantor to establish the Near West Side Initiative to create change for the residents of the neighborhood. One of the methods applied was real estate development, especially in several derelict buildings. As these timber-framed structures were gutted in anticipation of being built out, massive, locally-hewn planks and columns were salvaged. From one such structure several hundred thousand board feet of softwood structural material was harvested, primarily hemlock, fir, and pine.

The narrative of this material was evidenced by the holes that originally held hardware or were pass-throughs for electrical or plumbing. Even though the wood species were not commonly used for high-end furniture, this narrative overlay made the lumber compelling for a furniture application once it was milled. It was this lumber (taken from the Lincoln building, pictured) that became the generative material for a new collaborative venture between the Near West Side Initiative and the Northside Urban Partnership: Salt Works.

Salt Works was conceived as a follow-up program to the standard Green Train program. By taking promising graduates of Green Train, the intention was to train them in a higher level of finish and skill through the production of heirloom-quality furniture, using the salvaged material from the development projects. Funded by a grant from the Kresge Foundation, a shop was set up to mill and process lumber and apply finish. Initial work was promising, with standard products being slab type forms: Table tops and benches. As the employees gained skill it became clear that the capacity existed for them to make objects that explored different type forms with increased complexity.

**Service-Oriented Pedagogy**

DES 561: Furniture and Light Studio is a long-running class at Syracuse University that focuses on furniture design. This is not a skills class, rather the curricular thrust is the design of the furniture objects. That said, of course, the best way to assess whether a furniture object is successful is to prototype it at full size. Often the students’ final object requires further iterations in terms of construction and finish, but the project brief outlines the necessity for the object to be usable as intended: A chair must be sittable, a table must stand on its own and support objects in a way that is consistent with that furniture type form.

In order to keep the design students accountable to a usage mode, I run this class in a “client-based” fashion. I work with local companies to create a project brief that is aligned with the current needs of the company. Past partners have ranged from sustainable-material manufacturers like e2e materials to library furniture distributor Gaylord Brothers. For the semester in question here I obviously partnered the class with Salt Works. This presented some interesting parameters for the design work that he students did. To begin with the material had to be honored: All designs had to be stick-built furniture, plywood would not be an option. In addition, there was no automation in the Salt Works shop, so all operations had to be repeatable by hand with an acceptable amount of precision.

Tooling as a parameter is nothing new in this kind of class, but in this instance the tooling was very limited: The shop had basic milling machines and table saws, but no specialty machines of any kind. This limited the students (in general) to straight cuts, but it also pushed them to think about fixtures and jigs that could be used in conjunction with the existing tooling. And as is always the case with this kind of project, the most stringent parameter was the amount of labor hours required to make and assemble parts. In conversation with the Salt Works team, students were encouraged to streamline and simplify their construction processes, which affected the design work. The material also presented an unusual set of possibilities: Because of its history some of the lumber was massive: Some planks were 5 inches thick and 18 inches wide.

The students designed and prototyped two objects over the course of the fifteen-week semester. Both objects had the same set of parameters: the possibility had to exist that they could be made using the existing tooling in the shop, the existing skill set of the workers, and the level of complexity had to be within the bounds of a profit-generating object. They were introduced to what Viktor Papanek describes as a design “based on method: The interrelationship between material, tool, and process.” These parameters were applied as design lenses to two different type forms described by the Salt Works design team: A lighting object and a seating object.

**Project Brief 01: Illumination**

The desire for a lighting object grew out of the off-cut bin in the Salt Works shop. The production of the initial line of Salt Works
furniture produced multiple cut-offs, many of which were small enough that use in other furniture objects was not possible. Mobilizing these smaller pieces of material as table or accent lamps was the student’s first charge.

For many of the students, this kind of materials-based practice was a new endeavor. Many of them began their design processes without taking in to account what the inherent material qualities of the scrap wood might be, causing several to have to rethink their approach after the initial design phase.

The more successful work showed a sensitivity to the material as well as the available processes, producing some objects that were quite beguiling. As is often the case with young designers, many students struggled with one of the basic realities of any lamp: the power source. When addressing the stark realities of a lamp base, a power cord, and a switch, some students were better able to navigate thoughtful treatments of the hardware, while others struggled with that aspect through to the final critique. As is typical, some designers chose to circumvent this particular reality by applying LED technology instead and using batteries. This “make it disappear” approach is useful pedagogically as it introduces its own inherent challenges: How are the batteries accessed? How does that need for access affect the overall design?

The ubiquity of chairs in the spaces we inhabit everyday often leads young designers to make the (erroneous) assumption that they are an easy object to design, a misconception that is rapidly unpacked as they enter the design process. It is for this reason
that a chair design has always been a part of the curriculum for this class. In this case, the Salt Works team was interested in including a chair form in their line, so this long-standing project dovetailed nicely with the needs of the client.

After all of the necessary conversations about anthropometrics and ergonomics are engaged and the students begin to overlay conceptual or aesthetic concerns, it is common for beginning designers to get so lost in the morass of considerations that they grind to a halt. One student, Jessica C., exclaimed at one point “We should all just sit on stumps!” The idea of designing an object like a chair from the inside out in a user-centered way is a struggle for many designers, let alone beginning designers, and great care must be taken when leading them through a design process to allow them the necessary time to make these discoveries and to engage all of the common mishaps along the journey to a finished seating object. The idea that a chair cannot simply consist of two silhouettes joined by a seat is surprisingly novel especially to young designers. In addition, the extreme relevance of materials and connections provides much rich conversational possibility.

This necessitates a great deal of “works-like” prototyping, as initial design work intersects material or ergonomic realities. For this reason deliverable dates are set within the eight week project that emphasize making sittable models early in the process. This ensures that by the end of the process the work is viable as a chair, rather than simply being a chair-shaped object with little practical relevance.
Make Change

There is deep learning that comes with engaging any real-world client, just as there is deep learning that comes from engaging the fabrication process for any project. As Dunnigan points out, this “thingking,” or reflective prototyping, allows the process of changing the object during fabrication to also change the design student. As attachment and construction possibilities are explored the design student is adding to their own growing knowledge base. Adding in the element of creating social change, however, allows for a thoughtful investigation of the role of the designer with regards to society at large. The conversation centers on responsibility and possibility as much as it does on fabrication and cost. Creating links between viability of the product and success of the training program allowed the students to draw direct correlations between their design choices and the possibility of affecting people’s lives for the better.

As resources diminish and economic disparity grows, it is incumbent on us as educators to foreground for our students the repercussions of the work that they do. Many of the wicked problems that we face culturally and globally will benefit from applied design thinking by all designers, whether beginning or advanced. By exposing our students to the reality that their effort, intellect, and practice are needed on the front lines of improving the human condition, we increase the likelihood that they will choose to apply themselves in a socially relevant manner, rather than a one that is simply driven by market trends.

Notes

Public Art in Design Education

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Introduction

Although art and architectural design have, in essence, grown up together in the academy, they began to assume different positions in relation to their function in the late renaissance. At this time, architectural design, began to emphasize scientific and technical advancement over symbolic meaning. 1 Since then the function of art has evolved to inspire and arouse, question and provoke, intervene and break with convention, while the function of architecture and landscape architecture has evolved to accommodate physical and social needs, create space for habitation and solve problems using technical and aesthetic principles.

In the last thirty years, however, these distinctions between art, architecture and landscape architecture have become blurred. Artists have increasingly expanded their practice to become more contextual in site-specific and public art, while architects and landscape architects have ventured into making more conceptual work like urban interventions and speculative fictions. 2 As this cross-pollination takes place, several pertinent questions emerge for educators: In what way does contemporary art theory and practice develop and expand our pedagogical approaches to design education? What do these new cross-disciplinary practices teach our students about the value of agency, agility and criticality? And finally, how does the autonomy afforded to art-making affect and influence the values of the beginning design student?

This paper presents three examples of public art projects integrated into the studio curriculum: 1) a collaborative public mural by undergraduate drawing students; 2) a series of art installations by beginning landscape architecture graduate students; and 3) a series of architectural interventions in response to the UMass Amherst Fine Art Center building by second-year graduate students. Through these three examples, this paper argues that architects and landscape architects must be educated to think like artists in order to imagine, invent and conceptualize new spaces and places through multidisciplinary collaboration. They must learn, not only how to interface with a broad spectrum of engineers, builders, contractors, planners and clients, but also how to be speculative thinkers, dreamers, philosophers and poets of space.

Project 1: Morrill Mural

In ART 202: Advanced Drawing Problems (ADP) undergraduate art and architecture students were introduced to drawing as a tool for research— to observe, gather and assimilate visual information, which can then be interpreted anew. For two consecutive years (2011, 2012), ADP students collaborated with Prof. Sandy Litchfield to produce a permanent public mural in the UMass Amherst Morrill Science building, which still lives on today. This four-story mural was commissioned the UMass Biology and Geoscience Departments. The goals of the project were threefold: to foster a cross-disciplinary exchange between art/design students and scientists; to teach students about the value and execution of public art; and to enliven the Morrill stairwell with dynamic and artistic interpretations of the researchers lab-work.

At the beginning of this project the chairs of the Biology and Geoscience presented the ADP class with a slide presentation and a tour of the labs, giving them an overview of the science research being done in the building. Students took notes and made sketches, which were later developed as studied for the mural design. As they continued collecting visual information, they were given the freedom to interpret and appropriate the concepts and images in any way they chose with the faculty acting as an advisor.
Once the individual drawings were finished, the instructor collected them and orchestrated them together into a cohesive design. The final elevations were designed in such a way as to give unity to the whole, while allowing for the expression of each student’s unique interpretive design. Materials used for installation were simple: blue and green latex paint, black Paintmarkers, and black acrylic paint. The whole project took three weeks with the final week allotted for installation.

Outcomes

The Morrill Mural has now been up now for over six years and has likely been seen by thousands of UMass students, faculty and staff. It is valued not only for the way it transforms the otherwise plain stairwell, but also for how it illuminates and interprets the work of the scientists in the building’s labs. For the student-makers, this project provided them with an empowering sense of accomplishment, one where they were able to produce a large-scale version of their own individual design and have it choreographed into a wider communal endeavor. In this project they learned not only how to interpret knowledge into their own vision, but how to work as a team to execute a public mural valued by the community.

Project 2: Art Installations

The first-year MLA studio, instructed by Prof. Carolina Aragón at the University of Massachusetts Amherst, introduces students with no previous design education to the study of landscape architecture. The goals of the studio include: developing basic design vocabulary through the creation of paths, spaces & edges, understanding the role of human scale and perception in the design of landscapes, understanding the dynamic quality of the landscape media, and developing basic tools for design and representation. The studio work consists of three distinct projects over a seven-week period. The first project, Installations, challenges students to create full-scale temporary outdoor art installations to transform the perception of a familiar space surrounding the studio building. This two-week exercise introduces students to notions of materiality, context, the dynamic nature of the landscape media, and human scale. Complimentary drawing exercises, provide an introduction to orthographic representation, scale, and the use of digital media for documentation and presentation layout design. The goals for the project include fostering students’ ability to develop original ideas about engaging the dynamic nature of the landscape, provide an opportunity to implement alternative ways of organizing space, use sketching as a design tool, learn to draw a plans and elevations, and learn to use architectural and engineering scales.

In this assignment, students are challenged to explore the power of a temporary art installation to transform a familiar space. Their proposals should engage the human senses, while redefining the experience of an outdoor area adjacent to the studio building. The installations should provide a new use or percep-
tion of the space by providing a redefined path, focal point, threshold, or edge, engaging users with the changing qualities of outdoor spaces. Students are encouraged to consider how the materiality of their installations will make dynamic forces such as the wind, sunlight, and precipitation apparent, while creating stimulating sensory environments. In addition to the design goals related to human perception and the design of the space, students must also address issues of materiality, public safety, and abide by Land Use regulations regarding the use of campus outdoor spaces. Their installations must be made to withstand outdoor conditions for a minimum of 48 hours, cannot obstruct pedestrian or vehicular traffic, damage existing vegetation, buildings and structures, or be taller than 71 inches. Students are to submit scale-drawings and sketches of their designs prior to the installation, as part of a Land Use Request reviewed by the university’s Department of Facilities and Campus Services for approval.

Over the course of two studios (Fall of 2013 and 2015), students produced a wide variety of installation projects as a result of the autonomy afforded by this art-inspired pedagogical approach. The project engendered freedom of expression, autonomy in material choices, and independence in establishing the level of public participation with the installations. Students expressed diverse interests regarding the subject matter of their installations. Their foci ranged from natural and seasonally attractive features, such as calling attention to the biannual fruiting of the apple trees (Fig. 3); to highlighting environmental phenomena, such as casting shadows with an overhead canopy or creating a wind-sensitive reflective screen; to emphasizing and engaging familiar paths of travel to the building. Having freedom of choice regarding materials actively engaged students in decisions reflective of their environmental values. Although not ubiquitous, most students have made sustainably conscious choices, opting in high numbers to use found objects on the site like apples and branches, or lower impact materials such as recycled bottles, recyclable paper bags, or biodegradable twine and jute fabric (Fig.4). The projects also range in their designed interface for public interaction. A net-like twine overhead canopy offers very limited opportunity for public engagement, as opposed to a curvilinear xylophone path edge made of recycled bottles which invites the users to activate it while walking by, or a new edge defined by poetry-ready sand-filled sandwich paper bags which invite creativity and participation in the making and meaning of the space (Fig. 5).

The projects have addressed multiple spatial dimensions through a variety of interventions focusing on the floor plane, overhead canopies, and suspended vertical screens. Some projects have addressed two of these planes to successfully create
engaging environments. Although the project required the installations to react to sun, wind and precipitation, several projects did not fully address this aspect. Of the projects that engaged a dynamic outdoor element in their design, most engaged with sunlight and to an extent the wind. No project thus far, has engaged precipitation. Projects dealing with sunlight have ranged from shade canopies, sequined screens, and cloth screens. Projects responsive to wind included a field of pinwheels enhancing a desire-path over a lawn area leading to one of the building’s side entrances.

Outcomes

From a pedagogical perspective, the projects have been successful in introducing students to issues of materiality, scale, and site within the dynamic framework of outdoor space, while providing a strong introduction to drawing and design representation. The agency afforded by art-making has allowed students to imbue their values and previous knowledge into the physical shaping of space. The project has served as an introduction to design, which embraces the students’ interests, abilities and aspirations, while challenging students to operate within the opportunities and constraints of a full-scale installation for public use. In doing so, the project provides tangible opportunities for understanding the challenges of construction and material performance in outdoor space, issues of human and site scales, and elements shaping the site (such as solar orientation, wind direction, and slope among others). Additionally, the process of sketching and drawing throughout the process, allows students to better grasp the notion of architectural and engineering scales, and architectural representation through plan, elevation and sketch perspective drawings. The well-defined edges of the existing building and structures, provide a framework from which to document the often softer and more fluid edges of the installation projects, serving as a strong introduction to landscape architecture representation. It also provides an introduction drawing as a tool for ideation, while demonstrating the challenges of architectural representation as a means to represent phenomenological experience, or dynamic fluctuation in the landscape.

Counter Arguments

Some may question the value of making art installation in design studios; some might be critical of the wide parameters of the assignment, which make evaluation difficult and subjective. There might also be a sense that the project is “too much fun,” and that introductory design education should be more rigorous, and include the study of precedents. The goal of this project, however, is to present an alternative introduction to the design process in which students are able to bring their own personal values, experiences, and knowledge to transform a space. It is not meant to supplant traditional design education, but rather complement it, enhancing students’ capacity for creative work based on their interests and values. This project offers them the opportunity for real-world testing of their ideas and their constructions. Furthermore, this exercise helps students improve their ability to translate design representation into a physical construction, and introduce them to the rich potential of working in an outdoor public space.

Project 3: Site FAC

The final project, titled Site FAC, was organized by Prof. Sandy Litchfield for MFA and MArch students in ART 601: Graduate Drawing, and ARCH 796D: Independent Study Design. This semester-long project involved making a site-specific proposal and art installation using the Fine Arts Center (FAC) as a site. The primary goal for this project was to provide students with a hands-on educational experience of making public artwork, including writing proposals, making site drawings and working with community members to gain public funding and support. In addition to the educational component, this project provided a public service by highlighting the FAC as hub for art and creative activity at UMass.

The assignment began with familiarization. ART 601 took an informal walk around the building and engaged in a discussion about the history, material and form of the structure. This
Brutalist-style building, designed in the late sixties by architects Kevin Roche and John Dinkeloo, lies at the main entrance of campus. The sprawling composition of concrete slabs is both impressive and imposing. It is also the historic home for the departments of art, architecture, music theater and dance.

After students picked a site in proximity to the building, they began more extensive research for their piece. At the first review, students presented preliminary drawings and were asked to address the following questions: how does the site lend significance to the piece? how does the piece engage with the history and/or context of the site? who is the audience and how are they intended to engage with the installation?

Once they received feedback from the instructor and their peers, students set out to make proposals, not only for permission from campus authorities, but also for funding from the UMass Arts Council, which sponsors “mini grants” (up to $1200). All proposals required the following: a title, a visual description of the location (including plans, elevations, and site drawings), a list of materials and mediums, a detail of the installation, maintenance and de-installation procedures, a list of all people involved in the installation, and a list of any technical requirements, such as lifts or hardware. They were also expected to include a budget breakdown, including any funding needed, and a resume, listing any previous exhibition/installation experience.

In addition to the guidelines, there were two main parameters of this assignment: 1) all proposals must be approved by a panel of jurors that including the fine art’s building department chairs, the UMass Arts Council, and the instructor; And 2) all sites must be returned to their original condition or better. The latter was of utmost importance; failure to do so would result in an “F” for the course. UMass Department of Facilities and Campus Services, who approved and facilitated the projects, insisted these strict parameters were in place.

In the end there were six out of nine proposals executed. Students who did not realize their projects (one by choice) still received credit based on the merit of their proposals. Students who completed their projects demonstrated tremendous enthusiasm for the process. This was due in part because of the autonomy they were given, and in part because of the ownership they possessed. Some did extensive research about the building, its history, design and legacy. Student Jonathan Stockton, for example, created a Mylar reflection pool called “Negative Icon” in homage to the building’s original reflecting pools, which have since been filled in. (fig.11) A couple of students made pieces in response to the massive weight of the architecture. Nour Bishouty projected the pattern of an enormous dress on the façade (fig. 6), suggesting the corporeal life of the building. On the opposite end of the FAC, Sarah Horne hung two 14 foot high banners, each with an image of the back of truck, a photo taken from her morning commute on the Mass Pike (fig. 7). Other students focussed on the transitional spaces of the building’s interior.

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The final exhibition ran for three weeks at the end of the semester. As part of the exhibition, students organized the design and printing of an announcement and a poster. They also sent out a press release and scheduled an opening reception, which was well attended by community members.
also raised social awareness about the history and legacy of the Fine Art Center. Some pieces responded critically to the architecture while other acted as illuminators of its past. As a temporary intervention, Site FAC recontextualized the building for the entire community.

**Conclusion**

Many educators acknowledge that students of architecture, landscape architecture and design benefit from artistic practice—that is, the freedom to explore materials and methods of making without the constraints of a program. While this is critical in foundation level classes, it also has importance and relevance to advanced students, helping them expand their techniques for innovation and design.

In Dunne and Raby’s recently published book, *Speculative Everything: Design Fiction and Social Dreaming*, the authors discuss the notion of conceptual design as “an alternative context to design that is driven entirely by market forces. It is a space for thinking, for trying out ideas, and ideals.” The importance for this kind of practice is not just to learn how to solve problems with an aesthetic eye, but how to ask questions, how to engage critically with the environment, how to challenge our assumptions about the environment, and how to speculate about design alternatives. In this way, designers need to think like artists; they need to be vigilant, critically responsive, and interpretive of their surrounding environment.

Using public art as a platform for teaching design as an ethical principal, raises important issues around freedom of expression, social engagement and responsibility. While it can be both rewarding for the students and enriching for the community, it can also promote resourceful thinking as it provides an invaluable testing ground for the synthesis of materials, ideas and ideals.

**Notes**


Projects from Module: Renegade Studios and Instructors in the Midst of the Traditional

Patience Lueth, Nathan Edwards, Tom Neppl, Iowa State University

Introduction

The Enrollment Managed Process

The enrollment management of educational programs is not entirely new to the higher education context. In design however, there are very few programs that are enrollment managed at their first-year level. This system not only gives students more choices in their portfolio application process, but at the same time, creates a cushion for the stability of educational entities, looking to increase retention, reduce attrition and implement strategies for consistent growth.

The College of Design consists of departments that participate in the undergraduate enrollment management process (Architecture, Graphic Design, Industrial Design, Interior Design, and Landscape Architecture and those that do not (Art and Visual Culture, Community and Regional Planning and Interdisciplinary Design)\(^1\). With about 500 students going through the core foundations program, an average of about 400 in the last 10 years have been accepted into their programs of choice. Although enrollment has dipped since 2011, within the college as a whole, this system is beneficial because there is less attrition.

The Core Foundations Program (CFP) that consists of several courses\(^2\), taken into consideration during the application process, includes Design Studies 102 (Dsn S 102), which is the main studio that these 500 students have to take if they would like to apply to any of the enrollment managed programs. Dsn S 102, gives students general design foundations knowledge, with the hope that student will in fact be prepared for the 2\(^{nd}\) year of college (first-year in the program of choice).

When looking at the definition of enrollment management, there are multiple affects of the process of enrollment management on the success of a program. Some of these are the implementation of strategies through a strategic process affected by various factors including: a) Specific administrative assignment (leadership style), b) impact of facilities, c) faculty/instructors choice and development, d) student demographic and e) project outcomes. This paper weaves in 3 main factors into the body of it’s discussion - c, d and e.

Traditionally (Fig 1.), instructors were selected to teach this particular course based on need, but since 2014, there is an identification of instructors in the college who have voiced their investment in the core and especially in the design thinking processes of first-year students.

![Fig. 1 The traditional studio sequence.](image)

This means that there is not only a diversity of intellectual processes and fields, but there is also a strategic implementation of various pedagogical styles that begin to draw out the student intellect, even
though there are shared projects and project learning outcomes.

Although this shift was an exciting prospect, there were still some issues with it. The first issue lay with the fact that the shared projects and outcomes would challenge the freedoms of the instructors pedagogy, based on the project or the student learning styles. There needed to be some steps taken to facilitate this freedom and to give Dsn S 102 a final push into the new. The deliberation from this invested group of faculty in summer of 2014, resulted in an overhaul of the existing projects and a new modular studio sequence (renegade) that was piloted (in the midst of the traditional). All this to address the lack of student preparedness when they entered their designated programs. All the projects were new to the Dsn S 102, and the method of delivery and deliverables drastically shifted from a few separate projects that projected their own outcomes, to projects that began to weave learning outcomes, which were accompanied by several implementation strategies.

Currently in the 2nd year of implementation, some instructors wanted to test the theory of going renegade in the midst of the traditional, where equity of students is still encouraged and required. This means that the portfolio applications are consistent, student artifacts are consistent in number and quality, which was truly the only marker of any stark difference that portfolio reviewers could be mesmerized by, would still be emphasized.

The instructor in this case, has much to do with what is produced, therefore, how can all 15 studios remain equitable, when all the instructors from different fields are invested in their pedagogical process to draw out the student intellect? One way was to encourage collaboration and difference at the same time. This was done using an eight-week module system where one instructor teaches 2 projects twice. Within a group of 4 studios that meet at the same time, the projects are staggered. At the eight week point, the students switch instructors and engage in another 2 projects. (Fig. 2)

In light of this, the goals of this paper are firstly to compare and contrast the traditional vs. the renegade, via a series of reflections from 2 instructors who taught in the opposing studio styles. Not only is there a documentation of the process, but there is also a discussion about the pedagogical implications of a module-style studio on studio production, the

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**Fig. 1 Modular (Renegade) studio sequence.** Inst. A= Instructor A, etc. There are periods of intentional collaboration between projects and at the 8-week point where professors inherit a new group of students. By that point students should have already encountered all 4 instructors.
implications of facilities, student production and the impact of the enrollment-managed process on the freedoms of the instructors. Additionally the expectations that the students have of the instructors also come to play. Secondly, this paper will discuss the similarities of these studio styles, even though they have shared projects in a different sequence, and how these studios can be informed by the strategic selection of instructors, the project outcomes and the student demographics, and vice versa.

And finally, through the process of analyzing the reflections, some themes emerged which incude a) the importance of community and shaping community through projects, b) the effect of instructor pedagogical stances on re-imagining and stasis and c) the affect of the project sequence and student demographic on stasis and continuity within a project, will be presented. These themes all being affected by the 3 important factors of the enrollment managed process. This paper will also end with some future projections and recommendations for the current Dsn S 102 instructors and other institutions that are in the transition of change, or who are leaning to an enrollment managed process of design education.

Reflections from a traditional context

Drawing from Personal Experiences (Neppl’s Studio)

In the traditional studio, I encouraged students to consider how they, as artists and designers, can share their voice on relevant and contemporary social, environmental and cultural matters. Throughout the semester, students are encouraged to reflect on issues and topics that are personally meaningful as a source of inspiration for their design process, to draw on personal experiences and to share with each other, in a public forum, their design responses. Specifically, students are challenged to create works that bring topics of inattention into conscious awareness as a means to begin to establish who they are as artists and designers and why that matters.

The “I Am From” Exercise

As a means to begin to understand who the students are and how they see the world around them, I begin the semester with the “I Am From” poem exercise. This is an engagement exercise (note – we don’t call it an “icebreaker”) which asks students to reflect on their personal histories, familial traditions and other life experiences as sources for both content for this exercise and inspiration of their future design process.

The “I Am From” poem is adapted from the works of George Ella Lyon and Linda Christensen. Lyon’s ‘where-I’m-from’ lists summarized life experiences and personal stories and, as he states, poems inspired by these lists can enable one to see the poems as “a corridor of doors opening onto further knowledge and other kinds of writing”3. Christensen notes her adaptation of Lyon’s ‘where I’m from’ exercise in her classroom as a means to “make students feel significant and cared about as well, to find space for their lives to become part of the curriculum.”4

She further notes these exercises build community, foster trust and care for one another in the classroom. Interestingly, Christensen notes that sometimes these exercises ask students to consider how they have been shaped, influenced and perhaps manipulated by media which is a theme I explored in the Mobile project later in the semester.

On the first day of the semester, I asked students to create a poem about who they are and where they come from. Structurally, the poem is to include four stanzas; there are four lines in each stanza, and; each stanza begins with the words, “I am from...”

The first stanza describes familiar sights, sounds and smells of one’s neighborhood. The second stanza describes familiar foods of one’s childhood. The third stanza shares family sayings often heard during one’s childhood around the house and at family gatherings. And, finally, the fourth stanza describes one’s friends.

Christensen notes this exercise brings students together through the sharing of details, traditions and experiences of one’s life. To foster an environment of sharing, I gathered students in small groups to share their poems with their classmates. They were encouraged to listen for unique and common experiences within their group, which could lead to continued discussion amongst the students in that setting. Following the reading of the poem I had written, students are invited to read their works to the class as well.
An example poem from a recent semester is offered:

I am from Omaha, Nebraska
brick paved neighborhoods of fire escape evenings and towering cottonwood trees
a growing, changing city of new people but always familiar faces

I am from early mornings of sweet French toast
at local diners
steaming hot cups of green tea
bacon and eggs stolen from my plate by little hands of siblings

I am from “Hoovers never say can’t” and “work hard, love always”

I am from coffee shops and house art shows
local garage band concerts and studios
where friends and youth pour their sadness and hearts
into creativity

Following the readings, a class discussion about experiences and how they shaped us was encouraged. Students were asked to consider how they could draw on their life experiences as a design student and, ultimately, future artists and designers.

Specifically, students were asked to consider the statement, ‘the role of the artist is __________.’

Building on this discussion, students were then challenged to consider how they brought areas of inattention into conscious awareness. Each student was asked to take the opportunity in this studio to communicate to society something about an issue that was both socially relevant and personally meaningful. I provided a list of potential topics, for example, ‘depersonalization’ and ‘desensitization’.

The range of topics introduced intends to be varied and spacious enough for students to find something that might inspire their work in the studio. Ideally, one or more topic (as some topics are related and interconnected) might prove to motivate the student to engage in a thoughtful response to the projects’ requirements by providing a higher meaning of sorts to the student’s effort in the projects. Each student had the opportunity to select one or more topic to serve as an underlying theme to his or her project work.

These exercises and discussions served a dual purpose. First, they aimed to promote intellectual diversity in the student by providing space and time for each student to share their individual statement on an issue of personal importance. This served as a unifying element for each student’s work expressed across time through the four assigned projects. Second, it aimed to serve as a common reference point for studio discourse throughout the semester. The course syllabus and project statements outlined the requirements of each project as they relate to materiality, form and composition. Encouraging each student to also address a topic of inattention unified the greater class in a sense by promoting an ongoing environment for studio discussion. Each student may have identified with an individual expression, which may have addressed unique topics compared to their classmates.

While this is encouraged in all projects throughout the semester, my reflection focuses on how this teaching strategy is utilized on one of the four course projects – Mobile.

Mobile is a four-week project, which includes both individual and group effort. Students are required to thoroughly listen to and research a piece of music, which serves as their design anchor. They are asked to consider who wrote the piece, what form it takes, its characteristics, mood and format, among other qualities.

Using their research of the piece to guide design development of the mobile, students are asked to consider how their musical analysis closely relates to visual and spatial analysis and that the musical language and narrative of the piece can be translated into visual and spatial language.

The mobile (Fig 3.) should be a response to the music and must consider human behavior, motion of the object, light and shadow, materiality and the relationship of the mobile to site and context. It should be scaled, designed and positioned to be interactive with the human body. One should be able to move through it and it should be mobile, as well. It should be moveable, locatable and dis-locatable.
While many instructors assign a single song or a choice of songs for this project, I assigned Roger Waters’ ‘Amused to Death’. Waters tends to make large statements on the human condition and ‘Amused to Death’, as a concept album, offers a social commentary on the state of things including many of the semester discussion topics introduced previously in this paper.

Through the album, Waters questions why we view the world in terms of profit instead of human life, challenges religious dogma, points out the futility of individual actions, and shows how mass media has persuaded people into doing what goes against human well-being and logic. The album addresses the desensitizing effect of mass media using aesthetics to manipulate people through guilt and greed and playing on their emotions. As such, it serves as a very appropriate musical work for students to further investigate social, economic, environmental and other topics introduced on the first day of the semester.

Due to the album’s lengthy runtime of 73 minutes, I allowed student teams to select one or more of the thirteen tracks to focus their efforts. Each track tends to focus on a single issue or a small number of interrelated issues ranging from the public’s desensitization to war and its impacts, technological advancement and environmental concerns. By selecting a single track, students are able to concentrate their efforts and interest on a concern that’s of interest to them.

Often, students’ response to this assignment is to make a bold statement with their mobile concerning a particular issue they wish to address. Their project’s form and color are striking, the mobile is designed for broad, sweeping movement and students carefully consider the appropriate site and context for their project to emphasize the statement they wish to share (Fig.4).

Student teams test their project’s responses to varying settings and environments to begin to understand the significance of context on the built form as well as the underlying theme or concept.

Reflections from a Renegade Context

The Structure (Edwards’ Studio)

In these modular studios, instructors are paired in leading the same projects over the semester. This new sense of partnership encouraged collaboration and shared knowledge, often coming from cross-disciplines between the instructors, on interpretations and directions on how a project might unfold. Because of this visible act of teamwork between colleagues, students also benefit from the experience by mingling class sections together during class activities developing communication skills and an awareness of diversity between students in the interpretation of projects.

However, a time of trial challenged this sense of community without warning at midterm. The eight-week long relationships that had developed between the instructor and students were disrupted by this change, which left the feeling of a relationship being severed.
As this was the first experience of a transition within the modular studios, no one was certain how the personalities of students would alter. I had personally expected to continue to communicate regularly with my previous students, but even the short distance between my studio space and theirs, divided by a solid wall of pinup board, seemed to be enough to break down that working relationship. Taking in a new group of students, though familiar faces, the experience of altering sections was relatable to beginning a new semester entirely. Looking ahead to future changes in the modular studio is making a more aware effort to maintain instructor-student relationships and nourishing that bound throughout the whole semester. Both eight-week sections through the semester are my students, shared with my co-instructor who teaches the other two projects. The goal within the new modular studios is to enhance community between instructors, between students, and everyone fully within all participating sections. This community has the potential to share a crossover of design knowledge and skill development with a broad, yet clear focus on the potential for engaging design thought and practice.

Efforts have been made, and continue to improve, to have students visit other studio sections to see the process of work their peers are creating and to establish a means of networking, a dialogue, across sections. An emphasis on “togetherness” should be pressed and practiced regularly during the scheduled class period.

Perhaps the change from the traditional studios to the new modular studios is an act of reawakening the original expression of cross-communication within the shared spaces of Dsn S 102.

Drawing from Personal Experiences

Going into the fall semester I had wrongly assumed that I would have a similar experience teaching the experimental modular studios compared to the traditional studio from past semesters. I knew there would be differences, but what they would be or how they would reveal themselves would take time.

I was assigned to teach the Color Composition (fig.5) project at the start of the semester focused on color interaction, collage, and mark making that was typically introduced as the third or forth project in the traditional course. Based on the broad instructions in the project handout, I interpret the Color Composition project as a visual sensory experience that is experientially playful through the range of exercise objectives and material applications. Its structure and outcomes shouldn’t be compared to or assumed to be the same experience as the traditional first project, 30-20-10 (fig.6). The alteration of the mindset of the one teaching the project needs to know the difference. This is what caught me off guard. Of course, I lead the project with the same enthusiasm and effort as I would with any project, but I had wrongly assumed that students would have the

Fig. 5 Color Composition 3’x6’
same vigor going into the project compared with past semesters.

By the time the Color Composition project is introduced, in the context of the traditional studio, students have been exposed to a variety of conceptual exercises, material awareness, and exploratory problem solving and failure in the making process.

Fears of the unknown and an underdeveloped structure in the iteration development that 30-20-10 provides influenced my first group of students’ experience in the Color Composition project. Main questions that arose were, “What am I suppose to do? Tell me how to do this. Is this what you are looking for?” Common questions that any first-year student may ask, I make it a goal to direct these questions inward toward the student allowing them to discover answers through their experience and observations. The first-year mindset is anchored in the idea that an act and result is either right or wrong and the fear is to be wrong, but design is more then a yes or no response. It is about what, how, and why it happened and where we go from there. Maturing and broadening the mindset of my first year design students is what drives me to press them inwards with their questions and exploration of their projects.

Because Color Composition was the first project these students encountered with a focus on color interaction, visceral drawing (fig. 7) experiences, and non-objective conceptual thinking, they approached the project with a raw experience. This project required a different way of thinking and approach. This subjective and, at times, unrestrained activity made the students vulnerable and unsure of themselves through their explorations.

How this raw exposure impacted the students in the later half of the semester is unknown to myself due to the unexpected abrupt change at midterm with student sections shifting and the loss of communication with most of the members in this group, but to reflect on and compare the exposure and experience to the first section of students in the Color Composition project had noticeable differences as I taught the project a second time with the new group of students.

This brings me back to the idea of sequence in the structure of projects in the traditional studio and the beginning observations of how the change in the development of the design student shifts. What should be observed are the objectives and outcomes in the Color Composition and how students take newly learned experiences into the 30-20-10 later on in the semester. A question that arises is, “How do the students interpret the exercises differently compared to students who started with 30-20-10 first?” Is there a willingness to push boundaries and experimentation? This will ultimately be impacted by the guidance and restrictions setup by the new instructor.

**Midterm Section Shift: Reintroducing Projects to a New Group of Student**

The benefit of teaching a project a second time within the same semester has allowed me to reflect upon my experience as I alter presentations, project discussions, and material demonstrations while the experience was still fresh in my mind to successfully aid the progress of students.

What benefits the students and the instructor is the growth in mindset of the student. Over the first eight weeks they have matured, begun to utilize design vo-
Patience Lueth, Nathan Edwards, Tom Neppl

cabulary in their project discussions, and begin to take risks in their iteration development based on concept development and the awareness and application of previously used materials.

Fig. 7 Color composition visceral drawings.

Reflecting on the student experience and the instructor’s self assessment during the shift of student sections at midterm and looking ahead to future semesters I want to make an effort to make the start of the semester just as beneficial for my students and myself. This begins with the evaluation and changes made to projects at midterm. Why am I restructuring my approach? What changes did I make in a presentation? Is there a reason why I restricted the use of certain materials? Within the experimental modular studio structure, teaching a project twice within the time frame of the semester offers the freshness of the previous experience with students to know what worked and what made a difference in the classroom. This modular studio allows midterm to be a time of correction and self-assessment making the project a richer experience for the students and their instructors.

Comparison

The relatively new Dsn S 102 projects have remained mostly unchanged since their inception in the summer of 2014. Foci and objectives have held on within their project handouts and have allowed an interconnected learning experience from project to project developing a sense of sequence within the structure of the traditional Dsn S 102 classroom.

The reflections of the instructors brought about the emergence of two prominent themes including: a) Continuity, stasis and re-imagining the project; b) The community bond between students and instructors.

Tension between Continuity, Stasis and re-imagining the Projects

Occasionally, as needs arise, projects have altered, adapted, and merged exercises between themselves aiming to better the experience within the learning environment. The traditional structure of Dsn S 102 is easily adaptable to these shifts, but the sensitivity and balance of the experimental modular studios has a more recognizable impact based on the necessary change in the usual order of design projects.

The reordering of design knowledge and skills in the modular sections challenge the experience of first-year design students and enhance their experience through the malleability of the instructional pedagogy. An example of this is seen in the order of the modular studio. Neppl talks about the mobile project, which in the traditional studio is the third project and starts simultaneously with color composition, which even though it is the first project that Edwards teaches, it also is the third project in the whole sequence. (Fig 5.)

Even though Dsn S 102’s series of projects are able to be standalone and have traditionally been given in an arranged order that compliments the succession of goals and objectives working as parts to a greater whole, each project establishes a series of exercises that build upon one another advancing the ideational development toward each projects goal with work that emphasizes a dance between consecutive objectives within stages and their requirement for particular media applications. This means that the mobile project (third project) for the traditional studio should flow naturally from the second project. Whereas, color theory (the first project in the modular sequence) becomes the beginning of a new “studio.” It matters that the sequence of projects are given over the semester because of their original intent. This means that much time and energy are spent redeveloping goals and objectives and changing the language of the project, so that the stopping point feels like a continuum. This is all with the fact that equity is highly considered, meaning that the projects cannot be changed much and the objectives need to remain fairly
stable. This in essence creates a dilemma for the instructors pedagogically.

The traditional studio does not have to struggle with this dilemma, but still feel the effects of the projects in an objective continuum. According to Edwards’ reflection, each project in the modular sequence should feel as though they piggy-back off of one another. Therefore much thought is placed on the how to deliver information in that regard. Leading his reflection to the questions of “how” and not the “what” of production. This leads to a conversation of the effects of “how” he engaged students to help them understand the continuum. The process in and of itself becoming stasis.

Neppl’s reflection, on the other hand, reported what the projects were and what students learned from them.

The Community Bond between Students and Instructors

What sets the experimental modular studio apart from the traditional is it’s unique and flexible structure allowing a crossover of shared knowledge and engagement between all students and instructors. The key to its success is the maturing recognition of a more tightly knit community, not just in projects, but the awareness of human engagement toward design. This is evident when Edwards suggests that there might be a crossover of knowledge between one module and the next. The question of how to re-use information learned out of sequence calls for some creative pedagogical applications. Neppl gives creed to the fact that the continuation throughout all four projects is key to the student overall understanding of one project or the other person.

In Edwards’ reflection (which is not included in the reflection section) he states, “Over the first run of the experimental modular studios in fall of 2016, the sense of community wasn’t perfect. In fact, for myself, it was similar in ways to the experience of previous years teaching the traditional structure of Dsn S 102. It is expected that old habits would carry over into a pedagogical structure that shares commonalities, but there was a refreshing reliance between instructors in the modular studios to seek advice and assistance from one another regularly, which may have been influenced by the fact the co-instructors shared the same group of students.”

Conclusion

Looking ahead through the transition of the traditional to the modular studio there will be a stronger sense of evaluation of projects for instructors, identifying what’s working, weaknesses in the projects, and a better assessment of the student experience. With a new group of students comes the adjustment of the classroom personality. Students are individuals that impact the expression of the classroom as a whole. Apart from becoming familiar with new students on a one-on-one basis, the instructor will need to accommodate the needs of the classroom. In turn, students will have to adjust to the new instructor’s teaching style and the space in which the classroom is assigned.

The plan for the fall of 2017 and spring of 2018 is for the modular sequence to be fully implemented into the whole studio sequence. This means that instructors will all engage in a very similar exercise to that which Edwards has experienced. Also because of a system of project rotation (one project will be replaced with a new on every year), there will be a perpetuation of the “freshness” of the project. Not only be asking themselves how students learn because of the constant 3 projects per year (as implied with Neppl’s reflection of the traditional), but they will also face the challenge of questioning their own pedagogical style.

The goal is therefore to keep the first-year design studio away from stagnancy. This will also ensure that there is a method of doing longitudinal studies that capture and discuss the implications of constant change and consistency within this setting.

As a whole, the shift of sections and instructors at midterm keeps the Dsn S 102 fresh positively impacting the performance of the instructor and the learning experience of the design student. With an enrollment managed system already in place, the factors such as the instructor, student and project outcomes are important. Keeping these factors intentionally selected and moving in a direction of positive change, adds to the rigor of what a first-year design studio embodies.
Notes


2 Iowa State University, College of Design, “Core Design Program” Iowa State University, accessed February 6, 2017, http://www.design.iastate.edu/current-students/core-design-program/applying-to-a-degree-program/


Engaging the Disengaged Design Student
Channing Lynn, Appalachian State University

Normal Teaching Strategies?

While there is a plethora of books, journals, and papers that offer excellent suggestions for eliciting innovative and creative design work from enthusiastic students, relatively little has been written regarding the challenge of teaching design to non-designers. What, then, are the teaching strategies to be arrayed in the face of undisguised distain for architectural design and design studio instruction?

The Problem:

During the spring of 2016, I was assigned to teach an introductory architectural design studio, a required course for all Building Science majors at my institution. I had high hopes for a studio of creative students eager to become better designers. I was prepared to take those basic skills to a new level and squeeze every ounce of creativity out of the group. To my dismay, I learned on the first day that I had a studio of nine Construction Management majors, one Architecture minor and no Architecture majors. In fact, it was even worse than first imagined: The Construction Management majors were there simply to fulfill a major requirement and quickly expressed their unhappiness about being required to take a course on design. The conundrum was the challenge of engaging these disengaged students while meeting the pedagogic objectives of the introductory design studio.

The Solution in Brief:

The solution was a design studio centered around individual students and their interests. The approach to design instruction, as well as the studio exercises, were radically revised in an effort to harness the student experiences and interests as the main driver of the design investigations. This paper describes my experiences in the studio, my attempts to establish a studio culture that would engage the students, and my assessment of the failures and successes of the instructional approach over the course of the semester.

The Solution in Full:

I began the first class with a simple assignment, one that emphasized discovery. I have to admit it was more for my benefit than the students benefit. Each student was asked to draft their bedroom using the digital or hand drafted method they preferred. When this quick project was turned in, I realized I had more issues to address than I originally recognized. The quality of the hand drafted projects was poorer than I expected, and the digital submissions were mostly chunky and clunky. I decided quickly that, now that I had an assessment of their “comfortable skills”, the students and I would address the thing that made them most uncomfortable – DESIGN! Not only design, but DESIGN using the medium they had not selected in the first exercise. In other words, if they presented a hand drafted version, the next version needed to be done digitally. The new assignment was to redesign their rooms in any way that they saw fit. I encouraged large speakers and televisions, larger closets and luxury bathrooms; whatever their hearts desired. My expectations were low, and I was prepared not to express my shock. However, to my surprise they actually enjoyed this exercise and the solutions were creative. In fact, the presentations of the redesigned bedrooms were better than the presentations of their current bedroom.

WHY???

After much thought, and many beers, I concluded that the students enjoyed the personalization of the project. It was their room on their terms, and it was something they could imagine and embrace.
So, how was I as an instructor going to continue to engage the students for the remainder of the semester? I wanted more than anything for these Construction Management majors to embrace design, and learn something even in its smallest form, learn to talk like a designer or at least understand the design vocabulary.

What now?

Design Project One began with a request for each student to email me two things that they were passionate about. With this information, I was able to create a unique project and/or client for each student. It was a lot of work, but it was a lot of fun, especially during the big reveal in class and well worth the effort!

We all laughed as the guy that had a passion for motorcycles was assigned to design an AARP office for senior citizens that were former Hell’s Angels. Another student was passionate about LEED design, so her project was to design a satellite office for the USGBC, a bit more serious but it was fitting to her personality. One student whose passion was jeeps was assigned to design a museum centered around the Bantam BRC (the first Jeep in production, 1941).

Each student was required to research their topic and write an outline consisting of 300-500 words. I thought this would be an easy and enjoyable project. I allowed each student to present their findings and express their feelings about the assignment thus far. This allowed me to gauge the current level of enthusiasm, and figure out how I was going to weave in some real design challenges and decisions.

Every project was designed for the same unoccupied site. The students were asked to visit the site, which was located within walking distance of campus, and analyze conditions such as foot traffic, sun angles, views and vehicular traffic. Additionally, all of the students were given the same building footprint with the same building infrastructure; they could orient the building however they wished based on their site investigations and design program.

The building configuration was load bearing exterior walls, with interior columns located asymmetrically. The students were allowed to add additional floors, if needed.

I worked with the students for several weeks on the design and development of their projects. At that point, I threw the class a curveball, one of my favorite things to do to young agile minds! The basis of this is my years of experience working in design firms. Not only does it paint a picture of reality, but it introduces the class to the all too well-known “think quickly in the field and fix it” method.

The curveball consisted of assigning each student a well-known architect, and have them research the work of that architect. At first, the students read about the buildings and later studied images of the buildings. As the students did their initial research, I moved from desk to desk, asking each student about his or her discoveries. Each student was asked to choose an intriguing and inspirational image, and subsequently use that information without plagiarizing, to continue the design development of their assigned project. Some students were happy for the curveball because it led them down an unexpected path and toward a better design. Only a few were unhappy but I concluded they would have been unhappy no matter what.

The students could respond to this challenge as they wished. I allowed considerable leeway and was flexible about structure to suit the needs of various personality types. For the majority of the class, the results were amazing. I was very pleased with the outcomes.

What didn’t work

Once the architects were assigned, I felt that I had to stay on top of the designs to keep the students from plagiarizing. I Remind-
Engaging the Disengaged Student

ed myself that these were not design students and, furthermore, it was all too easy to borrow elements, rather than inspiration, from those great works. The students associated plagiarism with writing but not with design.

For example, the student that was assigned the Jeep Museum was also assigned Louis Sullivan. The student’s first reaction was to throw deeply inset arched windows and doorways on every façade and call it a day! I had to direct the student back to Sullivan’s work and insist that he zoom in on his image of choice. I asked him “What does any of this have to do with jeeps?”

Amazingly, the student, a particularly rough around the edges kind of guy, exclaimed that he “had no clue that all that stuff was there!” I asked what he was going to do now, and he said with rare enthusiasm, “I am going to re-design this, with the Jeep’s grill as inspiration along with Louis Sullivan’s technique.” Pure music to my ears... Conceptually, he was on the right track. In the end, his execution was poor and his design was overly literal. However, a connection had been made and a good one at that.

Findings:

In order to engage the disengaged student, I had to engage myself with their interests, and keep my comments humorous and light hearted. When I gave encouraging words, I spoke loud enough for the rest of the class to hear. As a studio instructor, I tried to keep the parameters simple, structured, and loose, all at the same time. I set boundaries but challenged the class to break the rules with a strong defense. This allows the student afraid of design and to step out of his safe spot and break the rules. Ultimately, is that not what every design student wants to do?
Addressing Adjectives: Mimicking Branding Strategies to Promote Meaningful Architecture

Margaret McManus, Marywood University

Introduction

Architecture and media consume the occupants of our planet: one we inhabit, the other—albeit abstractly—habits us. Through signage, television and the internet we have graphic design flooding our brains via advertising and marketing: tugging on our heart-strings, pulling us to buy this or invest in that; all supported by an over-arching branding strategy. Architecture, however, is more passive aggressive. It is, for the most part, quiet and inanimate, yet has a similar capacity to persuade, dictate, and influence. While both branding and architecture fall under creative disciplines, they are vastly different in their outcomes or output medium. One could also argue that architecture falls under branding as another deliberate means to communicate a particular message at a public scale.¹ This paper delves into an architectural pedagogy with beginning design students that takes its cues from processes more commonly found in branding. It seeks to explore whether paralleling such a process can successfully translate into an approach young design students can grasp in order to create meaningful architecture that evokes emotion and influence and a clear architectural identity.

The processes of creating architecture—while on a more physical scale—are quite relatable to that of a branding campaign as they both share a common goal of creative problem solving through design. In a brief article, “The Difference between Marketing and Branding,” James Heaton, a creative director, describes branding as the “the expression of the essential truth or value of an organization, product, or service. It is communication of characteristics, values, and attributes that clarify what this particular brand is and is not.”² When teaching beginning design students, it is Branding’s unique notion of extracting the “expression of essential truth” and the “communication of characteristics”—of place, or of personal emotion—that is the main catalyst in an attempt to promote a coherent “language” within their architecture studio assignments.

Where emotions are paramount in carefully crafting a descriptive experience that defines a brand, it is through the generation of carefully chosen words—more accurately, adjectives—that students in a beginning design studio are tasked with defining an intentional experience through architectural intervention. Adjectives are translated into formal models that merge with physical site constructs, where emphasis is more on experiential engagement than programmatic constraints. This paper further examines the question: By using observant adjectives to instigate form-making, can we encourage beginning design students to achieve a more affecting architecture?

Fig. 1 A student’s study models depicting various emotional adjectives inspired by a project site visit, yet devoid of context and scale.
Margaret McManus

**Why? And Why Not?**

Successful branding processes both include—and are the result of—countless means of interaction and exchange with society under one singular message. As author, Michael Levine, states in *A Branded World,* “public relations is an integral part to the branding process, and that [branding] is a promise that you make to the public.” Beginning architectural design students often struggle with finding their own process as they embark on a semester-long studio project. Why not leverage the processes in which companies express and carry-out their commitments to the public through successful branding strategies? After all, architecture is to serve, yet aims beyond the promise of upholding the health, safety and welfare of the public. If a tried-and-true branding process (whether revealed to the beginning design students as such or not) can focus them on a common goal, message, and promise of their design project, then they can begin with a platform that can assist as a checks-and-balances system for which to proceed and defend their design ideas.

**The Process**

The branding process used to outline the studio semester consisted of a cycle that is not unlike a typical architectural process; though this paper will look at it under the lens of a branding strategy revealed by the principal of an internationally-recognized design firm that focuses on brand campaigns and promotions. The first part of the process is to *gather.* This involves heavy research into client history, previous branding if applicable, the client’s target audience, avenues and mediums of communication, external influences that may impact current and future trends, etc. Step two is to *sort* everything that has been gathered, and to consider what is the single greatest challenge, opportunity or message for the client/brand? Step three is to *define* the brand platform — this is not a slogan or saying, but the statement from which all aspects of your brand must answer back to; and yes, this is where the adjective lies. In a single statement the brand is to be simplified into one descriptive adjective: “Brand X is [insert adjective here].” That adjective deserves careful consideration along with word association games and emotional investment before being finalized. Author, Levine, also reinforces this step as paramount in conceiving a clear, realistic brand identity: “These promises, which should be written down in the simplest language possible and distributed on a regular basis to every employee of the company, are covenant made to the public.” Once this pivotal endeavor has been realized, then *shape* can take place in Step four. This is where creativity and design take place in an effort to support and promote the brand platform. Step five is to *release.* The branding process is more than graphic design relating to a project. It is a holistic strategy that includes everything including, but not limited to font type, commercials, and timing in which to engage and to *release* to the public. The promise, or defined message should emerge through the presentation and communication of the student project.

**The Studio Assignment**

Experimenting with the notion of following the branding process outlined above took place in a second-year design studio dedicated primarily to a landscape condition (as opposed to an urban studio). The students were not aware that there was an underlying branding process set forth for the studio; and because, if the italicized words noted in each step above where to be extracted, they would fair accurately as a sufficient—if not ideal — architectural process: *Gather, Sort, Define, Shape, Release.* Nevertheless, the pedagogical strategy was to remove any jargon relating to *branding* so as not to skew students’ thinking into realms often associated with the subject like *selling* or *commercializing.*

![Fig. 2 Student Models representing the adjective “intricate” while devoid of context and scale.](image)

Another basis from which the branding process above differed from the studio assignment was in the fact that the beginning design students were not revealed a program or client until Step 4: *Shape.* Without a program or client, the students needed to engage the site as client in order to fulfill Steps 1-3, and in turn they had to answer to the site and its needs in order to *define* (Step 3) how they were going to proceed forward. In a landscape studio, this strategy of delaying the program/client allows the student to fully understand contextual needs from which to
Addressing Adjectives

embed the forthcoming program/client. If attempted otherwise, a student’s preconceived notion of assigned programs or their own unaccounted-for wishes may have been impressed upon the site, rather than be integrated within the site.

With the site and its contextual needs essentially acting as the client, yet still absent of an assigned program, the students needed to tackle Step 3: Define [the brand identity]. This step involved adjectives; fifty from which to start, and three from which to explore and eventually narrow down to one. The adjectives were all rooted in emotional and observational findings while on the studio project site visit. After the site visit, they were tasked with brainstorming and noting fifty personal adjectives relating to descriptive or emotional feelings of—or as experienced on—the site. Concentrating on language and words and word-associations is often a central focus for marketing and branding strategies; and by assigning such adjectives in this context it became the main catalyst in an attempt to reinvent the architectural process for this studio assignment. These adjectives were then translated into study models that were, at first, devoid of context and scale, yet gradually became introduced and rooted in the projects’ physical site.

Step four followed, and the request for a Live/Lab program was to be accommodated for and shaped within the already-evolving, integrated adjective-site models. One out of four unique occupants were to be chosen to live and work within the project much like an artist-in-residence program. The four occupants were strategically chosen as they each recalled unique characteristics of the site: underwater photographer (under/water); botanical illustrator (through/ground); meteorologist (above/sky); and lake/land-to-table chef (around/forest and water).

While second-year students often miss the opportunity to dive into details of their project for various reasons, (including a heavy emphasis on schematic design), and as was the case in this second-year design studio; this strategy remains in hopes that design decisions made and not yet made—in the shape phase of Step 4 will continue to be in response to the project identity (adjective) as defined in Step 3. For example; if the sole identity/adjactive that had been narrowed down from the Gathering, Sorting and Defining stages resulted in “introspective,” ask: can your project—form, materials, handrail details, etc.—support that identity? Can they strive to? Even as the project approaches Step 5: Release, ask: how can even our presentation of the project reinforce the identity of “introspective?” Just as brands perpetually communicate a message, so does architecture and the make-up of architecture. It is a challenging predicament to both communicate architecture and communicate through architecture; yet to have a singular identity platform can prove to be a reliable basis or starting point from which to aim to communicate.

Fig. 3 The “intricate” adjective study models are given scale and are integrated within the topography. “Intricate” is now the identity for which relationships between public and private, programmatic and contextual and the like will exist.
Conclusion

For a beginning design student, it is important that some pedagogical structure be in place in order for them to begin, to understand and to perhaps even depart from a process they can call their own. By providing such a structure that parallels a successful branding strategy, the students can decide upon a singular idea to fight for that can assist in the complex decisions that need to be made within an architectural design process. Project decisions involving superficial and spatial complexities, formal volumes, entry, thresholds, furniture and even presentation drawings can all be supported by a clear, defined [brand] identity while also performing their unique functions. To produce affecting architecture such that it will provide a coherent sense of place is a worthy goal to strive for; yet it may not be as important as asking why we might implement—at the beginning design levels—a strategy whose outcome might lead to affecting architecture. To the latter, this paper strives to encourage such an approach in order to guide students to commit to and to carry-out design projects that fight for an identity through a very complex process of design-decision-making.

Fig. 4 Inspired by the adjective “alive,” a student project culminates in a structure that encourages and invites plant growth in, over, and through the assigned program.

Notes


Students Stepping Up: Why Outreach is Important for Young Design Students

Margaret McManus, Marywood University

Introduction

The built environment, arguably, affects society at least as much as local and world politics, yet its relativity to behavior, outlook, and general progress in grades K-12 continues to exist as subtropical, if topical at all; when educating all students consistently on the past and present built environment (both locally and globally) can and often does impact the ownership and responsibility that develop in students as inhabitants of their futures. Education on the built environment, if implemented as a constant and living learning tool in any classroom, can steer and empower our youth as they are exposed to the inner workings and rationales behind structures and cities. In turn, such education can’t help but effect greater respect among students for their surroundings and the resources they consume—not to mention that an exciting introduction to younger audiences could also spark an interest in the architectural profession.

For three years now, I have been involved with implementing such an outreach program with nearby elementary and secondary school students in an effort to clarify a design profession that the public too often associates either with mathematics, engineering, physics and other left-brain pursuits or the 3-D results those disciplines ultimately produce. Third and fourth grade classrooms, in particular and for many reasons—including the younger students’ high level of engagement, have proven to be an ideal time in which to impart notions of architecture and design. Thus this paper will explore engagement at this level.

The program calls on college design students to share their knowledge, experience, and talent with primary and secondary school students in order to awaken among the younger students both full environmental awareness and how design affects it. It is an avenue that leads grads and undergrads out of their studios and into the forefront of the larger community while revealing to them their influence on the surrounding environment in a real-world application which, in turn, gives them a sense of responsibility and value. This model of community service has previously existed (sometimes successfully and sometimes not) through AIA Chapters across the country, and I am proud to say that we, too, are supported by our own local AIA Chapter. What this paper hopes to provide is substantial reasoning and implementation efforts so that this type of outreach can gain momentum in other design schools. After all, introducing architecture to our youth will begin a shift in perception of the design profession—from one that solely involves straight lines, geometry, and fractions; to a much broader and more creative realm that encourages dreaming, imagination and invention.

Fig. 1 Third-grade students using tracing paper and crayon to imagine their own programs after studying abstract diagrams.
Margaret McManus

Background

This paper will explore the benefits of inserting architectural education into 3rd and 4th grade classrooms. This model of outreach is largely based on experience with AIS (Architecture in Schools) or AIE (Architecture in Education) programs—sometimes associated with professional AIA branches seeking to expose young students to architecture.

AIS, or similar programs, have had great success in cities like Washington DC, and Philadelphia where the program can leverage the vast number of local architectural firms to partner with local elementary schools, marketing the idea as “Bring an Architect into the Classroom.” In smaller cities, where finding professional architectural volunteers to commit to an eight-week AIS schedule (typically, 1-2 hours of class time each week) proves to be more challenging, the logical architectural partner can be provided by the academic community—in this case, by Marywood University architecture students in Scranton, Pennsylvania. Marywood is a century old, yet the architecture program is one of the youngest in the country, having just completed a final, initial NAAB accreditation visit in the Fall of 2016. And, while the presence of a design school alone can positively affect working-class communities like Scranton, programs like AIS not only help to introduce the city’s new resource (access to architectural and design experience) to the community-at-large but expose the young to possible educational and career directions, the motivation to get there, and the desire to share their own learning experience in service to the community.

Therefore, rather than attempting to leverage the limited working design professionals and firms of the relatively small city of Scranton, Marywood’s program leverages its new architecture school, offering an Independent Study course that focuses on connecting university architecture students with local 3rd- and 4th-grade classrooms to promote the discipline and utility of architecture. Yet even with such a connection through the outreach program from the university, the surplus of demand lies in the K-12 realm. This AIS program has not been able to meet the high demand of classrooms that are eager to bring this engaging architectural program into their schools.

Perhaps this high demand is related to the growth of STEM in recent years? The relationship between a loaded topic such as STEM and the topic of architecture is not discussed in this paper, but it should be noted that the National Science Foundation (NSF) implements a similar program on a much larger scale, where graduate students act as liaisons, assistance, and teachers that engage primary and secondary schools; titled “GK-12 (Graduate STEM Fellows in K-12 Education).”

Why?

It is apparent that the need to connect higher education with K-12 education through university student liaisons can be seen across a wide array of subject matter and disciplines. One of the reasons being, as evident in programs such as AIS, that the university students interested in such a challenge have the opportunity not merely to become volunteers, but stakeholders in the community. They can create experiences that extend far beyond the walls of the university that will, undoubtedly, impact their own architectural careers.

It is fairly obvious that outreach programs benefit the recipients. And while this paper will present AIS evidence on that end, it will also cover the benefits accrued by the donor, the university student.

The idea that architecture can and should be introduced in primary schools is not a new concept. This idea and even the implementation of such can be seen in the example of an online resource extended from a collaboration between AIA Michigan and Michigan Architectural Foundation in 2006, titled “Architecture – It’s Elementary!” Its downloadable resource states, “This Web-based guidebook for teachers includes ten lesson plans for each elementary school year, from kindergarten through grade five.” But typically, if introduced at all, the notion of architecture (whether as art or science) is
generally sprinkled, even hidden, within such other elementary school topics as math, art and art history, physics, social studies, etc.—but almost never in its own skin, and rarely ever in texts prepared for children. And, obviously, what passes as an intro to architecture in wider contexts can’t even hint at the vastness of possibilities a career in architecture can offer.

Introducing architecture to primary or even secondary students hasn’t been and isn’t easy. Elementary and high school teachers aren’t trained for it. And they’re not trained for it either because it’s considered too esoteric for the grade-levels they’re teaching, or because they themselves have never been exposed to it. So the cycle continues. In Barbara Moskal and Catherine Skokan’s journal article titled Supporting the K-12 Classroom through University Outreach, the authors suggest a remedy to such similar situations by holding workshops for K-12 teachers (albeit in a different subject matter). Therein afterward, they can support those teachers while they are in their classrooms with periodic visits from university graduate students. One could also see this is a viable, potential solution in which to introduce a less-familiar subject matter such as architecture to primary and secondary schools.

The goal of AIS—both in general and specific to the local Marywood program—is to introduce architecture as an overarching subject (and, in turn, profession) that encompasses design, invention, creativity, science, climate and culture. A subject, by itself, far more significant than its links to mathematics and art history. For which reason AIS strives to clarify and stress the role an architect plays in society.

Whatever the reasons for neglect in pre-university architectural education, however, it can’t be said that children won’t be interested. In fact, it could be argued that they’d be more interested in the problem-solving nature of design than in any other subject to which they’re normally exposed. Most children relish the idea of creating something with whatever they have at their disposal. Perhaps the shift away from this type of intuition to engage in creative problem solving arguably happens midway through elementary school for various reasons including a heavy focus on mandated testing. But the (somewhat artificial) shift at school doesn’t mean that there is a shift in creative enthusiasm. AIS attempts to extend that real-world problem and the notion of learning through making—while that natural enthusiasm to create still thrives.

The University Students

University-sponsored outreach programs often exist to serve the surrounding community. But, certainly just as often, they are recruitment tools for the university. For the university students involved in such outreach programs as the AIS Independent Study at Marywood University, the benefits are numerous as well. The most obvious, of course, is the introduction to and connection with a wholly new audience of third and fourth graders.

While the university participants gain experience in preparing and presenting lessons for a sometimes-not-so-forgiving or patient “client,” they also gain confidence in public speaking; in adapting technical terms and jargon to the vocabulary, learning level, and attention-span of their audience; and translating verbal explanations and instructions into visual (and often hands-on) demonstrations. All of which hone the university students’ abilities to streamline complex concepts and to elicit the questions and demands that a working architect normally requires to please his client.

Confidence-building is also the natural result of reinforcing fundamental attributes of architecture along with their own ideas on communicating such knowledge. While every architecture student must eventually present his work to an already knowledgeable jury, the task of holding the attention of 8- to 10-year old critics presents entirely new challenges. But it is that task, precisely, that may most benefit the university participant: architecture students, as soon-to-be licensed, professional upholders of health, safety, and welfare, understand that public speaking—often to communities and individuals unfamiliar with any part of the mission or practices of the Architecture industry—is a large part of their future career.

Another, unintended but certainly beneficial, consequence of placing would-be architects in the classroom through such projects as AIS is that those undergrad and graduate students are exposed to an entirely new profession: teaching. This means becoming comfortable with garnering attention in front of a classroom, reacting to public situations; responding to and fielding direct questions; and assessing and addressing their effectiveness over a period of eight weeks. This can also come from discussions with supervising instructors at the collegiate level.
Margaret McManus

Fig. 3, University architecture student reveals to 3rd grade students some of the projects involved in architecture education.

Independent studies are often the most viable bases for students seeking information on topics they are curious about and that are not available to them. Such independent studies, depending on their nature and ambition, will require varying degrees of supervision. An Independent Study course through AIS encourages cross-discipline interaction and interviews with either current teaching professionals, and/or other university students embarking on education degrees. Excerpts from a sample syllabus follows.

Also, not to be taken lightly, a bonus to such specific service outreach programs as AIS that are often sponsored by local AIA chapters, is the new link formed between the university students and participating professionals in their areas. It is not uncommon that students who step into the community as representatives of their university are the first to be chosen for internships and jobs.

An Independent Study: Syllabus extraction

Course Description & Introduction:

An Independent Study; this course serves as outreach to and collaboration with the larger community while providing a platform for growth and experience for the MU students involved. This course brings upper-level architecture students into select classrooms ranging from grades K-6, and allows them to enter and to challenge their abilities of communicating and teaching architectural ideas. When in the position of teaching there is inevitably a process of RE-learning and gaining a more substantial grasp on subject matter; all the while being open to the unexpected lessons that teachers will, no doubt, learn from their students. This class will involve a pro-active research and planning process; real-world experience in front of a classroom; a parallel documentation and reflection requirement in the form of a blog; and a professional graphic and photographic record in the form of a book of their entire experience. A requirement is to be met that will involve engagement (through documentation of your choice: transcript interview, video, etc) with a professional educator and a student in the Department of Education to assist in cross-disciplinary studies, mentorship needs, and applicable assistance relating to primary education.

This semester AIS and Marywood students will team up with [Insert participating program and/or Elementary School here] to provide approximately 1.25 hour classroom sessions that will introduce both general and specific notions relating to architecture. University students will need their own transportation. Class Sessions will be held at [designate location with specific school name and address]. Each session will involve approximately 25-35 students in 3rd - 4th grade from 1:00 – 2:15pm on selected Thursdays for 8 weeks [changing all variables to suit specific details].

All work is to be cumulated and organized throughout the semester. All documentation will be submitted at the end of the semester both digitally (web blog – consider WordPress) and physically (book – consider Blurb with InDesign Plug-in). Work submitted after the due date will be penalized an additional half letter grade for each day late. Work that is submitted more than one week late will not be accepted or reviewed, and will receive no credit in calculation of the grade for that work.

Course Content:

The course content is divided into three distinct, yet overlapping, units as follows:

Unit 1: Research + Planning
Unit 2: Execution + Engagement
Unit 3: Documentation + Reflection

The above indicates solely an excerpt from a syllabus. Many other variables may be included in the syllabus per program, university, and student.

The Elementary Students

Introducing architecture to 3rd and 4th grade students can be a thrilling experience for anyone a decade or so older than that age-group. The topic alone—architecture and design in the academic sense—appears to have intuitively inhabited their conscious and subconscious minds already. From their earliest block-balancing days, they have been exploring, making, and inherently adapting to their rapidly-transforming physical
proportions as they negotiate their way in a built environment that has primarily been constructed for everyone but them! Nonetheless, their engagement with the types of hands-on activities that AIS outreach seeks to provide matches their enthusiasm of the subject. Through many of these projects, the students get to elaborate upon and to invent a world that responds to them and their own needs and wishes. Other projects reveal architecture as a subject and profession that goes beyond the drafting of the house or building and begins to relate such structures and their functions as parts of a larger whole—as inventions in response to weather, culture, time, function, technology, and available resources—to name a few. Children begin to see architecture for the thoughtful problem-solving and puzzle-like negotiation that it is. This first-hand knowledge (coming—in this case—from architecture students) is motivation and empowerment for them. The answer as to why this education is important to them is because it has great potential to shape the way they think about, react to, and treat their surroundings.

The answer to why outreach is important for young design students goes well beyond the realms of this paper. Facts and findings on psychological benefits for those that serve can be found elsewhere, but specific to architectural design outreach at the university level, it is clear that the reasons why outreach is important is because it is a win for everyone involved (as service often is). The community and the university benefit; and the elementary and young design students benefit as well. It is more than aid and support to current elementary subjects such as math and history. It is an introduction to a subject that directly impacts every student (and every being); while being a platform for re-learning, preparing and taking ownership of skills and responsibilities of soon-to-be architects and designers.

Notes


Conclusion

My experience has shown that university students thoroughly enjoy engagement in the AIS outreach program with elementary schools. One university student testimonial even noted that it was a “welcomed break to the chaos that is [college] architecture school.” This service “break” should be encouraged and adopted for all the reasons above; and yet another bonus one—as it may be a strategy that fulfills NAAB accreditation requests under Community and Social Responsibility: “developing graduates who are prepared to be active, engaged citizens able to understand what it means to be professional members of society...”

Fig. 4, Third-grade student work in groups to design and assemble tower-like structures using spaghetti and marshmallows.
The Body Mantle

Meghan Minton, University of Cincinnati

When contemplating the necessary skills that we as educators should be giving to beginning designers, I believe a good place to start is the beginning. How do we as interior designers define what is interior design is? Is it only a container for our earthly possessions? Is it a sanctuary for the quotidian rituals of humans? How do we provoke students to question the limits of what an interior is? Can one only find an interior within the confines of brick, wood, and steel? How do we get them to see that which they may take for granted? Lastly can the answer to all of these questions engage the budding academic discourse of interior design? I don’t believe that there is one exercise that can answer all of these questions but I do believe the Body Mantle is a project that begins to engage students in the practice of questioning.

To begin this project each student investigates the material properties of several everyday items; cafe straws, envelopes, garbage bags, coffee filters etc. It is necessary to look past the popular use of these items and begin to look at the material in which they are made from and the properties that they possess. The students are then asked to create a textile of sorts by joining a 100 like pieces of these items together. The 100 pieces may be joined by folding the material onto itself or the student may add a second material, a stitch. Through the process of developing this textile the students are asked to site this textile on their bodies thus creating the mantle. The body mantle is a means of provoking a young designer to become sensitive to the body, its proportions and its ability to create, measure and understand space. This project is predicted on the work like Rebecca Horn’s performance Unicorn, Hussein Chalayan’s Afterwords and Oskar Schlemmer’s costumes form the Triadic Ballet. Their uses of applying mediators to dynamic beings and how that then can begin to define not only the being but also the place in which they are in. Students are asked to examine the modification of ones body, and here the idea of inside and outside, interior and architecture become blurred.

Like any design project this is not a linear process, making the student continually test, analyze, iterate and recalibrate their mechanism of joinery and where and how the mantle can modify and enhance one’s own body and experience. The students must take into account the ability of the mantle to stay on the body and the amount of flex and restriction the mantle makes on the body. Craft is developed through the repetition of producing this textile, and is integral to the performance of the body mantle for the piece must then be able to stay on the body and endure the movements of the student. As a final element to this project the students are asked to participate in a college wide show of body mantles. This not only allows the students to share their findings across the studio, but also get further insight into how students across disciplines address this problem.
How do we define the interior?

*Interiors are the real containers of the immediately adjacent living space.* Wolfgang Meisenheimer

One of the interesting outcomes of this project is the craft and consideration each student takes in constructing and placing the mantle, and the unexpected surprise they have in wearing and experiencing their mantle. The understanding of what is inside and outside, the spatial experience of being within the mantle and the ultimate performance of the mantle begin to lay the groundwork for an understanding of how one can define the interior.

The body mantles that cover parts of the head or restrict the arms seem to give the students the immediate understanding of what is inside and what is outside. Is the hindrance of ones five senses fundamental to the understanding of how we perceive space? The spatial experience of inhabiting one’s mantle can emanate conversations of spatial qualities such as light, texture and noise. The performance of the body mantle is a result of the craft, success of material study and one’s commitment to exploring the relationship between the mantle and the body. The mantle and the body are both altered when they come together, and this symbiotic relationship creates a new thing. This relationship furthers the understanding of the body as space maker and begins to question where does the body end and the interior begin, and thus where is the line between the interior and architecture. Through the mantles’ performance as a prosthetic, shield, binding etcetera the experience one has is enhanced, the lines are blurred and the conversation begins.

*How do we provoke students to question?*

*What we need to question is bricks, concrete glass, our table manners, our utensils, our tools, the way we spend our time, our rhythms. To question that which seems to have ceased forever to astonish us. We live, true; we walk, we open doors, we go down staircases, we sit at a table in order to eat, we lie down on a bed in order to sleep. How? When? why?* Georges Perec

One of the most valuable tools we can give new designers is to question. By taking an anthropological view of themselves and society they can create a lens that allows them to question everything outside of the context they know things to be. They can challenge the way in which things are done, the materials that are used and the tools and methods that are used to construct them. The exploration of materials is obviously trying to provoke the student in engaging with this mode of thinking. It aims at getting students to look at a coffee filter not only as a vessel that they staggeringly shoved into a coffee pot everyday, but as a multisided vessel constructed out of a semi translucent paper that has an inside and an outside and can be malleable enough to follow the contours of the body but rigid enough to bear unexpected weight.

*How do we push the academic discourse of interior design?*

*Interior design perceived as feminine, superficial and mimetic as compared to a male, rational and original architecture.* Lucinda Havenhand

Interior design is not limited to the irrational and the decorative. Interior design can be rigorous, measured, iterative and replicated. It does not need to be limited to the surface but can be defined through movement, garments and objects. By looking at these statements as hypothesis it allows us to generate experiments. The body mantle is such an experiment. It has proven to be a mediator between the body and its environment. It has pushed the idea of the interior out of a
narrow singular discipline into a spectrum of multidisciplinary query. Finding ways to test these hypothesis and present them on a multidisciplinary platform that include architecture, industrial design, graphic design, fashion design, fine art and music, the academic discourse of interior design will be elevated.

The last component of the body mantle project is a college wide runway show. This project allows each student to create a space that only they can experience. Their experience up to a point is in isolation until they participate in the college wide show. Here they are confronted with other’s mantles and all parties are forced to negotiate space. The themes discussed earlier are repeated on a larger scale. The question of what is inside and outside takes on a whole new meaning when two students are standing next to each other. The layers of body, material and space creating thickness, qualitative pockets and moments of dwelling. All of this, challenges the definition of interior design, architecture, industrial design and fashion. In closing, I would like to continue the thought begun earlier by Wolfgang Meisenheimer when he described how we experience interiors,

Yet, their reality, which is so very suggestive of a wholeness around our body, exists only in our imagination, for we see and hear only varying fragments of them and they are not in the least palpable as “interiors”.

Fig. 3 Body mantle student show

Notes


**Introduction**

Observation and survey drawing is assumed as a baseline in beginning design, but re-imagining the “known” is paramount in our role as designers. The visual conversation between drawing both the seen and unseen must be introduced and cultivated early in the education of an architect. The hand/eye connection can be developed parallel to the connection between the hand and mind’s eye—forging a student’s ability to take ownership over a drawing’s process and intent in the foundation years; with limited (if any) time to develop analog drawing in a curriculum should we be emphasizing its opportunity to engage the imagination.

If we consider imagination as “retention of the absent” or the ability to retain absent things in our mind then its relationship to design is undeniable, and its relationship to drawing—essential. As designers, we are consistently charged with creating new things, developing new ideas, and/or delineating new spaces; but all of these must connect back to something existing or some known conditions in a meaningful and considered way.

This paper will present a drawing project developed for the first course in the visual representation sequence of Drexel University’s Architecture Program. The project operates as a case study for others that suggest building student’s proficiency in translating an observed (or known condition) into an imagined or series of imagined conditions. This approach can yield greater authorship and intention while simultaneously supporting necessary curricular outcomes and desired skill sets. These goals then, are outlined through ways of thinking rather than ways of doing.

This paper will present the project’s approach to incorporating the imagination in a structured manner. Surveying the existing, testing imagined conditions and then defining those decisions to reveal the imagined as an artifact.

In this classic problem revisited, students examine a tool that they have been assigned and draw that tool in its unfolded views. The processes that follow encourage critical thinking and iterate on other learning outcomes; both conceptual and technical.

**Imagining Process**

The imagination is a powerful tool that we generally engage with in design studios, but do not tend to cultivate this in support courses. Design problems are consistent in prompting students to develop ideas and manifest them in a visual form—a process that inherently provokes the imagination, but with a very broad stroke.

In any given assignment, there is likely a range of objectives, such as building a student’s technical ability alongside their capacity to grasp key concepts. An example of this being the technique of drafting construction lines and varied lineweights reinforces the concept of orthographic projection. This pairing could be successful in engaging a student in the concept of projection, but I would argue that without a deeper connection to the student’s individual perception or imagination, this approach can quickly become routine practice. Stronger students may decide to layer “imagination” into their work without prompting, leaving less engaged students to go through the motions feeling disconnected from the assignment and lesser in ability having not considered an imaginative approach as it was not “assigned”.

So why should we assign imagination? Why add a third condition to an already crowded set of standards. Especially for something that should be so simple to teach, like drawing? The imagination helps to ingrain information, ingrain processes, it separates itself from the perils of repetition and mimicry.

“Everything your ‘immortal’ mind imagines leaves material traces. Each thought alters the physical state of your brain synapses at a microscopic level. Each time you imagine moving your fingers across the keys to play the piano, you alter the tendrils in your living brain” If a student’s capacity or capacities for imagination are developed while drawing, the subsequent objectives, both technical and conceptual will be enhanced.
Re-Tooling

The first drawing assignment of the first year representation course involved surveying and drawing a tool or simple machine. I had inherited this common problem in foundation design and found that it had so many benefits. It generated the need to resolve problems of geometry, scale and projection. But what I found was that students rarely completed these drawings successfully in one iteration, and as a result of the project structure may have ended up comparing their very early beginning design work to their peers who may have had a background in technical drawing. Simply drafting the tool, studying its form, its detail, its materiality is valid and the objectives are sound goals but lacked engagement and interest on behalf of the students. (Fig. 1)

I set out to determine how could this common design problem, like drafting through observation, could become imaginative — teaching skills, thinking processes and individual authorship without treading into the territory of “design”.

In the re-tooling of this first project, students surveyed conditions, becoming familiar with their tool. (Note: no more than five students were assigned to a single tool type. But the assigning of a group of students to one type of tool is important to cultivating collective knowledge and introductions during the first week of classes.) This portion of the assignment is, the known, it relies on careful study, observation and documentation.

In a second iteration, students are asked to re-arrange distinct known portions of their tool drawing, from various views and details. They are to remake these disparate parts into a “new tool” of their own form and function. They redraw their tool at a new scale with known information reconnected in an imagined way. This remaking initially re-engages their technical and conceptual capacities and begins to fold in their imagination, making five very similar drawings of meat grinder, markedly different. In this example of productive imagination, parts of the “visible” are rearranged because they have “already gone through the de-sensing process of thinking.” In other words, the basis of this re-making is set, the known has been embedded to build upon and to affect.

Distinction

“...the image [imagined], passes over itself, it is not simply the mental representation of an absent object. It goes so far as to become the symbol of something and traces, or as Kant says, notes, something else, so that distinction, more than clarity, will be a result of the imagination and its fruits.” - Concettina Manna from “Text and Image”

This second step of three in the drawing project defines authorship in the student’s work. It provides a basis for critique that is not reliant on direct comparisons. It offers opportunity for dialogue with students to technically resolve a drawing, not as I (the instructor) imagined, but as they (the student) did.

In review, indications of depth are not readily apparent, they have to be teased out of a student if they are illegible. Layers, movement and space are not fixed nor pre-determined at this point, this phase allows for malleability in what they imagined but also what the student may have not fully considered. Ownership over these distinctions reverses accountability in the project and creates flexibility in solving the problem. Concurrently, other interpretations of their tool are unfolding simultaneously around the class, exposing the possibilities of resolution developed by their peers—preferencing conversation over comparison. (Fig. 2)
Drawing the Known and the Imagined

Fig. 2 Three interpretations of a Metal Stud Crimper

Rendering Value

The third and final stage of the project has students define depth and evoke material qualities of their new tool. The rendering portion of the project also forces students to define any vague understanding of space and relief that were unresolved in the previous iteration. In this last step, lines become spaces and layers making that which was imagined—seen. The initial snapshot of their mind’s eye is now made visible. The value of revealing this to the beginning design student is two-fold. One, they are able to see their own ideas with clarity, but they are also exposed to the array of possibilities their peers have also achieved.

Looking Ahead

This particular drawing project is presented as a case study for incorporating imaginative processes into future “supporting” coursework for beginning design education, such as visual representation. The need for these classes to support skills but also to maintain the creative engagement of the student is critical. This process or method is not limited to analog media or to drawing, I have been testing the possibilities of imaginative outcomes in subsequent courses that include 3D modelling and digital fabrication. As this initiative is part of a much larger curriculum revision, the potential of these changes has yet to be fully realized. However, in just two years, the student’s reaction to ambiguity in an assignment is now typically acceptance over confrontation; where the potential of an open-ended answer yields genuine interest.

Regardless of the subject matter or level of student, the aim is to intentionally and specifically engage the imagination in beginning design education. These efforts should run concurrently with technical and conceptual learning objectives; filtering decision-making through the imagination. In doing so, a students ability to recall a particular technique or concept will be linked to a memory of their imagining something that eventually came to be.

Notes

2 Doidge, N. The brain that changes itself: Stories of personal triumph from the frontiers of brain science. (Viking: New York. 2007).
Guided Visualization Pedagogy: The Information Model Approach to Beginning Design

Mark O’Bryan, University of Kentucky

Introduction

Guided visualization is a systematic approach used to teach architecture to the beginning design student. The study of design involves arranging and building elements into a simple and predictable whole. The impending discovery of new knowledge is assumed and the technical development always predates the discovery of new ideas. Guiding students to be mindful of the positive attributes of detail requirements, even the arbitrary and sometimes bizarre desires of the client, can lead to interesting designs and is worth serious architectural investigation.

In *The Art of Creation*, Arthur Koestler states, “the creative act is not an act of creation in the sense of the old testament. It does not to create something out of nothing. It covers, selects, reshuffles, combines, synthesizes already existing facts, ideas, faculties, skills. The more familiar the parts, the more striking the new whole.”¹

Drawing inspiration from Koestler’s words, this author argues a design act is basically the act of arranging existing things for a specific purpose. The concept and meaning of a designed object created by beginning students is the same thing. The critical discussion and narrative concept that follows, then, occurs mostly after the object’s production. Students learn not only to arrange, but also, with the help of educators, understand how to think of a concept that matches the object they produce. At some point in the design process the students will be able use this conceptualizing tool to inform their design thinking whereby enabling them to create and edit their designs.

This educational activity is part of the process referred to as “guided visualization.” It is this author’s hypothesis that design education does not go far enough into the details of the arrangement of architectural elements, even though these compositions lay the foundation for ideas that students will later use and apply in their own work. Additionally, it is the contention of this author that design education at the detail level should occur as early as possible in the studio curriculum, as early as the first day of class even, to begin building the underpinnings for mastery of the necessary standards that will eventually lead to the discovery of new, creative ideas.

Building information models (BIM) represent a logical standard for students to master. This article will describe an approach that takes advantage of BIM while utilizing the most recent visualizing technology. It will also describe the research in technological terms and argue that the creative discovery of new ideas is a byproduct, rather than the primary purpose, of this guided visualization pedagogy. This is in no way to degrade the importance of creative activity. Rather, it is the aim of this paper to place the priority on intensive technical understanding, while realizing that the aim of architecture school is always architecture. Students of architecture need to learn about the elements of architecture first. They must learn to be unspectacularly correct in their understanding of the architectural orders when constructing buildings. The described method proposed by the author also relies on more traditional sketch models at the start of the process and then moves quickly into digital BIM modeling. The role of visualization will also be discussed using references from architecture and photography to present a pedagogy that aims to instill an approach that is rigorous and experimental. A special debt of gratitude is owed to the author’s former professors at the University of Kentucky, Cornell University and the American Academy in Rome.

Guided Visualization Pedagogy

Guided Visualization Pedagogy is based upon learning first from standards of design and construction and expanding from what
is learned, then deepening it with formal exercises. This pedagogical method works because it is similar to the practice of architecture, where there are right and wrong answers to problems and there are requirements determined by actual clients with real cost considerations. The design problem in a studio setting is structured in a way that sets real limits on cost and construction type. Additionally, with the (hypothetical) client, a target goal and expectation of a complete set of building documents is a strong framework for constructive innovation. As in practice, unexpected connections of mundane requirements can lead to interesting inventions. Using this model requires that specific building information be assigned at the beginning and integrated into the problem statement. If students expand the scope of the assignment they can do so, as long as the essential parameters of architectural construction rules are followed.

Since design is arranging elements into a composition where the whole is greater than the sum of its parts, guided visualization can be applied to any part of the design project. Therefore, it is most important to assign a structural system that is pedigree. For example, a structural system that is a built up space beam and plank with built up columns and walls. This author includes masonry walls, columns and piers either of rock, stone and/or brick elements. Defined, coursing nomenclature, as well as texture and color properties, are investigated. Also, standard sizes for lumber and glass are learned. Keeping to these simple standard elements, students learn materials and methods of construction as they apply design concepts. Beam and column connections require students to define a rigorous directional grid as a first low level ordering principle.

For the beginning design student, all design problems work as long as the scope is relatively small. It is important for the young designer to apply rigor to the design process and to represent, both accurately and correctly, the content of the design. This means helping the student make “good” choices in the specifics and standards of design and construction. Guided visualization means acting as a guide and predetermining much of the quality and characteristics of the elements of design in the beginning. As professor Vince Mulcahay from Cornell University once said to this author, “pedigree construction is the key to learning.” It is recommended that one assign specific pedigree elements to students: those that exist, those that are available and measurable, and those that are of the highest standard of quality. Because these elements are real and measurable, the students can focus their attention on the difficult problem of design.

Guided visualization gives a specific type of structure in the problem statement. Guided visualization occurs vis-a-vis collaborative dialogues between the student and the studio faculty. Together they reach into other references (as well as their own experiences and knowledge of history and design), to make their connections. Students iteratively imitate that same critical process with each other. As with any experiment, however, there must be controls and constants. The quick sketch model approach helps the student to jumpstart the process and to establish a general line of communication with the professor. The BIM, however, is the central control point. The professor acts as interpreter and arbiter of the BIM in order to prevent contamination of the design lesson.

For example, the BIM process dictates that the roof is composed of built-up, spaced beam and planking in an orthogonal structural system. Beams carry the load of the planking down to the foundation, with built up columns (2x6’s). The span limit of the planking on a flat roof is 6 feet. Glass is in between spaced built-up columns and standard details for that is provided. If a student wants to cover the entire face of the building with a single glazing unit, then they are instructed to the acceptable alternative by the system-referenced standard. Rather than deny the students proposal directly, saying, “No, you cannot do that,” the educator says, “Here, according to the system, the glass works with this detail in this particular manner.” By phrasing feedback in this way, the educator defers to the standard, rather than to personal preference. Students are then able to use the guiding principles of the standard to figure out what part of the design is variable and what constitutes architecture with and dependent on that building information model.

This trial and error, BIM approach favors beginning design education. As Koestler suggests, the situation, time and circumstances, together with the various detail facts about the artifact to be, must be put together and combined by the designer. Creation reaction cannot occur in a void, therefore it is important to begin with some irrevocable and tangible facts. The building information model approach is precisely that, beginning with facts and building information.


Beginning of Sketch Models: Suppression of Detail

On the first day of class, an example of a sketch model is shown so that students can visualize the size, scale and features of the
Guided Visualization Pedagogy

object. Details are suppressed in order to investigate volumetric organization and characterization. A discussion follows and students learn from observation of peers. Students pick up design elements and ways of representing various components. The small house containing two rooms above a storage shed is all that is needed to begin the conversation, which is intentionally kept brief. Main concepts such as the structural assembly of beams and columns are discussed. Each student makes and presents six models. All students vote on the best model. This is done in half of the class period (see Fig. 1).

It is important to note that these models are suggestive and loose. They are a dime a dozen. Ideas are a dime a dozen. Both are important as a place to start, but ultimately, it is what the student does with it that matters most.

The next third of the semester is the most difficult and specific. The students create their first complete set of two dimensional AutoCAD design drawings for their project. AutoCAD drawings provide a specific technical knowledge base to augment the students design skill because the drawings represent everything, they are a density of information.

Drawing samples are provided to help students understand the Autodesk program and how architectural orders of constructing are represented in two dimensional formats.

System Integration: Pedigree Systems

After students are able to represent details in 2D AutoCAD, they learn to transport and loft digitally in programs such as Rhino.

This reference file is set up to show students exactly how this is performed using an actual architectural order of full scale constructing. The full scale construction photos are taken by the author using 14mm super wide lens Nikon df (see Fig. 2). The 14mm Nikon df representations are shown to the students and checked against the versions represented using Rhino renderings. View angle and distortion is correctable using Rhino and this is an important teaching point. Students with 3D rendering and modeling tools gain additional knowledge when they are taught camera settings and photographic techniques for architecture.

Students need to learn how digital modeling and digital visualization settings relate to paralax adjustment and tilt-shift mechanical operations of traditional large format camera photography. Discussion of “architectural photography” can provide important lessons about perspective correction standards applied universally in all forms of architectural media representation: books, magazines, etc.

Editing Between Digital and Analogue

After populating drawings with the details as required, inconsistencies in the plan become more apparent to the student and the professor. At some point early into the design, the professor must make a full technical review of the detailed work of the student. Reviewing all the student’s work is not necessary or even recommended.

The professor receives a design file and edits the printed version as shown in Fig. 3. Guided visualization is most powerful when students are able to understand and master the shadow line, stacking, placement, material layering and other visual effect controls as architectural orders of constructing.

Fig. 1

Detail Studies

System Integration: Pedigree Systems

Fig. 2
A wide range of visual technical solutions can be discussed, for example, how to successfully coordinate material modules and resolve joints and imperfections in construction. Also, students must be aware of the impact of weathering forces such as wind, rain and sun and how a building responds to its environment. They must also understand dimensional changes due to temperature and humidity as well as water, wind and gravitational forces impacting the structure. Simply put, students need to master the ordinary problems that all buildings encounter.

Guided visualization demonstrates these ordinary problems by including pedigree details and construction systems so that students learn architectural orders of constructing. For example, the cantilever roof protects the exterior wall and gives uplift to the interior span support. This is achieved by showing students how to build the correct drip edge profiles of eave and soffit details as pedigree using ordinary lumber, as illustrated in the drawing and full-scale detail mock-ups demonstrations in Fig. 4 and 5.

The professor that spends the time explaining the technical mechanics of this process has a better chance of gaining the student’s attention and focus.
Once the architectural requirements and building information models have been defined by the teacher and the student, then the task of design elaboration can move forward.

**Improvements by Assessment Goals**

This author is a chief proponent of a formal assessment of student outcomes for the University of Kentucky’s College of Design and School of Architecture. An assessment of student work occurs two times a year. After work has been completed, digital copies are sent to a site organized by year and NAAB criteria. Faculty reviews the collected work and assessments are created based on goals and NAAB learning outcomes. The results are discussed by the school curriculum committee and reported to the faculty and University, as required.

University and school assessments are intended to ensure the faculty conducts a scientific data based review of student work. Collectively, the purpose is to improve student learning. As the former associate dean and chief assessment officer, this author has conducted many assessments of previous student work; including the author’s own student work. The assessment scores were completed and, over time, various criteria for student work outcomes were adopted. The work of students is now assessed using the following criteria:

1. **Elegant**: Simple, compact and composed. Uniform shows restraint and/or fits justly and rightly into a complex composition. Easy to remember (mental model). Differentiated by use and structural and material characteristics. Honesty of appearance - looks like what it is and not something else.

2. **Performance based function**: Performs extremely well and requires minimal maintenance. Sustainable, serviceable and durable.

3. **Versatility**: Building type with reversible and invertible spaces - a background building. Its physical presence does not interfere with its purpose. It is not likely to go out of style and/or become dated. Its meaning is legible and its form is clear. It will always delight.

4. **Contains few arbitrary, contradictory or adjustable elements**: Systematic in detail, regulatory of detail, etc.

5. **Self-evident**: Explains itself by observation. Makes detailed predictions about future observations that can disprove or falsify the model if they are not borne out. Facade as prophecy. Inspired detail. Consistency of detail. Predictions can be made about the interior, its structure and uses from the parts. Agrees with function and explains all existing and future functions (adaptable and expandable).

6. **Symbolism**: Referenced form. Forms are about something cosmological, reinforce health and wellbeing, rightness of mind, cultural, social, and ritual, evokes a poetic response and tells a story (not necessarily a structural story). Differentiated enough to make the connection of all differences.

This assessment has evolved over many years of teaching. It involves both the author’s own self-assessment of student work and the opinions of fellow faculty members who have looked at previous work samples of student work. Additionally, counsel from fellow faculty members was relied upon for possible improvements.

The sum work from 2010, 2011 and 2012 show weaknesses in all categories, particularly criteria 1, 2, 3 and 4. Starting in 2012, the teaching approach evolved into a straightforward system method of defining a structural system and dictating a smaller project scope. The focus is also now on one small project rather than many projects. By reducing the assignment to one building...
project assignment, it is possible to better align representation with thinking, thinking with good models and models with seeing. In Fig. 6, selected examples of student work from 2010 to 2016 show improvements in the architecture of student work including visualization and rendering, detail development and architectural structural sophistication.

The elaboration of structure and detail evident in more recent work can be explained by a shift in emphasis to the Guided Visualization Pedagogy. The scope of the projects is small and manageable to allow for architectural construction. Other improvements in teaching method include more workshop style demonstrations of full technical reviews of student work. The author is specifically more strategic with regard to daily, in-class assignments and individual desk criticisms, which allows for more time for students to use class time for production work.

These improvements place more emphasis on teaching the mechanics of the design project in the beginning, which results in the more efficient use of students’ time. This efficiency results in more effective construction of physical models, while placing more emphasis on the digital models and subsequent rendered investigations (Fig. 7).

Conclusions

Guided Visualization Pedagogy uses a coordinated assessment process that has led to pedagogical improvements in the design studio. A teaching faculty that embraces a culture of assessment, while balancing the need for individual faculty autonomy, can better improve and communicate its values, while also meeting the NAAB criteria. The faculty assessment and reflective statements are based not on anecdotal information but rather on a random sample of student work. Studio faculty should perform evaluations that are based upon a clear standard for expectations. In light of this author’s own assessment of student work, which has resulted in the changes made in teaching methods and improved student work outcomes, the following conclusions can be drawn.

First, the author’s approach to teaching design is now more akin to the way the author would design a project in practice and less an idealization of architectural education. The approach puts upfront emphasis on defined scope and measurable standards similar to real life experience in designing a building.

Less emphasis is placed on narratives and design concepts in the beginning of a design project. Instead, an intensive focus is placed upon defining and solving project requirements. When a student populates the design with all that is actually required, including materials and structure, then and only then does the student have enough building information to model a design concept. If a high standard is set for building information models (BIM) then the chances for success can be vastly increased. Therefore, it is important to set a high standard for material and structure in student work at the beginning.
Second, the role of the teacher in this assignment of material
and structure is absolute. After the project is essentially
designed, the work expands in the visual language by using
visualization software. Good design standards go hand-in-hand
with BIM. They are guided visualization tools. To restate what
was said in project development earlier, a structural and
material BIM is good for architecture if it is:

1. Elegant: Simple, compact and composed. Uniform shows
restraint and or fits justly and rightly into a complex
composition. Easy to remember (mental model). Differentiated by use and structural and material
characteristics. Honesty of appearance - looks like what it is
and not something else.

2. Performs its function: Performs extremely well and
requires minimal maintenance. Sustainable, serviceable
and durable.

3. Versatile: Building type with reversible and invertible
spaces - a background building. Its physical presence does
not interfere with its purpose. It is not likely to go out of
style and/or become dated. Its meaning is legible and its
form is clear. It will always delight.

4. Contains few arbitrary, contradictory or adjustable
elements: Systematic in detail, regulatory of detail, etc.

5. Explains itself by observation: Makes detailed predictions
about future observations that can disprove or falsify the
model if they are not borne out. Facade as prophecy.
Inspired detail. Consistency of detail. Predictions can be
made about the interior, its structure and uses from the
parts. Agrees with function and explains all existing and
future functions (adaptable and expandable).

6. Symbolic: Is about something cosmological, reinforces
health and wellbeing, rightness of mind, cultural, social,
and ritual, evokes a poetic response and tells a story (not
necessarily a structural story). Differentiated enough to
make the connection of all differences.

In On Becoming An Artist: Reinventing Yourself Through
Mindful Creativity, Professor Ellen J. Langer states: “We
think we should already know what only firsthand
experience can teach us. If we are mindfully creative,
the circumstances of the moment will tell us what to do.
Uncertainty gives us the freedom to discover meaning. .
what we think were sure of may not even exist.” 2 In
thinking about the observable facts with students who
begin the design process with BIM it is possible to
overcome these prejudices and see things directly as
they are. Too much energy is spent in beginning design
in disparaging the world as it exists in the everyday
around us. These prejudices prevent students from
noticing the beauty and complexity of it. Instead,
beginning students are brainwashed into thinking that
the world and couture in which they were brought up is
something to question and even dislike. Often students
of design are taught to disavow their richly varied
design culture in favor of a world of exotic words,
cardboard, plaster and CNC milled abstract shapes.

To use the work of Langer, when we apply in our own
way those expressions while understanding and fulfilling
the rational dictates of building information we find an
inner voice and make better progress as architects. The
combining of already existing facts, as mentioned by
Koestler, and attention to the everyday world that is
discussed by Langer, with the logic and reasoning
supplied by a BIM, students are happier and perform
better overall.

Studies in the value of BIM represent a logical standard, and
mastery of the standard is a necessary precedent for the
creative innovation of the kind discussed by Koestler. Additional
advantages of guided visualization can be found in the Design
Self-efficacy (DSE) studies conducted by Dr. Gregory Luhan at
the University of Kentucky, the University of Kansas, and Texas
A&M University. Luhan’s research has developed instruments
by which instructional methods, self-efficacy, and student
projects may be measured and scored, enabling reliable and
valid investigation of the relationships among factors related to
design to determine if correlation exists between Design Self-
Efficacy (DSE), disposition for collaboration (PD), studiotype (ST),
project-type (PT), and project score (PS).

According to Luhan, “Research revealed that PD is sensitive to
different students and different moments in time. The DSE
instrument produced results that aligned to self-efficacy theory
and data analysis revealed increased self-efficacy from
undergraduate through graduate studies, and theoretical
groupings that parallel the processes of design studio problem
solving, project development, iteration, evaluation, and
communication. The PS data analysis revealed gaps in
architectural design studio evaluations that can be addressed
with an assessment rubric.”

Guided visualization includes detailed and defined sets of
building information models that are to be learned and applied
from the very beginning of design education. More research
Mark O’Bryan

needs to be done to prove or disprove the tact of guided visualization. Tracking students after they graduate, performing well-designed surveys to record performance, seeing what does and does not work, and more fully defined assessment criteria of good design principles is part of this author’s ongoing and future research. It is the hope that with guided visualization we can develop a culture of design that thinks of architectural design in the same way we think of engineering arts, or aesthetic product design. In other words, that design art is as beautiful as the rules of the system and structure.

Notes


Design exploration is only limited by its methods.

Why do we select the design methods we use? In a typical third or fourth year studio, it’s easy to see how the newest plugin, updated version, or recently tagged published project skews the student body’s presentation. Reflecting on my education, I recall coordination was paramount. In early years, documentation drawings followed model explorations and later, with greater program complexity, resolved plans led to physical presentation models. Both of these lay the foundation for digital design processes as a logical advancement due to their inherent coordination and gratuitous sophistication (complexity faked through the ease of resolution). Having always been a proponent of carrying a large tool box, I believe students should gain as many design skills as possible. Yet, the skills themselves are irrelevant if one has not developed the ability to select among the methods judiciously.

In this paper, I will discuss a project series which frames a design approach directing students toward a critical look at their design methods. This is accomplished within the curricular requirement of establishing fundamental drawing and model building skills. For this I have introduced three steps; nurture an independent appreciation for disparate design methods; place those methods in competition with each other to solve an architectural problem; repeat the problem with great complexity and methods of investigation. In this case, unique 2D and 3D methods are developed so students are able to reflect on what each approach brings to their design processes. The 2D method focuses on the site responsive refinement of the design’s organization strategies, as the reality of problem solving material connections injects complexity within the 3D tectonic models. By defining the relationship a competition and not a coordination effort, the act of design develops as a volley, an endless recursive process. Specifically within the beginning design course, each attempt provides another step for the students’ hand-skills and formal design language to improve. With this experience they define for themselves the qualities each method brings to their design process. Rather than creating the final presentations as a postmortem to the design process, it is instead merely a moment acknowledging the unique purpose that each design artifact (model, drawing, diagram, narrative) aims to communicate.

This paper is divided into four sections. The first involves an introduction to the overall pace of the course, titled Forward, Forward, Reverse. The second and third sections describe the constraints of the 2D and 3D techniques utilized through the semester, respectively. The final component narrates the use of competition as opposed to coordination between the students’ process drawings and models. Each section is accompanied by observations from past students regarding the impact of the assignments and my personal reflections on points of success.

Project pace: Forward, Forward, Reverse.

To begin the semester, independent 2D and 3D charrettes are used to expose students to the constraints of design methods. Once familiar with the constraints of each method, the students cycle through three projects which build upon the previous. Each demands greater complexity within the architectural program and method it is challenged to explore. The first project, representing the core program, is comprised of 5 spaces, of which there are three spatial types: an A; a B; and three C’s; each with assigned area, adjacencies and siting constraints. This assignment is investigated through a 2D site plan and 3D tectonic model. The second project adopts all of the previous constraints and demands the embedding of specific spaces into the ground plane. Disturbing the “Z” axis demands additional investigation by the student through site section drawings. Human scale is introduced in the final project as path and paneling (required to filter specific views) are added to the growing program. Diagramming and enlarged physical details further complement the additional program respectively. With each
restart I purposefully switch the method I prioritize in their work. This involves replacing the site plan as primacy with section drawings or tectonic studies in the lead role. Regardless of the point of departure, there is not an inherent hierarchy between plans, sections, details, or diagrams -- each must play a part. The repetition of the project allows the students to see each method's characteristics in relationship to the project as a whole.

Fig. 1 Diagram of the project pace

**Students thoughts on the semester’s pace:**

"By repeating the same project, but with different iterations, it allowed a sound understanding of the progression we, as a class, were to make as far as understanding how a variety of elements can work together to respond to an environment and interact with the community. It supported the design process by being able to experiment on different variations of an element of the project that would later be modified and implemented into the finished presentation." Ashley Sylvester

"Doing the project repeatedly let me grow further in my skill levels. I did not understand at the time I was doing the project, but after I completed the project and looked at the work I had done compared to my first attempt I realized that I gained so much from trial and error. My designs were more advanced and sophisticated at the end of the project when compared to the beginning. I was able to experiment and discover which designs worked best and I became more efficient at doing them." Erin Steinkamp

**My reflections on the semester's pace:**

Reflecting on the products and post studio evaluations, rather than multiple disparate design prompts, repeating a core program with greater complexity allowed the average student to build upon past successes (even if they were small or revealed through the success of others). The quick turnover for each project allows advanced students the freedom to challenge the requirements and their skills with less fear of failure. This again reinforces the notion of design as an iterative process and by the third project even the less advanced students begin to find strengths in their design decisions and craftsmanship. Reversing the start sequence for the third attempt -- the initial step a section and/or detail model rather than site plan -- fractured the impulse of merely executing "a scripted process" for appreciating design process as a malstrom that you compose.

A Layered 2D Technique: Either way, the preconceptions that “one is or is not an artist” is to be battled in beginning design.

Fig. 2 mixed medium process drawing, N. Dubak, B.Arch 2020

Draw upon a personal beginning design experience influenced by Klee and Kandinsky's foundations in composition and visual tensions, this 2D method moves beyond the ethically void hypothesis of the tabula rasa and exploits context as the design catalyst. The primacy of site and program allows the act of designing to be first understood as responsive. The 2D method introduced this semester is a mixed media drawing consisting of a pastel base layered with HB, 4B, and ink. The goal of this method is to develop the student's ability to fluidly move between the ambiguous (in this case pastel exploration drawings) to an analytical resolution (defined Euclidean elements) in ink. Each medium is paired with a purpose: the Gesture captures the beauty of ambiguity through loose pastels; Exploration with HB graphite facilitates a slow identifying of project intent and program; Definition follows with 4B’s clear articulation of design elements; and Execution in ink demonstrates a level of resolution in design decisions previously unattainable. Although first stated as a sequential (linear) process, erasers are referenced as design tools which allow a continual fluctuation between the mediums -- a reworking of design decisions. With the freedom to erase and rework, the rich quality of struggle represented in these drawings detaches the student from the belief of the precious final presentation.
Fig. 3 Diagram of the mixed medium process drawing

2D charrette prompt: Through a plan drawing, graphically locate and define physical characteristics you determine as important in the given topographic model.

Appointed a topographic site model to assess, the students are challenged to complete this drawing in 30 minutes. Rather than being asked to document the topographic model, they are asked to graphically capture, or Gesture, the unique movements within the site. The students begin by smearing pastels with their fingers into a height-field map. Split complementary color schemes are introduced to allow intrigue to develop in the atmospheric drawings. Requiring only the willingness to try, these drawings level the playing field for those who have and have not had prior art coursework. For the second, Exploration, students practice full arm strokes with HB pencils. Using the phrase “to-draw-out”, we remove the idea of rendering and focus on the act of drawing out as a means to explore and extract. This layer looks for potential advances in the design as HB pencil marks trace out any moments of interest hidden in the pastel gradients. Similar to freewriting, the continual movement allows intuition to push through. The discussion of intuition and aesthetic judgement is an initial struggle for most but is supported through the practice of making light explorative linework. As they’re building up and drawing out, students develop a strong sense of ownership in their decisions. Once a hierarchy of linework has been established, the students use a 4B pencil to define individual design elements through a strict use of points, lines and arcs. This is informed by Paul Klee’s seminal work Pedagogical Sketchbook, in which he describes exercises he developed instructing basic design at the Bauhaus 1921-1931. The shift to a strict design vocabulary allows this analytical study to incorporate measured refinements. Documenting the visual tensions inherent with each element instills a greater understanding of the compositional relationships and establishes a foundation for later design opportunities. Once clearly defined in the graphite, a final layer of ink demands the greatest level of execution to date. Precision and craftsmanship are now demanded.

Fig. 4 Collection of first site responsive schemes. B. Arch 2020

Students thoughts on the mixed medium process drawing:

“I found these processes very liberating in helping me to experiment without having a definite end result.” Ashley Sylvester

“This design method has really helped me to loosen up with my design. Coming into the class, all of my pencil lines were hard and dark and every one of my designs are pretty set in stone after the first of second drawings. Through this method, I learned that if you are loose with your design, the possibilities are endless in what you can create.” Tuan Nguyen

“I feel that I learned how to more efficiently experiment in designing, and how to explore more options and opportunities on the page in front of you. We learned to find some element of our work or create something special and fall in love with it and nurture it into something beautiful.” Jared Sliman

“In the class, “drawing” quickly became more of a study tool and less of an art. Therefore, the ability to understand how blind exploration was used and could eventually provide certain ideas didn’t come easy in the beginning. It took overcoming that hurdle before I could understand how exploration meant seeing/finding new opportunities, and then how concentrating those opportunities meant seeing/finding an end product.” Mason Orantes
My reflections on the mixed media process drawing:

With 100+ student examples, I have witnessed two primary areas of success. First, acquiring the confidence to solve a problem one step at a time. This is the result of the students’ ‘2D method. During an end of the year wrap up, we discuss frankly how the mediums themselves are irrelevant. They are merely the means for resolving the stated problems. By taking loose first steps, ones that can be made or revised fearlessly, you develop a process for moving from exploration to refinement. With each successive year finding incoming students have less and less of an art course foundation. Although initially conceived to facilitate design process, the second benefit has been in the students building of confidence with their hand drawing. Historically when assignments would separate each medium, students would tend to cling to the single approach with which they had found success. This was most visibly a problem in upper level studio’s when ambiguous design methods (pastels, watercolor, or collage) are forced to make a jump into required architectural drawings (building plans and sections). Where as here, each medium played an integral role for the design to move forward. The students take away an understanding of the strengths and weaknesses of each medium within the process.

Tectonic Assembly: The reality of problem solving the connections between woods, metals, and concrete, corrupts all intent... Beautifully.

With nearly a decade of professional practice before beginning my academic career, my perspective on architectural design is firmly rooted in the human experience of assembled materials. Within practice, the world became a continuation of the academic Kit-of-parts project: We are all exposed to the same material options and success is only limited by your inhibition to dispute the accepted assemblies. Having been exposed to construction through family businesses, a lecture I heard later in life by the architect Mark McInturff struck a cord. He mentioned that all the design intentions he cared about would be executed in the erection and detailing of the structure. He said, you see, the structure is usually finished before the clients begin freaking out about money.

This first year assignment revels in the complexity of problem solving connections between wood, metals, and by the end, concrete. Forcing students away from preconceiving the final form, this project focuses on developing a logic of assembly. This encourages an interest in exploring the characteristics and potential of different materials as they impact an assembly system. Students allow the struggles of detailing to advance design language beyond their initial voice.

3D charrette prompt:

Limited to pinning, binding, and interlocking connections, construct a joint that holds two chopsticks ¾” apart.

Prior to the project, students are invited to bring in to studio an egregious amount of connection materials for binding, pinning, and interlocking elements – toothpicks to screws, dental floss to barbed wire. Given two chopsticks (cheap and workable) students stain one black with a Sharpie. Once the chopsticks are selected, the students are asked to choose connection materials for their characteristics: workability, aesthetics, smell and taste. A single constraint that “no single element can touch both chopsticks” introduces Edward Ford’s concept of the detail as joint. With concern only for the connections, the students pour their design decisions into the details of their work rather than obsessing on the overall sculptural form. As these systems mature, regardless of physical scale, the students develop a confidence in the construction of their designs.

Students thoughts on the tectonic investigation:

“This exercise helped me in three big ways. It made me realize that sticking to your initial idea when you first approach something will never be the best idea. Secondly, it opened my eyes to the idea that non-stop building is pertinent to developing ones design, but by using constraints on each iteration can push a designer to be ever-growing/ever-changing. It also helped me in my design process for when I hit a “road block” in my design. It showed me that by pushing that “road blocked” design aside for a second and starting something new, it can help me through the block by opening myself up to new ideas again.” Hanna Simpson
My reflections on the tectonic model:

Just as the mixed media drawing’s quick and repetitive nature encouraged confidence in technique and a willingness to explore, this 3D prompt initiates a series of material investigations. As the 2D method “drew out” the design as a response to its context and constraints, these initial assemblies allow the building up of complexity due to the reality of problem solving connections. Working through version after version of these connections students expand their knowledge of the limits of their materials and the craftsmanship required to challenge those limits. Through this strict use of materials and articulated connections, the students evolve a critical eye for material selection. As the small connection types develop into larger assembly systems, the notions of hierarchy within organic ordering systems is brought in to lay the groundwork for an understanding of structure (the tree-trunk to branch to twig to leaf). The point of connection between elements becomes ripe for complexity.

Changing size as a means to investigate design ideas — larger and larger details demanding more and more intricate connections — layers complexity into the work with a level of heuristic integrity. Louis Kahn’s observations that “Each part clearly and joyfully proclaims it’s role in the totality” opens our discussion for the relationships between connection points. Once a family of variations have begun, the students are asked to layer personification of the relationship of one joint to another: Using “parent-to-child” we discuss hierarchy (This can be seen when two details are constructed as nearly identical, yet one is physically smaller); Referencing “twins” stresses mimicry (Here, the repetition of identical details demonstrates consistency and uniformity); Discussing “cousins” correlates to transition (As later courses introduce variation of details through parametric means, students witness how transitions form through subtle changes from one detail to the next); While “strangers” play to juxtaposition (By composing a novel connection into any of the previous strategies legibility of that unique note is clarified). Critiques for these tectonic studies revolve around the role that each member joyfully plays. And through this lens, if an element lacks a role it is labeled superfluous and ornamental.

Process as Presentation: The sophistication and craftsmanship embodied within the products of our processes communicate the respect we hold for the ideas they aim to represent.

The concept of this Process-as-Presentation Pedagogy is one that continuously pits process drawings against tectonic models in a recursive battle. The competition is most akin to playing chess against oneself. For the game to have any interest, for your best decisions to play out, you must be able to detach yourself a bit. The ability to convincingly role-play one side and then the other, allows the introspection one must have to effectively see alternate points of view (possibly that of a future client for instance). With this definition of competition, each design artifact craves the spotlight. Each drawing or model aims to outdo what has come before it. This competition is introduced at the “I’m done” moment. That is, when the students, having completed the minimum requirements (in the case of the first project, one model and drawing) feel their work is over. It is once these initial attempts have been generated, regardless of the order started, the students are told to ask themselves how can the model become better than the drawing? How can the drawing become better than the model? Of course, they begin by asking me as the instructor for advice on what is better, to which I reply: “What is the most successful part of your drawing/model? (This demands the student to reflect and prioritize elements of their design); What takes away from that success? (Now the students must assess where there is unwanted conflict in their work); How can those successes inspire advancements in the design approach with your model/drawing? (Like in a game of chess against oneself, how can you now side with the opposing method, robbing the successes of the previous to further the other).” Revisiting the drawing allows complexity stolen from the constructed details to recursively fold in the 2D composition pushing the tectonic systems beyond their previously self-referential solution. Through the refinements, the 2d methods are able to express advancements in the organizational strategies, demonstrate sophistication in relationships between site and response, and achieve a level of machine like craftsmanship with the successful execution of ink. The 3D tectonic model demands that the composition moves beyond the ideal with the corruption of material characteristics and their constraints.
Kris Palagi

Students thoughts on the Process as Presentation:

Some students may be better at expressing themselves in the visual sense of drawing, while others represent their ideas better by building physical models. Whichever the student’s forte was, they used one strategy and method to push the other further. Jared Sliman

My reflections on the process as presentation:

Why do we select the design methods we use? Because of the strengths they bring to our process. This desire to challenge, or juxtapose, the characteristics of one method against another lays the foundation for strong decision making for approaches to come. With each progression of studio, students are bombarded with methods. Rather than merely supplanting past approaches the competitive recursion as a design tool allows the pop technique of the day to be assessed and consumed for its strengths.

The students develop the ability to select each method for the role it will play (an obligation to bring something new that only it can communicate). The documented process inherent with this process as presentation instills a strong sense of ownership in students’ design decisions. Students see that by simply collecting their model series and latest mixed media drawings, the lineage of their design decision are legible and fertile for critique. Through competition, the process has become presentation.

Notes


Fig. 7 Site plan and model. D. Roth, B.Arch 2020
Most of my professional writing, whether emails to clients or planning commissions, with enough time and spell check would pass muster. It was only when I—as a design professional required to constantly write—was forced into hasty replies that bouts of nausea and insecurities would flood my day. But within residential construction, let alone on an island like Hawaii, hardly anything is rushed. So I survived. I kept things short. For the planning and building departments, full sentences were rarely required; bullet points were efficient. Ego and effort were primarily drained in client correspondence. In face to face meetings, more often than not, I was a marriage counselor as much as the clients’ architect. I would find myself taking notes on which side of the bed they sleep on, who gets up early, or who really has more pairs of shoes. This intimacy demanded an informal familiarity to our written correspondence that the bullet point approach just did not suite. As my computer’s flashing cursor mocked my attempts to write, I would change my technique to graphite. Yet, the same pencil that would freely sketch a plan, section, or perspective jerked and skid spasmodically when letters were demanded. Friends would give me the advice, “Just use your voice.” This suggestion resulted in composing flippant nonsense which led me to dark alleys of sarcasm, hyperbole, and inappropriate analogies that cost me more than one commission.

I decided I had to design my approach to writing—first define the problem and the requirements, then layout a system of refinement. The problem was easy to identify; as students of architecture, we have spent years developing the skill to visualize our designs, not just the formal concerns, but the confluence of the budget, the construction methods and timeframe requirements. The client has not. Individual design decisions are not made in a vacuum; prioritizations of quality and quantity weigh in, tying each decision to a network of others. Designers often enjoy the spiderweb of intent—although intent may be clear in my head or in sketches, its network tangled me in knots when writing. The requirements became: Clients respond best to straightforward questions, cause and effect, and defined options to select. “Stay on point,” became a mantra for my writing.

The designed approach to writing began by training myself to limit the correspondence to one question or update per email. My rambling, due to enthusiasm or uncertainty of a situation was not allowed. The client wants to know why I am contacting them and what part of the building this email is specifically regarding (e.g., Building System (S): the roofing, the floor tile, the foundation or something a bit less tangible like natural ventilation or the building’s relationship to outside). Rule #1: I must make the thing I’m concerned with clear and not allow myself to stray off into something else.

As the architect, each email’s focus required my professional input. When we are young practitioners, it was hard to acknowledge the client makes the design decision while we, as the professionals, define the impact of each option. This loads the pressure on the client, and it’s hard for the client, once stressed, to see past the immediate impact of time or money. As the professional tasked with looking forward, I needed to calmly present how each design decision will alter the clients’ later experience of the work. Rule #2: Move them past the tension of the decision by narrating a time when this design decision impacts their lives.

These rules kept me in the black and not laughed at, but I have to reflect on why I struggled so much with writing. College did not strengthen my writing skills much. Although Paintshop Pro moved at a snail’s pace, my IBM 286 with 16MHz processor could spell check and find the most basic of grammatical errors. I was saved! From there I foresaw a world where my remedial writing would be masked by a sea of ones and zeros. Even when attending the only required writing course for my design degree, Compositional Writing 110, I quickly discovered...
ways to circumvent my weakness. The instructor gave extra credit for “publishing” your essay in class (i.e., making printed copies for classmates or if you read it aloud for review). The few dollars spent copying a horrifically composed document was an easy price to pay for 30% bump in the final grade. Of course, my affinity for public speaking didn't surpass my insecurities for the words I had written, so I elected to publish my rough drafts instead of reading my final papers.

After a decade of finding my way through maintaining my office with the most minimal writing required, I found myself returning to academia as an instructor. Appointed to my first third-year studio, having just barely understood the NAAB requirements set forth, I was frightened to discover the what the bold “W” written in the course outline implied. I was told I needed to collect, review and give feedback on 20k words from each student. No assistance was given, no path laid forth. I had hobbled my way through the writing required in my profession but pretending to instruct a writing intensive course seemed insurmountable. After the panic attacks calmed, I fell back to my only strength, design. I need to design a writing assignment. Reflecting on my practices, rules one and two transferred: 1) be singular and clear, and 2) narrate the experience. The NAAB requirements typically focus on the ability to design one building system or another so they slid easily into the part to discuss. But I saw the role of the professional architect different than that of the student. Academia is a testing ground; clients and budgets are not real so we test the success of a student’s design with their ability to lay forth and challenge a design approach. Depending on the school or instructor, an approach may, at its core, be a conceptual or process driven path. This design approach became the third leg of the stool.

I was surprised by the first responses I received from students (when tasked with writing about a specific part of their building, how their design approach informed this one part, and what experience a person would have from it) became pages of long essays. After wading through pages of delusional speculations of their world saving concepts, I pared the assignment back. In a single sentence students are asked to bind an identified building System (S), the conceptual design Approach (A), and the user’s Experience (E). Attempting to roll a lifetime worth of struggles into one writing prompt, I cobbled my crazy into an acronym for the sake of clarity. I developed the SAE statement. This concision thwarted the often nebulous or esoteric concepts presented by the students by forcing them to explicitly state the relationship between a specific building system and their intent, while the addition of the user’s experience forces the students to see their fetishized objects (drawings and models) at an architectural scale.

One of the first faculty resources I was introduced to after taking a position at Louisiana State University was their Communication across the Curriculum (CxC) Program, a collaborative initiative of staff and faculty to improve the multi-modal (e.g., written, spoken, visual, and technological) communication skills of undergraduates campus-wide. The decade-long running program primarily works with faculty to certify courses as communication-intensive (C-I) in combinations of two emphases of communication modes (For example, my studio was certified in Written and Visual communication). The program’s certification criteria, rooted in best practices of decades of research from Writing across the Curriculum (WAC) and Writing in the Disciplines (WID), stresses the importance of discipline-specific communication instruction through active learning, informal and formal assignments, and a draft-feedback loop for providing individualized feedback to students prior to evaluation.

Active learning, a practice no designer is stranger to because it is foundational in design studios, simply means learning from doing or trial and error (e.g., model building) as opposed to passively listening to lectures or reviewing concepts (e.g., PowerPoint presentations and textbooks). In Engaging Ideas, John Bean explains, “In most of these [active learning] strategies, the instructor encourages inquiry by presenting students with disciplinary problems that stimulate critical thinking and by making students responsible for formulating their solutions in language, either spoken or written.”

LSU, like many universities, began their CxC program because it was “attracted to WAC programs for [many] reasons, including faculty alarm about the “writing crises” among American college students; the need for more active learning through writing; demands from business and industry that college graduates be better writers; and, more recently, the rapid expansion of the kind of “literacy” demanded by the developers and consumers of new media.” While there is a previous article that details the background of CxC, its connection to the School of Architecture, and its benefits for accreditation and improving student presentations, I would suggest one of the simplest and overlooked benefits of the program is faculty being able to work one-on-one with a writing professional.

In addition to certifying courses, CxC runs discipline-specific communication studios (named in a nod towards the active learning in design studios) as collaborative, active
learning spaces staffed with communication professionals for course development with faculty and enhanced communication instruction to support student projects and out-of-class learning. The coordinator of the Art+ Design studio is a writer with a background in teaching creative writing and English and Composition, so I was very interested in bringing my notions of the SAE statement design and assignment to him. Our meetings gave me confidence in myself as a writing instructor that does not need to be the authoritative or sole source for feedback (I could rely more heavily on peer feedback). I also learned that not every writing assignment (informal or writing-to-learn assignments5) needed feedback! I had designed a writing assignment that convinces my students to struggle with language and I had a writing professional’s seal of approval that it does not take a novel’s worth of writing to reap the benefit of the written word within architectural design.

It may be interesting to note that while CxC’s criteria for written communication certification once contained a length-requirement (10pp), this requirement has been adjusted to account for the differences of genre-expectations according to discipline and to emphasize refinement among iterations. For instance, a student could learn just as much actively revising a one-page concept statement 10 times as a 10-page research paper once. The written communication required of a designer does not require lengthy discourse, so the lifting of the length restriction also provided me the freedom to really get my students to focus on designing and executing their writing with emphasis and precision on a sentence-by-sentence level like Orwell refers to in his infamous essay on writing “Politics and the English Language.” In fact, he uses the pseudo-architectural image and simile of “phrases tacked together like sections of a prefabricated hen-house” to disparage writing that is vague, incompetent, and often lengthy.7

The strategy for introducing the SAE statement into beginning design was to repeat a task weekly with little room for failure but constant refinement towards success. Once the students were reasonably adept at combining the elements of this statement, we challenged them to use this new found tool within their design process. For the weekly (informal) assignments students were given a prescribed list of architectural magazines to select a precedent article from. On a single sheet of paper students were asked to sketch the precedent, compose and SAE statement regarding the work, and define two unknown vocabulary words. The direct combination of both visual and written methods of communication was important. The sketches and writing (both nascent) developed together through the weeks, while the addition of the vocabulary helped build their design lexicons. This exercise repeats 8-10 weeks as a homework assignment, in a way hiding behind the spatial and material studies of the studio assignment. Two hours once a week is given for an instructor-led peer review to maintain a level of awareness and continual development.

The weekly informal critiques begin with the 60+ students breaking into 10 groups. Within each group, spending no more than 30-minutes total, each student would read their week’s SAE statements aloud, and as a group they would select the two that their group felt captured the paramount feature of the referenced work. Once two SAEs were selected, we would gather as a class and ask for the selected statements to be read to the entire class. At this point, as the instructors, we would listen for the three points, make note of them and ask other students to question the clarity of the statements or did they contain all three components. The statements are read prior to knowing the architectural precedent. After the statement is read and we are informed of the architecture that spawned the statement, we discuss if the words reflected the strength of the work and if the statement captured, misled, or aggrandized the actual architecture? With each passing week this group review became more lively, and as instructors our involvement became less about our critique but rather helping the students to structure their own inquiries into the effectiveness of the statements. This review process results in the students being more invested in their writing (since they know they will be discussing in front of their peers) as well as individuals forming skill-based, peer-editing friendships that could be carried throughout their tenure as students and even into the professional world.

After the start of the final studio project (in this case when seemingly abstract site sections have been composed), the students are asked to look at their original work with fresh eyes and to apply the skills learned writing SAE statements for precedents. Seeing scale figures in their work, they now must compose a formal SAE statement from the experience of their figure—rather than earlier, when they were able to reverse engineer the three components (SAE) from architectural case studies in the articles. The students are challenged to develop an SAE statement as a design goal for their project. They are encouraged to reflect on past statements they have written and the lexicon they accumulated. In the final weeks, the statements are refined via feedback from peers and instructors to continue to challenge their drawings and models. At the final presentation, the SAE statements are presented with their work as a window into the use and intent of their designs.
**First weekly precedent-based student examples:**

As stated previously, the first few weeks are spent defining each of the components of the SAE sentence. Students were quick to stumble on focusing the sentence to a paramount System (S) of the building.

Example #1: “By pushing the boundaries of the interior space, they created patio access on either side of the home giving the space a feeling of privacy from the streets just outside and segregation between domestic and social spaces within the home.”

Critique question posed to this student: What architectural system is perceived for the boundaries to feel pushed?

Example #2: “The Museum of Contemporary Art and the Planning Exhibition combined create a modern museum to exhibit architecture in a family friendly matter.”

Question posed to this student: What design decision by the architect made you feel this was “family friendly”?

Or, sometimes, the initial SAE attempts lacked expressing the experience of the work.

Example #3: “The roof of the building sweeps up and down portraying the rises and falls experienced in the economy.”

Questions posed to the student: Who experiences this? Is it a positive or negative event for them?

Example #4: “The bends and twists of the building’s steel creates an enormous variety of floor sizes for the different needs creating a multi-purpose building.”

Questions posed to the student: What is this experience like for the ritual user (employee, maintenance, and staff) or the first time visitor? Is the experience intriguing or disorientating?

Later weekly precedent-based student examples:

Although students were originally requested to merely define the experience of the user, after several weeks of minimal success in the Experience (E) component, we altered the assignment by requesting the SAE statement be written in the first person.

Example #5: As I walked through the shared area between the two homes, I enjoyed the sunlight dancing around me through the pattern blocks of the exterior.

Example #6: As I approach the house my eyes continuously explore the intricate metallic skin discovering new hidden details each time.

Example #7: As I look upon this glass goliath, I admire the simple complexity brought to life by its many protrusions.

Example #8: I felt hidden as I walked through the shadows of the massive walls that caress the natural curves of earth.

In addition to developing an SAE statement for the architecture referenced in the article, students were asked to acknowledge at least two words they do not understand their usage—a soft way of acknowledging a limited vocabulary without flaming insecurities. To accomplish this, students were asked to document the sentence the word is found in, then find the definition that most suits the article author’s use of the word. Below is a wonderful example highlighting the range of concepts tangled within architecture. In one article, a student selected “municipality” and “immutable,” perfectly representing the professional responsibilities and poetic potential of architectural design. The students SAE statement for that week follows below:

Example #9: The isolated location of the cemetery and the **municipality** itself, perched on the hillside of San Martin, define architectural design criteria at a great scale, based on the relationship with the landscape and the absence of formal and functional continuity with the urban morphology of the town.

**Municipality**- a city or town that has corporate status and local government.

Through the design of a discontinuous, less impermeable limit, it improves the continuity of the landscape, winds, light and nature, **immutable** elements of landscape and time.

**Immutable**- unchanging over time or unable to be changed.

When I walk through the cemetery, the partially transparent walls make me feel empty, as if I lost a loved one here.

In reflection, another learning process intrinsic to writing and the
writing instructor, I have bounced this SAE through the architectural curriculum, Architectural System seminars, third and fifth year studio, but this paper outlines my recent attempt to utilize this concise statement within the beginning design studio. I found the SAE statement is effective in first year due to its length; a bite-size approach to writing allows an increment of success, especially when students are writing about a subject they know very little about. The addition of a named user, or first person, experience forced the students to see their fetishized objects (drawings and models) at an architectural scale. I have watched the students’ eyes widen as the SAE narrative breathes architectural life into their previously abstract compositions, such as the final SAE example below.

Fig. 1 Final site section develop with the SAE statement below.

Example #10: Entranced by a sweeping view of the landscape, an explorer wanders away from the security of the embedded space to the precarious cantilevered glass deck as he nervously checks his footing.

Here, revisions were requested to limit and re-focus the sentence on the architectural design decision’s direct effect on the experience.

Example #11 (Revision for final presentation corresponding with Fig. 1): The explorer nervously checks his footing as he wanders away from the security of the embedded space to the precarious cantilevered glass deck.

As I am laying out the schedule for my next session of beginning design, I am attempting to add as many weekly precedent studies as possible. I found the act of going to the library increased student exposure to architectural design language as having to wade through critical essays, very often written over even my head, exposed them to thoughtful examples and descriptions of unique work. I will make four changes to the semester’s assignment: first, the strict use of a single sketchbook to document the weekly precedent statements and collection of the growing lexicon; second, the addition of two material descriptions from the articles; third, each week I will assign a specific point of view for the sentence (beginning with first person, and later weeks will focus on a mother and young child, possibly a night security guard, or an employee with impaired vision); and the final and most drastic development has been caused by my act of writing this paper. Given precise phrasing is everything, in an attempt to clearly articulate the three components of the SAE statement, I believe I will make a few changes to my labeling acronym. The building System (S) was useful in third and fifth year studios as an approach to further students’ investigation into whichever NAAB requirements were thrown at the course, but in beginning design, I think it is more beneficial to re-label this component as building Part (P). This refinement will allow me to pose the clear question, “Exactly what Part of the building are you referencing?” This change caused me to extend my reflection to the language I use in discussing studio projects with these students throughout the semester’s design process, and I noticed that I could be more consistent if I clarified and changed the design Approach (A) to design Decision (D). So with the Experience (E) component still intact and unaltered, I’m left with PDE statements for the next writing assignment. No matter the acronym, I believe this writing approach stretches the students to see how their work can affect the unique world of people around them, so I will conclude this paper with a few insightful student reflections on this particular writing assignment.
Finding and crafting SAE statements about other works is insightful because you do not have a sense of ownership impairing your observations. You do not feel the urge to make the architecture sound "pretty." The only concern is to aptly describe the quality of the work using precise words that capture the essence of the architecture. Practicing like this before crafting SAE statements about your own work is important because it helps you remove owner bias and allows you to accurately describe the work from a balanced perspective.” --Alexander Vinet

"The SAE statements proved to be highly effective. These assignments developed my vocabulary and helped me to find new words to describe the atmosphere of a space rather than just using basic words such as pretty or beautiful. When presenting at pinups, I found myself using words that I wrote in my SAE statements and I believe my presentations got more and more interesting because of word choice and usage." --Tuan Nguyen

"It wasn’t until the very end that I began to see that those potential, emotional experiences could be easily considered within the design process when using the SAE statement as a tool!" --Mason Orantes

"The SAE statements were extraordinary to have. The statements, while using first person, allowed us to experience our designs first hand and we were able to see which parts of the designs needed more modification and which aspects of the designs were working for us. Out of the three methods we use (drawing, building, writing), I think for me this process was a major eye opener. It appealed to me because it made me create a place and an environment that embodied my designs. It was the prime example to show how architecture reacts to nature, the things around it, and how it interacts with people. The SAE statements reminded me throughout the course to think about design decisions for the structures and landscape as well as how these elements of the project will be viewed by the people as a whole. What will their experience be—caged in and scared or open and nostalgic?” --Ashley Sylvester

"I believe that in making the writing process of the SAE statements first person, it allowed me to think about the experience of what it is like to walk through the space and structure you are in, and to notice and appreciate details and design decisions—to truly understand what we are surrounded by.” --Jared Sliman

"I believe the SAE statements assignments were given to us to learn how to formally and fully express a design thesis for presentation. Learning how to properly write SAE statements has helped my presentation of recent projects in that I am fully and clearly able to express my design process and goal to an audience.” --Jacob Lyons

Notes


The Clone Project: Year one, Day one; Why we start where we start

Kristopher Palagi, NCARB, Assistant Professor, Louisiana State University
Angeliki Sioli, Assistant Professor, Louisiana State University

Trusting in the process is scary and difficult but in the end if you keep trying new things with eager fingers and an open mind, it always seems to work out. M. Terrio, B.Arch 2021

We compare all loves to our first; and love, far too often, is bittersweet. We have one chance at a first impression; one day to serve a tasty appetizer foreshadowing what their architectural education will be. Should the first day be synonymous with the bureaucracy of a syllabus, possibly the pleasantries of names and backgrounds, or can this moment capture the bitter-sweet nature of architectural design? We lean towards the latter and jump right in.

On average, fifty+ freshmen are gathered for our typical first day of class. Personalities are exposed as they begin to select desks. Some find security with their back to a wall, others eagerly sit where they believe the front to be. The remainder, unsure of what to do, roam around hesitantly. A few talk to each other while the majority check their cell phones silently. No matter how they choose to wait and how well they disguise their undoubted first-day-in-college anxiety, their hands seem to embody all the tension in the room. Either putting them on the desk in front of them, cracking them while they talk with their classmates, resting them in their pockets or using them to scroll down their screens, the students’ hands express more vividly the awkwardness of being in a new environment and the anticipation of starting something new. It is these very hands that they will have to deal with for the next four hours during their first day in an architectural school studio.

We make sure to enter the room at 8:30am sharp. With the bare minimum introduction, limited to a greeting and a brief welcome to the School and their “new home” (not-one of them is fully aware at the moment that the studio space will literally become their home for the months and years to come), we ask them to build a 1:1 scale analytical model of either one of their two hands and arms. The supplies at their disposal are strictly restricted to recycled cardboard, x-acto-knives, sharpies and glue; materials we had in advance asked them to bring in class. They are given exactly one hour with no further instructions. Fifty pairs of eyes, bewildered and confused, stare at us for a moment, before they focus on to the supplies and try to figure out what on earth they have been requested to accomplish. Some of them stare intensely at their own hands.

While we roam around their desks overlooking their first moments of hesitation and gradually their first attempts we offer small pieces of advice; like how to hold an x-acto knife and which side of the blade is sharper; how to remove an old blade and work with a new one; how the glue-gun works. As the clock keeps ticking, a hesitant appropriation of the space is noted. Students start looking for outlets around the walls to plug in their glue-guns; short groups gather around some outlets with students waiting patiently for their turn; a few groups exchange ideas and seem try to help each other. The majority of them, though stay put in front of their desks trying to tackle the given problem. A constant comparison between the cardboard pieces

Fig. 1 Tools required for the first day of studio.
they cut or think about cutting and their own actual arm and hand takes place. Sharpies create outlines of open hands or parts of arms on cardboard surfaces. Some students concentrate on details of the figures.

Well into this first hour they have been struggling with a number of the most basic architectural questions: scale and the human form; model-making; materiality; connections and joints between parts. Most importantly they are immersed into an environment which prioritizes learning through making and shows them in the most tangible terms that their own hands (the hands they use to create the models of their hands) have a life of their own. The intention to cut a perfectly designed curve on the cardboard is defeated by the actual encounter between their yet inexperienced hands, the new tool (x-acto knife) and the material. They quickly form an understanding that repetition is training the hand, letting it then flow more freely on the material, collaborating more willingly with the tool. The second and third time they try cutting, the results already reward them.

After an hour of this intensely-focused activity (we encourage them even to use construction cans in case they need a quiet environment to be productive), we request that the students exhibit their draft artifacts on a big table in the middle of the room. Fifty different models, which have achieved different scales of completion, gather in a few minutes next to each other on this table. Fifty pairs of eyes stare at them intensely while instinctively starting to compare their efforts to those of their peers. The first evaluation of their work is already taking place in their minds. Without asking them any questions, we arrange the draft models in groups that seem to share more or less similar characteristics and design strategies. Just as years before, three general categories appear; the sculpted, the sectional, and the flat. We spend equal time noting the successes and failures of each of the approaches but with all eyes on the pile of sculpted arms, we begin our discussions there. Here we see various creative manipulations of cardboard (bent, twisted, and possibly fluted). Although each unique, we point out that they are artistic interpretations of the arm. For their design decisions to be recognized as successful, the viewer/critic must accept the artistic representation of skin as cardboard. This may be a tough sell. In direct comparison, by selecting a well executed sectional study, we see how the surface of the arm is implied rather than represented. The specific materiality of the cardboard is rendered mute by the action of the cut. The accuracy does not rely on the skill of the sculptor’s hand but rather on the analytical study and craftsmanship of the cut. At this point we move to the third group of students who have now hidden themselves away. Although left two-dimensional, many of these demonstrate an increased accuracy in the silhouettes crafted. Lifting spirits, we highlight the skill executed in these as goals for which other students should aspire. At the same time, the students are forced to recognize the ideas they might have had but did not act upon. “Action is the foundational key to all success,” as Pablo Picasso would argue and we underline how we must become fearless with taking action.

The students are also exposed to the phenomenological premise of the predominance of the body over the brain in perception, and how their own hands are not just executing rational thoughts that spring into their minds, but are actually part of the decision making. They are introduced to the notion of the “thinking hand” through the work of Juhani Pallasmaa and they are encouraged to accept the fact that “a hand is not simply part of the body, but the expression and continuation of a thought which must be captured and conveyed,” as the author Honoré de Balzac notes. Or argued more poetically, “the hand has its dreams and assumptions,” as stated by philosopher Gaston Bachelard. [1]
With eyes even more surprised and bewildered after these last statements, which they find particularly hard to accept as true, they are requested to go back to their desks and give the assignment a second try. The use of the recycled cardboard has a less altruistic purpose than one might think. The freedom, or loss of inhibition thanks to the lack of cost of the material allows for ripping apart and rebuilding with reckless abandon. One more hour at their disposal, while, once again, we walk around offering minimal guidance and advice. At the end of this second attempt, very few students are still struggling with the jump from two to three dimensions. Almost all the models are three-dimensional and almost all of them are working with cross-sections. A few hand and arm segments seem more life-like, expressing gestures or even emotions. The conversation around the common middle table now focuses more on the importance of cross sections. Cross sections are identified as the chosen method to analyze the form and the assignment is revealed as a site survey assignment in disguise. Exposed to cardboard’s weakness as a sheet material, students gain an understanding that they have to establish a method of construction utilizing x, y, and z shear planes. Once supported, the cross sections can be assembled to imply the form rather than producing an artistic interpretation of the surface. What sets off as a seemingly mundane assembly, begins to develop complexity and identity as each student acknowledges the design decisions they are left to make: Where do you select for a cross section to be present? What is the accuracy with which you execute details in each cross section? How do you solve problems (intersections) of the assembly system resulting from the position of your appendage?

For a third time the students are asked to work on the very same short assignment. They are given the choice to start afresh or keep working in order to improve their previous model. By the time we gather for the last time on this first day, students acknowledge a marked improvement resulting from the conscious design decisions they have started making and the exponential improvement of their own craftsmanship. They can already appreciate the impact that each revision has on the quality of their work. During each peer review, a strict narrative is given to the students to use when playing the critic. “What is the strength of this work?” and “What takes away from that strength?” These questions volley the role of the critic back to them, establishing a foundation of reflective self-critique.

By the end of the day, the studio is undoubtedly much messier than it was 4 hours ago and the awkwardness noted in the students’ hands is gone for good. X-acto knives, cardboard pieces and glue-guns fill their previously nervous hands. They have moreover discovered all the outlets in this new room and ask if they are allowed to bring and use extension cords. Some of them try to find a better table, one closer to a window for more natural light, or one closer to some of their already first friends in the group. Their eyes are less filled with surprise or agony and more with a hinge of the shine that creative works brings. Their hands are tired and their feet even more so as most of them had not even thought about sitting on their stools while working through the morning.

We finish the first day by handing out the first complete assignment to the students in writing; three weeks for a complete cardboard clone of themselves in a position that needs to be studied and explained in details (we will guide them through that choice in the weeks to come, offering particular constraints and parameters). We leave the room posing one last question. “How many complete clones do you think you will actually build during those three weeks before the final deadline?” None of them dares an answer, though those who better comprehend the process and path followed on this first day smile shyly and nod their heads in understanding, a lot of trial and error awaits them in the coming weeks. We are pretty confident that questions about how they will design their torso or their legs are popping into their minds already. We exit the room with no more comments. When we meet the students again two days later, they are already on their desks working on some other parts of their body or handling the hand once again.
What did we care to accomplish in this first day? Our intention was that while students stagger towards their next class in the English, math, or science department they take away impressions from heuristic experiences rather than facts to remember. We designed a problem for them to solve and we provided the time for them to struggle and fail, assess and revise. We introduced them to a material, a system of work derived from the material’s characteristics, and challenged them to acknowledge that their intent could have impact on that system within their designs. We instructed them to give feedback on the successes and failures of others’ attempts. Within this first four hours we provided them with framework to learn from the process of iteration and witness with each attempt how mastering their craft allowed for greater communication of their ideas through the work. We exposed them to the bittersweet act of letting go and beginning again with a stronger base of knowledge and more confidence, making sure that the sweetness of new discoveries balances the bitterness of creative struggle. For their very first architectural experience we served them an amuse-bouche of their education to come, whether they liked the aftertaste or not.

Notes

1 As both of them quoted in Juhani Pallasmaa, The Thinking Hand; Existential and Embodied Wisdom in Architecture, (Chichester, U.K.: Wiley), 2009, 16 & 25 (respectively).

Fig. 6 student example: three weeks in.
VARIANCE: Coordination vs. Variation in Foundations Studio

Anne Patterson, University of Kansas Department of Architecture, Design & Planning

Background: Curricular change, changing times.

Our school of Architecture offers several different degrees, the most traditional of which is the five-year professional Masters in Architecture degree, typically populated by students coming out of high school. For many years we have had a four-year non-professional Bachelor degree in architecture degree which has a broader knowledge base for students who might transition into a related field: often into one of our Masters degrees in Urban Planning, Architecture, or Construction Management. The number of students in this non-professional degree had been small, in the shadow of our flagship five-year degree. Budget-driven university directives to generate more Student Credit Hours in the school led to a promotion of the four-year BA and a flood of incoming students, equal in number to our five year program. No longer the stepchild, the program demanded attention. The BA curriculum itself had been revisited in the last few years and revised to include workshops and drawing classes to introduce those students to design thinking and to better prepare them for our fast-track masters programs.

The increase in numbers was hard to absorb, both in terms of staffing and space. All of a sudden we were running two big programs. A task force was set up to look into curricular parallels and the possibility of consolidating some classes. At the same time, the School of Engineering expressed a desire for their Architectural Engineering students to be exposed to architectural design thinking in their freshman year. It was the perfect storm. The task force recommended a pilot year where freshmen in all three degrees (5-year Masters, 4-year Bachelors, and Architectural Engineering) would take Architecture Foundations studios together. As a consequence, numbers in those studios jumped from a total of 64 to an astounding 208! We added nine sections of Architecture Foundations! I had been teaching in these studios for 20 years, and coordinating them for 10, and frankly, the year level was running like a well-oiled machine. It was relatively easy to bring a new instructor on board and to give them good support. With an increase in numbers, we weren’t exactly pulling passers-by of the streets to teach studio, but not many of our faculty had experience teaching in Foundations. Coordination was going to be more than a coffee date with a new adjunct. Of the ten professors assigned to teach the thirteen sections, only two of us had ever taught the course before. Others had teaching experience at upper levels, or in freshmen studios at other institutions and two had never taught before. For me, teaching beginning design is second nature, even auto-pilot, but as Foundations studio coordinator in this situation, had to revisit what I do in order to effectively communicate curricular content and intent the Architecture Foundations team.

Communication & Coordination.

The communication of ideas is something that I advocate strongly in my own studio: easy to profess when the listeners are a captive audience, but the challenge of communicating respectfully with peers is another matter entirely. The conference prompt that beginning design education needs to begin not with questions of ‘How?’ but with questions of ‘Why?’ are the very questions my new colleagues were asking. I began to realize that it had been a while since I had revisited these questions for myself. The ‘How’ question has always been easy for me to answer, but the ‘Why’ question, especially in a group of peers, is always more difficult. In addressing these questions, I turned to the Syllabus outline which lists the outcomes/teaching goals of each project. These had been catalogued for our recent accreditation visit so the evidence was organized and easily accessible. There was still an active accreditation evidence room where the body of work was displayed: a veritable museum of Architecture Foundations studio. Project descriptions, content, intended outcomes, was shared via dropbox with all instructors at the same time, so each person had time to absorb and reflect on the content in their own minds before we all met face-to-face. Our first grand meeting, in the summer before the first semester of the grand experiment, took place in the accreditation room surrounded by physical examples of the work.
That meeting’s agenda was to:
1. Foster a culture of collegial collaboration.
2. Outline the responsibility of each professor to educate within the prescribed framework using the curricular goals listed in the project outcomes.
3. Describe the Curricular content and intended outcomes of the semester.
4. Introducing variance: discussing the variety of interpretations of the same material.

**Common Goals & Project Outcomes**

According to the shared syllabus, the first studio, Architecture Foundations I, is ‘An introductory design studio directed towards the development of spatial thinking and the skills necessary for the analysis and design of architectural space and form. This course is based on a series of exercises that include direct observation: drawing, analysis and representation of the surrounding world, and full-scale studies in the making of objects and the representation of object and space. Students are introduced to different descriptive and analytical media and techniques of representation to aid in the development of critical thought’.

The semester is divided into four main projects: DRAWING, LINE, OBJECT, & SPACE. The first of the projects, ‘DRAWING’ is a freehand drawing unit that includes ‘direct observation: drawing, analysis and representation of the surrounding world, and ventures into a world of imagination and interpretation’. Students are converting a three-dimensional world of observation and experience into two-dimensional images/representations. Outcomes for the various projects within the unit were:

- Developing interdependence between eyes, minds hands.
- Developing acute observational skills
- Mastering the use of freehand drawing tools
- Understanding the power of line
- Understanding freehand perspective construction
- Understanding the role of line hierarchy
- Seeing surface
- Understanding layering of images
- Seeing space and perspective at full scale
- Depicting depth with tone

In our conversations about the drawing unit, there was clear consensus on content. We all agreed to draw ‘things that exist, things that are abstractions, and things that exist only in our imaginations. There was some discussion of the use of digital tools and the group clearly had a range of expertise, familiarity and or willingness in this area. We agreed as a group, to emphasize freehand techniques, with some exploration into the digital realm, although the accommodation of a student with special needs and physical challenges in one of the sections, would compel one of my colleagues (Hui Cai) to offer a hybrid studio. In her own words, she took ‘a hybrid approach that combined analog and digital design and representational skill was undertaken in my section. Several tutorials and workshops on SketchUp, Rhino, and adobe Illustrator, and Photoshop were held concurrently with studio to provide students skills on digital design tools. Students were given the freedom to work with either digital or analog tools. Some interesting differences were observed as results of design tools.’ As a group we anticipated variance in this unit but there was a lot of common ground.

Another colleague (Amy Van De Riet), said that in her studio: ‘Variation (would be) encouraged with the addition of “composite” images (created in Photoshop with overlays of photos, filters and sketches) and allowing for color and diagrams to supplement the work. I find allowing the students to have an “outlet” with less guidance for specific presentation materials alleviates some of the resistance to the rigidity of conforming to drawing standards.’

**Variance begins.**

The second project, ‘SLICE’, takes a two-dimensional image and brings it into three-dimensions as a layer model through extrusion. The syllabus description of this unit is: ‘Exploring
form-making through mapping & extruding. Extracting surface & volume from lines: extruding form and exploring materials. Exploring the use of color, understanding abstraction, and understanding the object through drawing conventions (plan, sections, elevations, and paralines). Stated outcomes for the projects unit were

- Understanding mapping
- Discovering the relationship between two and three dimensions
- Conceptual thinking
- Understanding the importance of a structural idea
- Understanding how to define a way of making
- Mastering craft in model making
- Understanding the importance of process, and iteration
- Understanding architectural orthographic conventions
- Mastering precision
- Using drawing to explain a concept and refine and idea

This second project, which would be the first foray into three-dimensional form-making, sparked much animated discussion regarding the image to be used for the project prompt. The origin image, or ‘prompt’ served as a catalyst in the design process while also somehow manifesting itself in the final piece. The examples I had shown used excerpts (‘slices’) of the student’s own drawings and extruded form was based on a value-map of that image that became a plan for the model.

There was discussion about this ‘slice’ and the genesis image for it: what I will call the ‘prompt’. Even the projects that I had provided as examples from the previous year were showing variance within my studio and a great deal of variance between sections. The room was blossoming with ideas and I realized that I was, in effect, running a design studio: My job would not provide authority but to provide a stable datum a point of reference/Departure for each instructor. It became apparent that variance, the very thing that distinguishes one student from another from another in the singular studio, would be what would distinguish one section from another, (a ‘super-studio’ of instructors). It was the initial discussion of the ‘prompt’ that was most potent: the moment when the idea of the project became visible. Individuals had strong biases and opinions about source material. The list of outcomes gave way to a flood of visual ideas: Words had become images and there was no going back. In our contemporary culture, we are all increasingly drawn to the visual realm, as Juhani Pallasmaa discusses in his book, The Eyes of the Skin. He calls it an occularcentric culture.

I realized at once that as coordinator, I was acting as professor, outlining intent and setting parameters, and my team of instructors was already interpreting what I presented through their own filters and experiences. We would all learn from each other. The bedrock of our collaboration would be common goals, but our adventure would be variance.

Variety of generative images

The image prompts from previous years had been excerpts from the students’ own drawings from the previous unit. Building on the students’ understanding of light seemed to be an obvious segue into value-mapping.

My colleagues had other ideas, however, and even I thought that the project had perhaps run its course and was due for a new iteration. If the generative image was found in some version in the finished piece, then what would results be like if that image took different forms in different sections of the class? It was decided that each section would try its own experiment with the prompt image. Prompts still included student drawings, but also architectural photos, paintings, photomontages, found objects, and Gee’s Bend quilts. The quilts offered social histories, had been made by more than one person, had distinct patterns of pieces and blocks, and imperfect geometries. the imagery was rich and the inherent
patterns began to suggest groupings and ways of making. Some students used color-mapping instead of value-mapping to sort the layers in their models.

Some images were so hard to make that all the students could do in the beginning was to extrude blocks, rather than to make space, and there was no real exploration of structure: one of the intended project outcomes. The studio that used a found object and superimposed it over a Gee’s bend quilt was the most extreme example of the tyranny of complex plan image.

However, those studios using intricate plan images responded to the difficulty of a hand-built model and adapted their modes of making from freehand to digital tools (maybe this was their intent in the first place). In any case: image was beginning to drive not only conceptual idea, but also the way of making.

Variance in making and representation

Models were made from Stratmore bristol or chipboard with a considerable variety of modelmaking techniques across the sections. from entirely analog, to laser-cut foldable templates and topographical layers. All students were required to represent their process to meet the project outcome of understanding the importance of process, and iteration.
The representation of the models in both orthographic and axonometric projections varied widely, included hand-drafting, sketch-up models, and rhino models. The experience of students across the sections was beginning to be uneven, but we felt as though our curricular goals were being met. The group clearly had a range of expertise, familiarity and or willingness in the area of digital media.

**Ongoing collaboration**

As the semester progressed, the role of coordinator had changed to convener. We met every couple of weeks to monitor each other’s progress and address variance between sections. Instructors were required to bring evidence of the ongoing work, both good and bad. As my colleague, Alejandro says: ‘The design development phase of each exercise is closely monitored, and the creative process is given priority to the final result. A successful result is an outcome of a rich and careful process of research and experimentation, distillation of technique and content’. These collaboration meetings were always in the middle of projects, so instructors could share ideas, address concerns, and make adjustments if necessary. And we tried, when possible, to go to each other’s reviews.

This paper focuses on the particular project which seems to best illustrate the balance between variance and coordination. Later projects in the semester diverged more widely, although we kept on meeting, sharing, and discussing the work. Abstraction is emphasized at these early stages of learning and some of the prompts used in later projects exploring folded from and the study of light, used more abstract generative images such as this light study that used a ‘Proun’ by early 20th century designer El Lissitzky as its genesis.

**Conclusions**

As teachers, our biases, predispositions and interpretations of the visual realm play out in fascinating ways, creating a wealth of variance within the described framework of a curriculum. Celebrating variance fosters engaged collegial discussion, and an enriched curricular content. The variety of projects under the umbrella of shared outcomes lays a rich foundation for subsequent studios where students from different sections will merge and a rich variety of ideas will be shared. Studio culture as a whole can benefit from this diversity of thought.

Our School’s studio culture guidelines recommend that: ‘It is expected that students will follow proper studio culture in terms of these principles: 1) Optimism, 2) Respect, 3) Sharing, 4) Engagement, 5) Innovation.’ The guidelines hold for the instructor group, too. Under the umbrella of the conference theme, variance, rather than disciplinary adherence, is precisely the agile system we promote in the individual studio but it relies on the willingness of teams of instructors engage in continuous conversation and collaboration.

**Image Credits**

Alejandro Aptillon, Anne Patterson, Roberto Castillo, Kadim Alasady, John Trefry collaboration

**Notes**


2 University of Kansas Department of Architecture Studio Culture Vision and Policy Statement
Experimental Drawings in Contemporary Design Education
William M. Philemon, School of Architecture, University of North Carolina at Charlotte

The only way to approach an understanding of architecture is through the medium used in its creation – drawing.
Simon Unwin

Premise

Drawing is paramount because it forces designers to see the world as an abstraction. That abstraction necessitates intellectual engagement and definition dependant decision making prior to marking the surface or altering the visual area.

The presence of a conceptual and theoretical framework within experimental drawings necessitates that designers face architectural questions in an explicit state of the abstract, a condition where particular elements are removed while others are emphasized.

Nothing present within a fabricated environment (the abstract drawing) can obscure or hide the factors and purposes of the drawing or the exercise fails. That being so, the results should reveal the appearance of a particular design logic. A successful drawing, therefore, allows a student to gain facility with the interactions of basic design principles in an experimental, diagrammatic form. These diagrams/drawings can engage and reveal ideas such as scale, pattern, occupancy, behavior, etcetera.

This paper will seek to extend the role of drawing to become experimental tools in contemporary design education in order to foster a culture among future practitioners that will enable them to ask the question of “why” rather than “how.”

The role of experimental drawing

Experimental drawings constructed according to the methods presented in this paper could become very powerful tools in design education however their limits must be acknowledged. They should not be viewed as substitutions for producing actual architectural form. Design schools across the country are often filled with beautiful abstract drawings and diagrams that typically receive high praise from jurors without ever giving a clear indication as to how they are representational of an identified “object.” Specifically, this type of drawing problem should only be supplemental so that its benefits may help guide students in their design process.

Furthermore, the drawings produced by this method are representational of an architectural exercise or exploration while being non-representational of a proposed or built architectural form. The marks made during the drawing process essentially act as a documentation of the questions asked and the responses given during the pursuit of the design experiment.

Reason for Experimental Drawing

A contemporary trend in architectural education is for schools to move towards a digitally-based pedagogy that focuses on whatever technology and software packages are en vogue at the time. This is not inherently wrong because there is certainly merit in providing students with computational fluency and proficiency in the programs needed to excel in professional practice. The caveat of this approach to education is that it inhibits the students’ capacity for growth as a designer because it sacrifices instruction of design logic for the immediacy of what is readily available. In other words, teaching conversancy of design fundamentals is painstaking because it grows slowly throughout a student’s education and therefore its presence goes relatively unnoticed while it emerges over time.

Meanwhile, the appeal for instant gratification by way of simply learning a new software and churning out flashy renderings of twisty towers it indeed quite strong due to the apparent “cool-factor” of the images produced during the process.

Critical exploration of design logic cannot be sacrificed for the production of interesting artifacts whether they are digital or analog. The elevating of drawings and models made in design
school to so-called art is a problem that must be addressed by reorienting the focus towards developing and understanding the framework of design process. Ultimately this is the way in which the discipline is pushed forward.

The mindset described above is not at all unprecedented. When Jackson Pollack moved his canvas from the wall to the floor he changed art forever by innovating a new way of understanding the relationship between himself and the picture. He transformed the structure of painting not by jumping on the bandwagon with a popular new tool/method but by studying what he was actually doing and making. Similarly, the design industry should be pushed forward in the same way; by analyzing the elements of the medium and transforming their use and function in order to develop true design thinking.

Instructors must ask the question; “what is the architectural equivalent of moving the canvas to the floor and what possibilities does that open up?”

Gestalt in Design and Drawing

Beginning design curriculm typically include some reference to basic gestalt theory and/or principles of figure ground which are taught, regurgitated by students and then forgotten. Both of these concepts should be given more attention because they play significant roles in helping students learn to see and understand pattern which is the key to recognizing visual order. The ideas seem to by comprehended and are made quite clear in the study of traditional gestalt images however as soon as a problem becomes more complex – or more architectural – students’ typically struggle to see the visual nature of the problem. This prohibits their understanding and subsequent reaction to the situation at hand and prevents their ability to translate an abstract idea or notion into a realized form. Therefore, it can be inferred that they don’t actually have the capability of seeing the underlying structure of an image. This implies that limiting the instruction of gestalt theory to its more basic examples is preventing the students’ comprehension of the subject.

Recognizing this apparent struggle to implement gestalt theory in practical situations spotlights the need for practice in this area. This is where experimental drawings become useful because they present an opportunity for visual problems to be created that contain varying degrees of difficulty. Drawings that address gestalt or figure ground directly may appear to be simple in terms of their constituent parts however they actually maintain a very high level of visual complexity. Even easier drawing problems in this realm can be incredibly demanding and require a high level of ownership on behalf of the student. Working with the gestalt through the means of experimental drawing inherently produces a high degree of ambiguity which promotes a productive disorientation and loss of certainty. This is similar to the aesthetic found in West Coast minimalism that places the emphasis on carefully viewing and seeing what is actually present in the space or on the wall. This must lead to much conversation about the visual instability of the image which requires the author of the work to formulate his/her understanding of their work in a clear and concise manner. In doing so, an inseparable linkage between the intellectual intent of the image and the responding execution of the image is created. This will contribute to the development of the student’s visual acquity while also revealing their subconscious biases toward the visual problems they are faced with.

Ways of Seeing

The sculptor David Smith says that his art is strictly a visual response and that he physically touches the world with his eye. This is significant because it gives preference to what a person sees over what they make. The act of making a mark – or any other physical construction – is simply a response to what one sees and how they process that piece of visual information. This brings forth the question of; how do we see? What must a student do to gain facility over their own perception of their visual surroundings and the imagery that they make?
These questions can be dealt with by using experimental drawings on a fundamental level to increase students’ awareness of what they might be looking for. Drawing at this very basic level requires students’ to make simply marks and/or gestures in order to discover questions that they never knew existed.

Fig.2: Perhaps an introduction to experimental drawings should consist of asking students to analyze and discuss images such as these before attempting to make any drawings. This will aid in their ability to see what kinds of questions might be asked and what they will be grappling with in their own drawings.

**Relationship to Art**

Many of the techniques and methods described for developing experimental drawings have been heavily influenced by the practice of Abstract Expressionist artists. One major difference that must be acknowledged however is that experimental drawings should viewed from a very different lens than that of fine art. These drawings must not be seen as any sort of finished piece or work, they are simply the residue that remains from the exploration. They are not meant to be hung on the wall in a nice frame or exhibited in any way other than to facilitate a discussion about the design problem. Once they fulfill their role in this matter they should essentially be filed away or even destroyed.

This is often a struggle for most architects and designers who make beautiful drawings in the name of “architectural research.” Figures such as Daniel Libeskind, Lebbeus Woods and Perry Kulper among many others often talk/write about the exploratory nature of their drawings but they tend to place more emphasis upon the work on paper rather than on their built work.

**Problems on a Fundamental Level**

Helen Frankenthaler, among many other Abstract Expressionists, is known to have generated pictures through a type of “systematic programming.” For example, she may start a painting by simply stating that she will use three blues and one other color at which point she lets her own compositional responses to that problem drive the development of the picture. Other pieces might begin with a certain number of rounded brush strokes of different colors all creating a specified edge condition. ‘This type of formulaic approach to drawing – and painting – can provide design students the ability to see more clearly the moves they are making and, more importantly, the effects of those moves. The seemingly simple prompts offered by Frankenthaler’s examples actually conceal a myriad of design questions that, if recognized and explicitly stated, are of great importance for those who are interested having a functional use of gestalt theory.

It should be noted that the function of experimental drawings generated in the context of this paper varies from how artists such as Frankenthaler. As art, these systematic images could be developed and evaluated strictly for compositional reasons however as design experiments they must adhere an explicit criteria.

When looked at in this way one can quickly see that experimental drawings can very readily take on many different means and methods. One might elect to prescribe a very precise series of lines be drafted within a tightly defined area. Likewise, another project may consist of marks made with charcoal pencils over a water color wash on a large surface.
The degree to which the rules of the drawing assignment must be followed should also be interrogated. Even in the more basic, or fundamental, operations suggested above there are many ways to approach the rigidity of the rules. There is certainly merit in strictly abiding by the stated drawing formula in order to more precisely measure the results of the exercise. This also lends itself to comparison across a body of work by one or more authors relative to the same drawing problem.

However there are times when it may be beneficial for discovering students’ tendencies to have them take certain liberties with the instructions. These could be spontaneous and completely unscripted moments or they could be woven into the structure of the drawing in the form of substitutions. For example, students may elect to use a certain line weight when drawing curved lines but must use a constant and specified line weight for straight lines.

More complex drawing problems could very easily develop out of the previously mentioned examples. While the simple drawings with only one or two steps are great for learning the kinds of questions one must ask when constructing a drawing—or when studying an image—more complex drawings are far more valuable when learning design fundamentals. This is because they allow the student to not only see but also control and experiment with relationships and responses/reactions. Drawing in layers with varying steps/rule sets allow students to properly document their decision making throughout the process and learn to understand how a designed logic operates within a system of multiple parts. The students’ design decisions can then be carefully evaluated and discussed. The conversation that comprises the review of the work should focus on other possible drawing outcomes—the results of a different decision being made somewhere in the drawing process—in addition to what was actually drawn. In other words; how would the outcome of the drawing organism be different if this line was drawn instead of that one? This kind of questions requires the students to look even further into the logic of the drawing system as well as their response to the framework that they developed in previous layers of the drawing. It can be said that “often what architects choose not to draw is as important as what they choose to draw.” For this reason instructors should take the opportunity to highlight the aspects of the drawing that were not drawn; the decisions that were not made or the lines that were left unmade in favor of those that were actually

The following figures illustrate examples of how drawing problems can be developed and expanded as part of the learning process.
Experimental Drawings in Contemporary Design Education

drawn. Working in a series helps aid this discussion because it greatly increases the sample size for comparison.

Fig. 5: Layered drawings made by combining oil pastels and color fields in order to explore the relationship between line and field by asking when does a line become a shape—and vice versa.

The individual layers of the drawing may consist of any number or type of components; there really are no boundaries. As a result some drawings may become a type of collage while others might start to address specific media and themes that arise out of their inherent characteristics.

*Example Drawing Sets*

The following list of ten steps constitute the formation of one drawing set. Again, importance is given to the notion that this is not meant to construct a single drawing but rather a set. That is to be an exhaustive set, one that consists of many drawings made by several students in order to see a true representation of the range of work that can be born from one set of drawing steps. It could be said that all of the drawings made from this list are fundamentally the same drawing.

*Layer 1- pencil*

Connect the intersections of subsequent vertical gridlines with diagonal between horizontal gridlines.

Diagonal line for every third vertical gridline in opposite orientation than diagonals previously drawn.

Line from one intersection along previous diagonal to a grid point one gridline above or below.

*Layer 2- pencil*

Line from the end points at the extents of the previous line.

Connect any two end points and intersections (one must touch the two previous lines) — X2.

Connect any intersection along the previous line to the end points at the extents of the composition — X2.

Vertical line from the previous lines extending any length above or below.

Connect the previous vertical lines end points to any intersection.

*Layer 3- pen*

Two primarily horizontal intersecting lines that pass through any two intersections.

Verticals through intersection along the previous two lines.

Connect the previous two end points.

Horizontal through the intersections along the previous line.

Connect the end point of the horizontal intersecting lines to the top/bottom horizontal gridline in the composition.

*Layer 4- pen*

Connect the bottom horizontal to the top horizontal with diagonals every other (new) gridline.

Heavy line over two verticals (outside of horizontals).

Connect previous end point to a corner bounding line.

Crossing lines from any pencil intersection to any pen intersection to any pencil intersection.

Repeat previous step but invert the order (pen, pencil, pen).

*Layer 5- pen*

Three groups of parallel lines.
William M. Philemon

Thick heavy line.

Dotted line connecting to previous line.

Separated dashed line – X2.

Connect the previous lines to the dotted line.

Layer 6- pen

Extend a line to a grid point beyond the composition passing through any two pen intersections.

Dotted line through previous line with both end points at grid points.

Connect the previous line with a curve.

Two lines from the curves end points.

Connect the previous lines end points with a dotted curve.

Layer 7- pen

Frame a corner (doesn’t intersect with anything).

Straight line through points of the frame.

Dotted line that crosses into the composition (multiple angles).

Center line through the previous line.

End point of the center line back to the composition.

Layer 8

Two horizontal parallel lines.

Two heavy short intersecting lines.

Two lines through the previous four.

Connect the previous lines to any end point in this layer.

Repeat previous step.

Layer 9

Dashed parallel lines.

Dashed parallel lines through the previous group.

Angle through intersection of both sets of parallel lines.

Verticals through the previous intersections.

Single line through the previous verticals.

Layer 10

Make one existing line a heavier weight.

Radial lines ending along previous line.

Dashed parallel lines crossing the previous group.

Heavy short curves through the previous group.

Line through two curves – X2.

Fig 6: Resulting drawing from the steps listed above.

It is important to notice that there are essentially two different types of steps listed in the example above. These are steps that are completely autonomous and steps that require a previous mark to have been made. This is important in designing the sequencing of an experimental drawing because the type and order of the steps, in a sense, pre-programs the drawing or at least partially determines the possible outcome of the drawing exercise. Recognizing the quality of the steps and the medium associated with each of them is critical in the design of a successful drawing problem.
Experimental Drawings in Contemporary Design Education

Attributes and Characteristics

All of the examples mentioned thus far have dealt entirely in the abstract in that they have been entirely non-objective and non-representational. As students progress and gain facility over this type of drawing and thinking through the use of purely visual problems they must begin to face more architectural issues in their drawings. As is typical in abstract drawing any issue related to architecture can be explored via this method. Light, shadow, ground, building systems, technology, sustainability, etc. are all viable subjects to be deployed into the experimental drawing environment.

Two critical issues that should be explored as soon as possible are material and scale. Obviously to begin to incorporate elements such as these into a drawing set the instruction may begin to take on quite a different form. The narrative may have to become much more prescriptive and much more verbose in order to adequately describe the development of the drawing.

The reason that these two factors are paramount is because they appear to be the most fundamental elements that evolve design thinking from free-form ideas on paper into real architectural problems. That is not to say that they are the most important elements of architecture – though they may very well be – but rather they are the most immediate in helping students’ begin to transition their thought from the abstract to the more real.

Each of these elements can be clarified in order to help them fit into the realm of experimental drawing for the sake of the exercise. Material logic should be limited to a very select kit of parts so that instructors may, through the programming of the project, edit a great deal of possibilities before the drawing problem even begins. This will require students to think about very specific properties of the materials selected in isolation such as connections between one or more materials, surface texture or thickness/poche among many others. The role of scale should be implemented as a proportional logic that always relates back to the human figure. Recognizing that certain elements – or materials – have specific proportional relationships to the other components of the drawing, all of which are understood in comparison to the human body, is critical in understanding the role that scale and even human occupation have in architectural thinking. By utilizing an indirect proportional logic students’ are more likely to consider the space of and around an object as being tied to its physical characteristic rather than simply its size relative to a scale a figure. This kind of thinking leads to a richer understanding of how objects relate to one another as well as the space they are framed within in addition to the people that interact with them.

Architectural Form Making

The previous notes about material and scale in experimental drawing began to imply the biggest perils associated with this type of exercise within the context of an architectural education. As mentioned in the opening section of this paper one must take care not become trapped in the world of experimental drawing without ever finding a way to translate the lessons learned through its process into actual architectural form. Staying in the abstract world of drawing and calling it architecture would be detrimental to the field because it reduces the depth and criticality of the industry. Beautiful drawings are no more than beautiful drawings if they do not lead to an act of form-making that is explicitly architectural. This is not meant to deemphasize their use or importance for beginning design students but they cannot be the end goal. Experimental drawings must be seen as a tool for a specific learning outcome and no more than that.

The major question lies in the role of these drawings in terms of developing an architectural object. Do the drawings completed
during this phase develop into form or are they viewed entirely as exercises that are produced autonomously from the production of the form? In the latter case, they are should be viewed as equal to the drawings of the form because while they may not represent the form in any physical way, they are the means to which the form was reached. The experimental drawings represent the thinking behind the drawings of the object which make them equally valid and of tremendous importance in the design process. Therefore they cannot be written off as having nothing to do with the production of form in their own right.

**Conclusion**

The aim of this paper is to reintroduce educators and students to the idea of drawing as investigative and instructional act rather than a simple activity used as a tool with which to design. Recognizing this potential of drawing is critical for design students in that it helps them sharpen very specific skill sets while increasing their ability to be generalists by enhancing their visual capacities. Drawing is the paradigm method for beginning design students to understand ways to explore an idea and how to amplify specific conditions of architecture and visual studies. This approach to drawing will lead to a form of design thinking that is projective and focuses more on design logic rather than on temporary methods that will soon fade away. Thinking in such a way encourages designers to ask the question, “why” rather than “how.”

**Notes**

Universal Vocabulary: constraints and the beginning
Roya Plauche’, University of Houston College of Architecture and Design

How or Why or Both

Where do you start at the beginning? Without a guarantee of an equal preaced knowledge, exposure or understanding of the given discipline, how and why should we as educators’ setup the framework for the beginning design student.

“In order to develop critical habits of mind that scaffold resilience and adaptability in students, we propose that beginning design education needs to be grounded in discussions of ethics and values, beginning not with questions of “how...?” but with questions of “why...?” 1

The challenge however, of teaching the why, lies in the very first course that builds the framework for the curriculum, in which no direct path has been established for the student. At this intersection, the how is an integral part of teaching the why. For the purposes of this paper, the how framework for curriculum is defined as universal vocabulary constraints, both linguistic and formal. This paper will examine the challenges and findings of developing universal vocabulary constraints (how) and encouraging a collective learning environment. I would like to differentiate this vocabulary constraint as a boundary (how), that encourages the pushing and pulling (why), rather than one that is limiting.

At the beginning, embedded memory.

First day of class, during the Fall semester, at 9:00 AM, we as faculty watch a diverse group of students stumble into an auditorium and await instructions. Some not knowing exactly what they are doing there, some confident that they have found a place of belonging, and some eager to make it to the end. The diversity of our students is not just geographical, cultural and traditional but includes a diversity in age and circumstances.

These embedded memories, accompany our students, as they arrive. Each have taken a different path to arrive in that auditorium this Fall morning.

“The University of Houston is the second most ethnically diverse major research university in the United States. Students come to UH from more than 137 nations and from across the world. Our student body comprises 40,914 undergraduate and graduate students.” 2

As an educator, it may be overwhelming to think about influencing and guiding these students in unfamiliar territories, making sure that each one can continue their own path in this new discipline. Constrains provide, a manageability, clarity, and directivity to the curriculum we intend to teach as faculty. The act of beginning something new entails both new content but should most importantly teach the student how to learn that content. A universal vocabulary is a valuable aspect of a curriculum and influences, critical habits of mind that scaffold resilience. We as faculty may have to teach them, what a scaffold is and how to build it.

Why is it important to have universal vocabulary early on? This constraint allows us as a faculty to introduce the basics of design, and allows the student to focus on direct tasks to complete an exercise. For instance, cut this black paper, in these dimensions, and place them on this white paper, with these dimensions, with intention (Fig. 1)! This approach of teaching the basics, has become a stepping stone that introduces the beginning design student to more complex system-base design and systems thinking. Using this simple start and constrain method has allowed us to emphasize the importance of developing good habit and encourage a thoughtfulness moving forward.

Fig. 1 SLR Project, student work
Vocabulary constraints: language and form

The Bauhaus method of teaching has been a relevant tool for architecture education discourse for its formalism and emphasis on square, line, and rectangle as architectural elements. Even though these elements manifest themselves into other vocabulary terms, such as point, plane, and mass or point, surface, and volume, they are derivative of Kandinsky’s Point and Line to Plane. This vocabulary has been the cornerstone of foundation education across architecture schools everywhere. It is an effective tool, simple to understand and clear in its intentions. It is an information graphic kit of parts that allow compositional creation of space.

But as we become more interdisciplinary, is this vocabulary still valid? I would like to suggest that Kandinsky’s Point and Line to Plane technique may still be a relevant way to teach the how of design if used not for its formalist value but its inherent relationships. I would even suggest that it is a way to teach the how of design, as an effective model, to interdisciplinary programs, if the use of the universal vocabulary refers to both object and human scales.

“Every phenomenon can be experienced in two ways. These two ways are not arbitrary, but are bound up with the phenomenon developing out of its nature and characteristics:

- Externally— or —inwardly."³

In his book, Kandinsky examines the basics of artistic language. The point as a “simplest axioms of geometry to the highest forms of art. Then, the line undergoes the same careful analysis. And finally, it gets to the plane, or rather the “main plane”, acting as the consolidating principle.”⁴ The reference to this simple geometry and the nature and characteristics they embody is what is valuable to this universal vocabulary and constraint. Looking at the inherent qualities of these design elements, is the basics of design relationships. If design starts with a point in space and continues to become a line that defines a boundary, the how, then the quality of the point and the line need to be investigated, the why. It is then important to emphasize the use of the characteristics of square, line, and rectangle for their constraints rather than their compositional quality. Can the point be aggregated in a field? Can the plane respond to light? Can the mass soften its edges to allow better ergonomic flow? The answer is yes.

I would like to use a specific project used in our first semester design studio, which is interdisciplinary, (Architecture, Interior Architecture and Industrial Design). The project is assigned the first day of class and is one sequence in a series of five projects for the semester. The project is SLR (square, line rectangle). The students begin with 2D exercises and at the end of the series they will investigate the 3D response. Each step is derivative of the previous, encouraging continuity within the sequence and the series. Students begin by cutting a prescribed square, line and rectangle from black construction paper and gluing them onto a 11” X 11” sheet of paper with intention. Once they compose the project they chose one element to repeat. In this case the line is repeated up to five times (Fig. 1). The goal of the project is to use the formal vocabulary of a square, line and rectangle to investigate relationships, vicinities and hierarchies within the figure/ground. The next part of the investigation is to extract edges, in the form of lines from the square, line and rectangle figure/grounds. These lines are defined as relationship lines. In this one step, the student learns that the inherent geometric constraints of the geometries, create varying grids, and therefore the geometries can become a controlling calibrator of the grid.

The transition to 3D occurs in the next sequence in which the students use the square, line and rectangle, along with the extracted relationship lines and inscribe them on to a 5.5” Boolean Cube (Fig. 2). “The objective of the project is to study edge conditions, folded planes, material thickness and joinery.”⁵ This is the first 3-dimensional investigation the students attempt and it introduces them to modelmaking, material assemblies and 3-dimensional craft. In each stage of the SLR sequence, the students are encouraged to self-correct and self-critic, using a multi-iterative process. This is a fast moving, rigorous process that is important in that, it sets forth the pace for entire curriculum. The tangible and intangible habits taught during this semester molds the students’ performance trajectory within the entire curriculum, I will elaborate on this point in a moment.

Fig. 2 Boolean Cube Project, student work
System based design

As I earlier stated, the SLR or Kandinsky’s method of teaching the basics should be used not for its formalist value but for its inherent relationships. I would like to iterate the important of flexibility within these constraints. If a curriculum is packed full with compositional constraints and reinforced within a four or five-year degree plan, then the students will be at a disadvantage in that the diversity of design and the resilience of problem-solving is not addressed. Students benefit in understanding that design, in its resolution, can be addressed using multiple problem solving methods. There is not just one way to do something, explore them all and let’s discuss the value of each. Therefor I would insist that Kandinsky’s vocabulary elements are better suited for the beginning and the basics of design and should be coupled with other current methods such as system based design strategies.

The next series of projects, following the SLR projects, are the Dynamic Field series. This series begins by studying grids and basic system based design. The objectives include “understand the effects of a static grid and an affected grid”5 and “defining a methodology and a systematic approach to”6 the “design process and material transformations.” The project is designed to both teach a new method but also responds to the previous one. The students use their previous Boolean Cube project as a site to explode a folded plane concept. During this semester students are encouraged to think at a 1:1 scale focusing on the vocabulary they are learning rather than specific object or human scale.

The series starts with Dynamic Dots, investigating “hierarchy and the effects of positive and negative space”5, which refers to the figure ground relationships of the SLR series. Then, moves to Dynamic Field (Fig. 3) which requires the investigation of “scale, frequency, and resolution”5. The project encourages the study of pattern and texture and its negotiation of an edge condition. It questions the understanding of material thickness and assembly strategies, and finally, “how does pattern define interior and exterior conditions”5. All objectives are valid questions in each respected discipline. The final project to the series is the Dynamic Pattern project (Fig. 4), in which the students learn basic pattern making and manipulation by converting 2D materials into 3D assembly systems.

Both the SLR and the Dynamic Field series teach tangible skills and intangible ones. Both teach the how and do ask the why, and they scaffold on top of each other. Each project can be interpreted into a multiscale investigation, both, of the space and the object unit of measure. The constraint of universal forms and language are valuable to a clear intention that encourages a rigorous process and iterative investigation.

Tangible Skills

The tangibles skills include the introduction to the tools, such as parallel bar, using an Xacto, scale, straight edge, triangle, all the elements of making. The introduction to drafting, graphic communication, presentation layout, orthographic drawings, all contribute to the student’s ability to understand, make and draw their intentions. These tangible skills are the tools needed to build the scaffold. They are part of the how. As faculty, we may forget how much learning is taking place at the beginning, not just at the foundation level, but to the start of any new undertaking. We may assume the student has prefaced knowledge, but this may not be the case, requiring the teaching of both tangible and intangible skills.

Intangible Skills

In their paper titled “Soft Skills for Digital Designers”, Shelby Doyle and Nick Senske discuss the importance of soft skills, defining them as “related to emotional intelligence, attitudes, habits, and interpersonal relationships.” Furthermore, arguing that “soft skills are similar to traditional soft skills in the way they affect how students apply technical skills.” These intangible skills are the qualities that make students resilient. The challenges our students face especially in this introductory studio encompasses the ability to learn these intangible skills. Some of these skills are very basic, how to be a college student, how to arrive on time, how to be prepared, how to find the studio! The hope is that with the use of universal vocabulary and constraints in approaching the first projects, there is room to help nurture
these soft skills as it applies to overall learning and not just digital skills. I would like to further define the intangible skills as thoughtfulness, thoroughness, cleanliness, values, accountability, self-direction and critical thinking.

The importance of a structured start is that there are multiple learning typologies and skills that need to happen simultaneously. The tools, habits, techniques, expectations, accountabilities, outcomes all need to be balanced to ensure success. They all lead to resilience. Success must be measured across a curriculum and not with a single course along that curriculum. I would suggest that success is not a pristine outcome, but the iterative process and accountability to the work. Being able to evaluate the value of the topic at hand and critical about its use. There needs to be a balance of safety in failure and encouragement to try again.

**Conclusion**

In conclusion, I would like to state that universal vocabulary, both formal and linguistic, provide constraints for our beginning design students, making it efficient to learn both tangible and intangible skills. The Bauhaus method of teaching may still be a valuable tool if used for its constraints and not solely for its formalistic composition. The formal language of the point and line are a simple and clear way to teach the beginnings to design even in interdisciplinary curricula if used for their inherent relationship. It is however important to balance constraints within a flexible net so that there is room to fail and self-correct.

**Notes**

2 “UH at a Glance” UH.EDU, [http://www.uh.edu/about/uh-glance/](http://www.uh.edu/about/uh-glance/).
5 Jackson, Meg “ARCH 1500 - Foundation Design Studio I Architecture | Industrial design | Interior architecture Project Descriptions,” (University of Houston, Gerald D. Hines College of Architecture and Design. Fall 2016).
Since the Renaissance, architects have depended on agile thinking to address contemporary architectural questions. The hands-on approach to the relationship between materiality, form, structure and organization that Brunelleschi developed in addressing the problem of the Duomo depended on sophisticated integrative thinking. Joseph Paxton and Gustave Eiffel employed new materials adapting old ideas to emerging systemic processes. The Cranbrook experiment adapted the arts and crafts focus on craft to cross-disciplinary experiments aimed at the betterment of society. In fact, the history of design education in the last sixty years reflects the elaboration on rather than rejection of established pedagogic paradigms. Methods may evolve but the substance of design education endures—disciplinary adherence (gravity still works) and skill building (things still must get done) are as essential today as ever before. The only threat to the integrity of beginning design education is to assume the “how” and the “what” of the disciplines are somehow mutually exclusive from the “why.” Such misguided exclusivity expands the gulf between abstraction and reality that typifies the worst of design education today. This is why we reject the rejection of the atelier and Bauhaus methods. The methods work precisely because they value the co-dependency between foundational and fundamental knowledge (the “what”), technical skill based on ever more sophisticated processes and materials (the “how”), and perceptual experience (the “why”).

Josef Albers’ greatest contribution to design education is his legacy of teaching. Josef Albers teaching career began at the Bauhaus in 1922, merely two years after the school was founded. The Bauhaus method was, in most respects Albers’ method, and it depended on the simple notion that discipline in skills and in thinking are essential in design education. Discipline is defined as “training that corrects, molds, or perfects mental faculties,” and for Albers discipline meant focused study and iterative practice with intention. This is what students remember of their time with him. “No less impressive in the eyes of former students was the prodigious vitality that Albers brought to classroom activities, and his total absorption in whatever was at hand. Often seen crawling around on his hands and knees to observe the work place on the floor, he kindled an atmosphere of serious fun and high-spirited play that inspired, energized, and motivated.” He also valued iteration over product, and rewarded students with theatrics when required. Students were occasionally required to produce “tickets” to gain entry into the “show.” The tickets were, of course, their completed assignments for that day and the “show” was the daily critique. Albers had a gift for motivating students beyond the menial task of awarding grades. This approach, and many other inherent principles of Albers’ method, still work today. “We recognize that much of the criticism of the Bauhaus method is the “myth” of Albers as a beloved teacher bordering on the threshold of being a magician; but the fact remains that countless artists and designers benefited from that “myth” Furthermore, the method’s resiliency and consistency were proved time and time again from the streets of Dessau to the mountains of North Carolina over a 36 year teaching career. That consistency relies on three primary and universal ideas: history and precedent, technical knowledge, and perceptual understanding.”

**History and Precedent**

History and precedent, though often ignored in the studio environment, remain vital in design education today. For the beginning student, history and precedent (with respect to architecture) are often regarded as a separate field of study, as different from the design studio as math is from literature. This is partially the result of their prior education experience but also stems from the fact they lack the proper context for measuring their value. Precedent is superficially regarded as an image to print and pin up as “inspiration.” This is of no value to the studio environment, because the student is simply responding to the image aesthetically, with little ability to articulate its importance or value. Students must be educated that “precedent” some-
thing worth study, and at times, this requires Albers’-like magic. But introducing fully formed architecture examples to beginning design students without a rigorous method of studying them invites confusion and frustration. Night Zag Wall, a sculpture by Louise Nevelson in the permanent collection of Crystal Bridges Museum of American Art, serves as the sole precedent for our Design 1 studio. This sculpture is ideal for a beginning studio because embedded in it are compositional, spatial, and formal systems that are analogous to architecture. “The use of analogy in beginning design curricula is a substitute for the student’s inherent lack of disciplinary intuition.” The fact that the sculpture, in this case a wall mounted form that blurs the lines between art and architecture, is ideal for it provides a “mechanism to subvert preconceptions regarding formal or spatial outcome.” By consciously avoiding architecture in beginning design, the “what” is temporarily suppressed and the “how” and “why” assume greater attention.

This strategy aligns with Albers’ method where projects were designed to promote learning through doing without a preconceived idea about the product or even what was to be gained from the experience. Student interviews from the Bauhaus reveal comments such as “nothing was presumed to be known,” “gather experience for oneself,” and “we discovered value in unexpected places.” Anni Albers confirms this in her own writings, stating “Every designer, every artist, every inventor or discoverer of something new is in that sense an amateur. And to explore the untired, he must be an adventurer.” For students today, “untired” is a foreign concept; they are timid, reluctant and stubborn, certain that their way is best but and oblivious of alternative possibilities. Secondary education prepares them to provide correct answers and finite solutions to black and white problems. But design, and design education, is anything but black and white. In a review of Nevelson’s Sky Cathedrals from 1958, a critic wrote that the works are “...profoundly exhilarating in the way they open an entire realm of possibility.” And this is why the sculpture is an ideal precedent for beginning design. It is accessible for even the most conventional thinker, and complex enough to engage students willing to dispel any preconceived notions about why they are studying “art” when they are in school to study architecture. The sculptures are ideal for understanding part to whole relationships, traditional and contemporary ordering systems, and a range of scales. In addition, Night Zag Wall lends itself to multiple skill-based methods including line and tonal studies, formal analysis, and measured orthographic projections like elevation, elevation oblique, and exploded oblique drawings. The latter drawings are some of the most useful for understanding the complex packing of the sculpture and reveal Nevelson’s acuity for both discipline and playfulness. Nevelson referred to her works as “environments” and a survey of titles for her work reveal this to be true: sky, mountain, night, and wall are commonly used in combination with other descriptors. Night Zag Wall provides an abstract “environment” for students to draw, analyze, model and study. The sculpture’s inherent principles of design allow us to subvert students’ thinking and engage the sculpture not as a work of art but as a constructed environment with all of the qualities and characteristics central to architectural design. Framed according to Albers’ philosophy of discovering “value in unexpected places,” Night Zag Wall is an ideal precedent for beginning design education.

Technical Knowledge

As technologies have changed and materials have advanced, the “limits” of architecture have greatly expanded. And this is where things get interesting. Technologies do not dictate the “why,” designers have to engage the process so that the “how” and the “what” are not the default but the intentional. Too often the “why” is the end result of a technological process rather than a physical manifestation of carefully articulated ideas. What Albers taught at the Bauhaus required discipline and precision, something that should not be dictated by a purely technological process. The genius of the method and in Albers’ teaching is that the technique and skill are fused with the perceptual, so a designer cannot have one without the other. For beginning design education, skill building has become increasingly complex. While the digital analog debate continues wise teachers recognize that both methods provide unique ways of seeing, making and representing. Traditional skill sets like freehand drawing and drafting, however, develop a particular set of perceptual abilities that digital tools do not. The connection between the eye, the hand and the paper is fundamental to Albers’ method for learning. In a world consumed by speed, beginning design educators must be emphatic about being slow, deliberate and precise in intention. Three-dimensional modeling programs are valuable, but they cannot replace that unseen force (gravity) to which physical models and architecture must adhere. Technical understanding of how physical elements work together cannot be learned through digital modeling; the wood shop is the appropriate studio for learning those lessons. Here is yet another lesson from Nevelson: the assembly of disparate parts into a cohesive and structural whole is about engaging in the process. She writes, “Sometimes it’s the material that takes over; sometimes it’s me that takes over. I permit them to play, like a seesaw.” Nevelson’s work, by its aggregate nature, implies a tectonic logic, a constructed artifact that is valuable for beginning design stu-
students. More important is Nevelson’s own word, “play,” which implies experimentation or at least a willingness to try something without knowing the outcome. Spontaneity. Technical knowledge applies to skills, but it also applies to the skill of thinking playfully and acting decisively. Through the very accessible form of the Nevelson sculpture, students learn that design decisions have technical implications and are able to apply those concepts in later design projects. Through a virtual “disassembly” of the sculpture and “reassembly” students gain insight into the complexity of composition, both two-dimensionally and more importantly, three-dimensionally. Rhino is employed to model the individual components, to re-assemble them and transform them through various operations, and then to “slice” them into a series of sections like architectural CAT scans. In our attempt to constantly and consistently shift the students thinking from virtual to physical, the slices are printed as traditional sections and then used as templates for constructing a layered physical model using plywood. The resulting forms represent the space of the sculpture as solid, but their layered assembly is a nod to Nevelson’s own constructs of part to whole relationships.

Architects don’t make things, they make representations of things; therefore, design education (and arguably the profession) has become less focused on the what (architecture) and more focused on the how (representation). This is why the first year design studio at the Fay Jones School of Architecture and Design embraces the Bauhaus model as a necessary precursor to agile thinking. Skill building gained in the first year ranges from measured drawings to freehand graphite renderings, from physical models to digital models, and hand-cut figure|ground studies to laser-cut bas reliefs. These skills are rooted in the discipline of the Bauhaus but with the inevitable inflection of 21st century techniques.

It is our position that contemporary methods of making and representing are enhanced by the knowledge gained through the discipline inherent in hand and eye synergy. For this reason, the traditional studio model is intensified at mid-semester with a weeklong hands-on collaborative workshop directed by designers and artists from outside the studio faculty. In the absence of input from the first year teaching team, the workshops introduce alternative ways of thinking, working and making. Complementary and/or antagonistic to the first half of the semester, the workshops also function as prologues to the experimental parameters of the second half. To determine the workshop groups, students completed a survey of questions based on interest, confidence in skill, and most importantly, willingness to take risk. This last criterion was weighted more heavily in the survey so the students were self-selecting into or out of the more adventurous paths. They did not know this, of course, but it ensured a variety of skill sets and personalities in the three different groups. Our position remains that students are only prepared to confront ambiguous outcomes and unknown parameters (the heart of Albers’ philosophy) when they are competent in their skills. In other words, some students are more willing to experiment than others, and we were able to test this in the second half of the semester.

**Perceptual Understanding**

The heart of Albers’ philosophy is the one that is the most difficult to articulate: perceptual understanding. Indeed, as educators we know it is the very “thing” that separates a “B” project from an “A” project. Perceptual understanding is difficult to measure in student work, particularly in the beginning student. Albers’ described learning as a cumulative process, comparing it to the crystallization process. What forms in the very beginning is an integral part of the completed whole. This is precisely why it is imperative to consider beginning design education as both foundational and fundamental, and while the two are related they are not interchangeable. Design principles provide a foundation for the accumulation of increasingly complex knowledge and skills. Albers was known for saying, “You must learn to crawl before you can walk, and until you can walk, you cannot run.” We can evaluate foundational knowledge by traditional means; measured drawings can be “correct,” and conventions of line weight and type can be objectively assessed. Craft, both in terms of precision and intention, is measurable. And this is why foundational knowledge, the very discipline of design, must first be taught and privileged over intuition and creativity. Creativity in beginning design education should be viewed with suspicion. Experimentation, however, should be fostered and celebrated, particularly when complemented by a process-driven method. When experimentation is combined with foundational knowledge, the perceptual understanding of a student is evident in the synthesis of skill and design. Foundational knowledge is proscribed with clear objectives achieved through process. Fundamental knowledge is gained through experimentation, risk, and iteration and/or repetition. On Albers’ teaching philosophy, Walter Gropius noted that he provided them with the skills rather than the answers. “He gives them instead objective tools that enable them to dig into the very stuff of life...” In other words, the methods foster perceptual understanding. Foundational skills like drawing and modeling, through both digital and analog means, are core to our pedagogy. Fundamental to our pedagogical beliefs are less tangible ideas of curiosity, joy and self-discovery: qualities of perceptual understanding.
Our semester privileged foundational knowledge in the first eight weeks, then paused and inserted the workshops as a moment for students to explore alternative ways of thinking and making. This provided them an opportunity to test and apply their knowledge from the previous eight weeks, gaining confidence through the application. The final eight weeks of the semester shifted from foundational knowledge to fundamental knowledge. A proscribed method of working was replaced with student-driven decisions about the methods and means for exploring an idea. Students were divided into pairs and each pair assigned a portion of the Nevelson sculpture as the “environment” into which a wall of their design was inserted. The programmatic requirements were simple so that the complexity of the tectonics of the wall and the tectonic relationship to the existing environment was emphasized. The students were given two requirements for the final presentation: two sections through the project and a 1” = 1’-0” model. The students directed the rest of the work produced: iterative or alternative, digital or analog, two- or three-dimensional. Proposals for the environment that drew from the existing foundational knowledge (both in skill and content) were celebrated; proposals that were merely “creative” for creativity’s sake were critiqued as lacking rigor and discipline. This is not to suggest that something of value was not found in them, but that their resolution was not pulling forward any foundational knowledge from the previous eight weeks. The final weeks of the semester yielded a roller coaster rhythm of production and reflection; the studio was a laboratory in the best and broadest sense of the word. Working in pairs quelled the timidity of some students and having a partner created accountability. Students had to resolve a shared design solution, and this required compromise for most pairs. More importantly, the partnership created dialogue between the students. The final verbal presentations revealed the students had been discussing their project with their partner consistently across the semester, and the visual presentations confirmed an attitude about making and discovery that a proscribed process could not have produced. The projects were vastly different in attitude, approach and characteristics, but they were consistently thorough in their resolution of the programmatic requirements. In this case, foundational knowledge was necessary for the students to take a position about design in their final project. The fundamental aspects of the project were more fully realized and represented as a result of confidence in their skills and in their perception.

**Conclusion**

Educating the architects of the future is more challenging than ever before, because it is easy to make “things” that look like architecture, but lack the substantial qualitative characteristics that we value. Architecture is not fast or easy. Digital technologies and the virtual worlds they illustrate seduce through idealized lighting and stylized entourage, but it is debatable whether those visualization tools enhance perceptual understanding or destroy it. Even worse, institutions are also pressured by the profession to graduate students who are “billable” on day one forcing on the academy the burden of both education and apprenticeship. Too much of the profession has already rejected the atelier method; and the more the academy emulates the profession the more we risk losing the experimental environment of the studio forever. We have to resist this in the same way we have to resist the rejection of the atelier or Bauhaus. Foundational knowledge acquired through making and learning to “see” is as valuable now, if not more valuable, than before. Foundational knowledge ensures that students are prepared to acquire increasingly complex and changing skills as technologies continue to advance. Foundational knowledge, even something as seemingly simple as drawing a line on a piece of paper, instills discipline and intention. This is an idea that was born in the Renaissance and remains relevant today. Leon Battista Alberti (an anachronistic introduction here) wrote extensively on discipline and limits in education. He states, “Perfection in the art will be found with diligence, application and study.” Limits are key to foundational knowledge. And foundational knowledge is essential to competence. Competence means students (and graduates) are flexible in both their thinking and making. Flexibility is an increasingly important quality for designers. And it is flexibility that breeds confidence. Alberti’s writings from the Renaissance emphasized foundational knowledge obtained through discipline. Some five hundred years later, Albers’ teaching method reflected the same attitude that knowledge acquired through disciplined practice is the foundation to good design. His philosophy also implies that confidence provokes agile thinking. And agile thinking is what empowered Brunelleschi to not only ask “Why?” but also, “Why not?” It is naive for us to assume that our world is more complex today than it was in the Renaissance or more fragile now than in 1920’s Germany when Albers left the Bauhaus. We have to be clear about what is foundational to design education. And in that clarity we also find what is fundamental to our role (the role of design) in our world today.
Notes

iv Ibid, p. 4
vi Ibid.
xii Kelly, p. 5.
xiii Kelly, p. 8.
This paper will hope to demonstrate the ability of first year students to experiment, analyze and present questions surrounding architecture and interior design without specifically focusing on; what I like to say, the bathrooms.

Following in the rigorous tradition of the Bauhaus and Black Mountain; specifically, at the undergraduate, our program aspires to transdisciplinary thinking; in other words, beyond the mere representation of architecture and interior design. Instructed and guided in their journey, the students develop a deep understanding of the myriad concerns inherently present in the creation, presentation, contextualization, and discussion of work. Focus is placed on teaching critical thinking rather than just replication, regurgitating, and imitating the work of the masters, requiring that they investigate and question. The pedagogy is rooted in active spatial design, a comparably new practice that crosses the boundaries of traditional disciplines and encourages facility with multiple modes of making and thinking. This repetition of making and the subsequent juxtaposition of a number of resultant works, stresses the role of questions instead of the value answers, which facilitates building the culture of inquiry. To frame the discussion, this paper presents only part of a larger pedagogical structure designed and implemented within a design school whose purpose is just this, to foster personal and collective evolution and to offer students an outlet for criticality and deviance. The paper will argue that this project sequence, executed within a standard studio environment and taught alongside more “traditionally” disciplinary projects offers the potential beginning step toward reinforcing agency, which is not simply a cognitive ability or even some form or capacity of rational thought, but rather, an embodied phenomenon tied to human capacity for growth.
Vincent Sansalone

How we use cartography as a way of understanding; for us, it is the discipline of the conception, production and dissemination of ideas, as well as the re-presentation of knowledge. In the broad sense, the gathering, evaluation and processing through forms of presentation, be it two-dimensional, three-dimensional or in the moving image. In world of today, mapping; i.e. GPS, takes on a new meaning. How do we get are students to engage in the journey and just not plug in the destination? This is looked at in key points in the foundation year that are restated throughout the entire year: love the question, have patience in the unresolved and believe in yourself to discover the potential.

This requires that students do exactly one thing: study the work in art; as the umbrella of architecture and interior design. This might sound similar to all schools and studios, where works of ‘architecture’ are read and understood so as to inform a project, but for us it’s different. The analysis is the project, analysis is the creative action. Typically; to date, architecture is studied—though the canonical in its own right. What I/we are proposing is each mode or operation is distorted, dissected, expanded, grown, and systematically mutated in what can be described as “the creative process in reverse.” If it can be used to generate architecture, we assume that it can also be used to understand architecture. Some techniques, especially those that are sometimes mistakenly associated with polemical movements, actually work better in this context. What’s more interesting than a generative parametric model? A degenerative parametric process. In many ways, we are blessed with the CO-OP, which allows us to flip the paradigm and work within the field of the exquisite corps.

This is where Alchemy plays a role; through speculation, translation and transformation into something new or into a new reading of something old. In order to carry out this exploration, the studio engages in translation processes between the mind and the materiality of architectural communication: two-dimensional drawings, three-dimensional constructs and the prosthetic (the unknown) and in reverse. At stake in this exploration will be the elemental, constructive matter-forces of ‘architecture’ and how these elements can be influenced by and integrated into a plastic urban condition to structure space and event. Studio participants will be pushed to develop strategies for their own process by tapping into the attitudes and operations of both the intuitive and empirical based on their understand of the process and their ability to ‘map’ it.

The ways in which foundational disciplines are historically taught and thought (praxis as theory practice) have an influence on the curriculum and philosophical dispositions faculty relay to their students. By using the vast body of pedagogical research on teaching arts and humanities, we can avoid teaching practices that hinder foundational understandings and research, and connect with the goals of the integrated foundational set of capabilities we seek to instill into our students, i.e. students out of the seats. In this practice, we seek the stage of Third-Space, a place of exploration of object, context and the interstitial space of possibility.

In this plan, the model of this foundation pedagogy is both fitted for undergraduate and graduate students, allowing us to en
gage more deeply with content and connecting the practices of thinking and making in their first year that deeply integrate the philosophy of critical inquiry.

This pedagogy is rooted in active spatial construction, a comparative practice that crosses the boundaries of two- and three-dimensional design disciplines. First-year students learn core principles, but more importantly, they learn to question and transgress the traditional. The curriculum places a heavy emphasis on self-awareness. In other words, it requires students’ constant consideration and incorporation of physical scale—the set of physical qualities, and quantities of information that characterize motor, sensory, social, and mental capabilities. Over the course of the year (undergrad), semester (grad), the program(s) unfolds in a series of projects developed to teach the principles of composition, form, and materiality through an acute understanding of the hand and making via iteration, craft, scale, and questioning.

Foundational experiences; at any level, thus set up an integrated vertical and horizontal investigations in ways of seeing and exploring. Finally, the need for comprehensive foundational integration and discipline requires acknowledgement of best practices, pedagogical innovations and initiatives for cross disciplinary studies already in progress in practice. With this in mind, this paper focuses on strategies and actions for implementing and creating a culture of collaborative research and pedagogical practices that will give our students a strong footing to creating their own constructed maps.

So how do we do this, it is very quite simple, from day one we ask them to make, then present, document, re-present. This is starts with a very simple object, transformed into a construct and so on which leads over time to a resolved idea or at the graduate level a way to begin to think about architecture.

Strange Things, Optimistic Pedagogies and Contemporaneity

Andrew Santa Lucia, Portland State University

The place of optimism in the discipline of architecture has affected far more than attitudes of students and practitioners. Architectural education has evolved along a relational continuum of variant disciplinary definitions of optimism - from the Critical (volumized functionalism) through the Cruel (aesthetic symbolism) to the the Strange which offers architectural pedagogy both complexity and corroboration (customizable contemporary). Although different in scale and implementation throughout history, the optimistic entanglement with the audience of architecture is underlined by participatory models that effectively shifted the focus on how architecture is made, to why it is entangled in the first place. Beginning design education should suggest how architecture participates with the cultures it finds itself in, as not only a methodology, but as an ideology.

Contemporary pedagogical models should make a concerted effort to provide a space that engages both Strangeness as a quality of architecture and Optimism as real-time agency by examining new forms of cultural and social engagement.

Optimism is a contentious term at best, sometimes associated with concepts like hope, utopia and instrumentality. First, a key cultural difference between optimism and hope is that hope deals in particular goals/outcomes tied to a situation, while optimism is a form of proactive engagement with the future. Second, the history of the term utopia is more closely related to the idealism of a “future without a past,” which differs from the real-time agency optimism offers. In regards to both hope and utopia, Aldo Rossi’s critique of naive functionalism locates the problem of idealism in the concept of function during Modernism, as a stand in or replacement to the structure and formation of architecture as a cultural, temporal and social element with a past and potentially negotiable future. It follows that the scale of architectural instrumentality is precisely the interface between discipline and culture that must be engaged when delineating a pedagogy of Optimism.

According to Jacques Ranciere, the Strange within cultures of art and aesthetics “…aims to produce a new perception of the world…[and] create a commitment to its transformation.” By challenging aesthetic, tectonic and programmatic norms in popular architectural pedagogies, the Strange offers students an awareness that (a) their work is different; (b) it is purposeful and (c) they are a part of mediating a change in architectural thinking. This essay will examine the curricular focus and selected student work produced in both a (a) first-year undergraduate interior urbanism studio at the School of the Art Institute of Chicago and a (b) third-year undergraduate ecological-design studio at Portland State University in 2016. Using Strangeness and Optimism as a lens, this essay will identify scales of cultural engagement, representational techniques and design ideation behind new architectures produced by students who were presented atypical pedagogies across both courses.

Chicago’s Live/Work Typologies as Interior Urban Affairs

“Every society clings to a myth by which it lives. Ours is the myth of economic growth.”

- Tim Jackson, Prosperity without Growth: Economics for a Finite Planet, 2011

In Spring of 2016, I taught a first year Interior Urbanism studio at the School of the Art Institute of Chicago called, ‘Post-Office Life.’ The premise of the studio centered on the fact that since Noll’s map of Rome, public interiors have been considered an extension of the outside city. In part, public spaces are an economized unit of the city, but becoming increasingly unavailable in the race for developing every square-inch of useable land. Consequently, the private interior is being affected by economies in much more precarious and, ironically, public ways. There is a genealogy of economic change that has shifted the way the public interfaces with interiors, from the advent of (1) late 90s ideas about Experience Economies that forecasted the move from selling goods to selling experience; (2) to the current Access Economies employed by Airbnb, VBO and WeWork that shift ownership and patronage to reformulate the way people access private/office/hospitality spaces in the city, as well as suggest the interior as a central image of urban life. The movement from Experience as capitalist commodity to Access Economies that center on a city’s interior is complete, but there is a
Andrew Santa Lucia

new species of urban space that is emerging which is neither totally private in use nor particularly commercial in scope, situated within the vast growing space of available rooms in the city of Chicago.

After this realization, the studio developed a floor plate of the Old Chicago Main Post Office building in downtown Chicago, designed by Graham, Anderson, Probst & White in 1921. This building is a megastructure by the same architects who completed the Merchandise Mart earlier in their careers, once the biggest building in the world. The program(s) which were explored in this adaptive reuse project were (1) living space modules that exist in the current access economy of spaces in the city, which can double as hospitality spaces available through infrastructures like AirBNB; and (2) working spaces that give patrons access to office amenities within the same building they live, which can also double as coworking Spaces like WeWork or Grind. This studio created several 1500-2000 sq.ft. livework interior access economy focused units that challenge normative models of architecture and interior architecture in the city Chicago.

The ultimate goal of the studio was to force discourse on the city to move (1) away from the scale of big data and loc/lo-...
types of products might they produce. This list of characters included highly detailed cultural and commercial information such as: Food Truck laboratory Kitchen/auto parts manufacturer ran by a 32 yr old African American Female with a 31yr old female partner and two shelter dogs; a Virtual Reality Startup that needs a small scale office environment + ample VR testing room ran by a 25 yr old single Latino American male who is a front end designer and owns one dog, a 22 yr old single white American male who codes and is in open relationship with the urban agriculturalist across the floor plate, and a 30 yr old single Asian male who is the president and owns one cat; and also an Urban Agricultural Center that operates a closed hydro/aquaponics systems for food growth and a tutorium ran by 35yr old Latino Transgender Man in open relationship with DIY hospitality manager and Virtual Reality Startup Coder. This intersectional set of characters was meant to amplify and make visible contemporary social identities in a hope to push architecture towards a more equitable direction. Their research included popular media, census data, direct phone interview and/or visitations to real versions of their user’s practice in Chicago.

Approaching the design of their live/work interiors, students defined their own programmatic breakdown of necessary space for living/working for each individual based on the original taxonomy of actual furniture’s, technology, atmospherics, displays, transportation, and publicity/privacy. This was achieved by creating a series of floor plans without walls that gave students an insight into actual limits of space, as well as organizational principals native to each live/work scenario. After this, the introduction of very basic wall systems - wood/metal stud, masonry, and other plastic non-load bearing typologies - forced students to have realistic/conventional dimensions without planning or organizing their space around them. This was a turning point in the course when students realized they created an architecture without using the traditional elements of architecture, instead opting into a discourse on the intersections between the way their users live and work, as a simultaneously aesthetic and functional action in space.

Fig. 3 What would a feminist racetrack look like? (model is deconstructed to show interior)

Fig. 4 A series of figurations of natural and cultural images on or near Mt. tabor City Park.

Aesthetic Quotations of Portland Culture as an Index of New Ecologies

“Traditionally, the practice of quotation has inoculated the author against accusations of plagiarism. Today, the quicksilver nature of contemporary communications obscures chains of reference. Must we jettison conventions of authorship or will we establish new codes of citation?”

• Introduction to Perspecta 49, Quote* (2016)
In fall of 2016, I taught a third-year undergraduate ecological design studio at Portland State University, called ‘An Acropolis on Mt. Tabor: how Portland quotes itself.’ The Acropolis in Athens, Greece was uninterested in connecting nature to civility; instead framing, reflecting and refracting Greek city life at the time. As a genealogical point in the development of architecture’s mediation of landscape and its implementation of new orders around it, this studio created small Nature Centers on and around Mt. Tabor City park that directly engaged the abundant natural visual resources and buildings of the city through the conceptual process of Quotation. That is to say, the studio quoted, cited, copied, appropriated, originated and evolved the visible orders – buildings and landscape - that situated student’s projects as an Acropolis.

As an origin in and of itself, Portland can be distilled into dominant tropes – abundant natural beauty, wooden architectural history and forward-thinking city planning – and minor tropes – kitsch design and pervasive weirdness. As a social product, architecture can learn from any aspect of culture and this studio cataloged and deployed some of these visual tropes through the quotation process. Ultimately, The Acropolis on Mt. Tabor is a product of and for Portland that finds itself on, around or on the side of a mountain and worships aspects of both Portland’s nature and culture. A key reason for this focus was to force students into dealing with their own biases about Portland through quoting what they love about, whilst at the same time critiquing what they don’t. This resulted in a portion of the class dedicated to a transparent visual and cultural criticism.

As a site, Mt. Tabor juxtaposes two important Portland quotations - close proximity to natural resources and larger-than-life recreation areas within kitschy neighborhoods. It is both a very old landscape with very new cultural qualities. Dating to the Pleistocene era, Mount Tabor is a dormant volcano located on the Boring Lava Field, which is an extensive network of small volcanoes stretching northward from from Boring, Oregon to southwest Washington. The Boring Lava field has been extinct for over 300,000 years. Conversely, the Mt. Tabor neighborhood provides an interesting moment of difference between the old volcano; a new neighborhood that is equal parts bourgeois and Portland-Kitsch. As a result, each student project had to develop a relationship between Mt. Tabor as natural site and Portland-at-large as a cultural one.

Students were assigned one of six different sites on Mt. Tabor that had equal ADA access (for simplicity and accessibility), but also a steep grade (for curricular purposes of introducing drastic topology). After this, students had to photograph the visual natural and cultural orders that define the site of their architectural project. They employed different methods such as photography, tracing, figuration and modeling, to motivate an arbitrary, yet seemingly analytical research product into popular architectural formats – form, diagram and drawing. As a product, students create 100 different figures based on 100 different elements on the site.

After this initial study, students had to combine and self-criticize their figures elements through three frames of production: Composition (aesthetic mixing), Behavior (programmatic/cultural ambitions) and Assemblage (new possible compositions for a whole architecture). They mobilized the visual and formal research of natural and cultural orders around the site, composing and assembling architecture derived from, evolved through and inspired by these orders. Finally, we introduced a social dimension of program and behavior so their architectures could project past themselves as ‘buildings’ and become sites of cultural interaction. Each student was responsible for creating a Nature/Cultural Center + event space that interfaces with the steep context – both mountain and city.

Can a Strangely Optimistic Pedagogy produce Progressive Architects?

The results of these intersections between social identity, economy, ecology, culture, and architecture have been highly positive, based on students reviews to comments by external critics to internal departmental reviews. A common theme discussed around both of these classes has been how the pedagogies are ‘out of the ordinary’ and/or ‘out of order.’ This was a purposeful choice that led to atypical arrangements of architecture that allowed students to explore humans, culture and space in novel ways. The place of Strangeness within these pedagogies intended that students actively sought to reify their understanding of what Strange looks and functions like. At times, the exceptional and/or non-binary identities of people inspired students to create a suitable and relative architecture; whilst at others, studying local culture as an indicator of a relationship to ecology, forced them to rethink what it means to design sustainably. As an instrumental dimension of architecture, Optimism underlay many of these design choices whether it was being optimistic of humanity, of architecture, of science, and/or criticism. Ultimately, the process of introducing a Strange dimension into a pedagogy is easy in that one only needs to replace elements that are
repeated or 'normalized' with ones that more specifically challenge the ideological nature of designing architecture.

Notes

2 Coleman, Nathaniel. Utopias and Architecture. (Abingdon: Routledge, 2005) 7-15
3 Rossi states that functionalism "...serves to maintain a certain order and to provide us with a simple instrumental fact - just so long as it does not pretend that an explanation for more complex facts can be extracted from this same order." found in Rossi, Aldo, and Peter Eisenman. The Architecture of the City. (Cambridge, MA: MIT, 1982.) 47
“Begin with Why | Ethics and Values in Beginning Design” is the theme for the 2017 National Conference on the Beginning Design Student (NCBDS). At times faculty and industry experts mention the phrase “in the real world” while giving feedback during a critique or in a classroom presentation. Usually the term “real world” describes the post-graduation environment. Why is the world of academia not considered a part of the real world? This paper provides discussion points for why and how the term “real world” should be avoided with our students.

The Transition

At the senior level in high school, students usually live in a well-established reality that they developed over four years. The transition from high school to college is a big step into unfamiliar territory, a new real world in a new environment. This change brings many exciting social and professional opportunities and poses many challenges for the beginning design student.

Considering most students are without adult supervision for extended periods for the first time when moving to campus, the seemingly unlimited freedom can be distracting. A lack of role models makes it hard to benchmark one’s own performance. “Students’ perceptions of the college student role responsibilities and its limitations can hinder their ability to strategize for some college challenges.”1 While most entering design students display great enthusiasm and curiosity, this limited role perception diminishes the scope of their thinking, and performance.

It is quite clear that managing the simple challenges of everyday life, trying to earn some money on the side and balancing the expectations from multiple courses require a new level of organizational skills. Plenty of programs (freshman orientation/counseling/welcome fairs/celebratory meals/sports events etc.) are in place for the incoming student. Design disciplines do not spend many resources on the program specific onboarding at the beginning of the semester. The burden is shifted to the faculty to develop the best practices for supporting students in the new reality and all the way to graduation. (reinforcement over time)

Moreover, faculty must support students’ journey, understand each student’s own life story and unique capabilities and adapt to these varying nuances, which change from year to year. The academic space is the real world of the stakeholder student. It is up to the faculty to set the framework for a productive playing field and the best possible student experience.

High school curricula usually do not emphasize abstract creative thinking, although skills taught such as photo editing, 3D CAD modeling and design thinking are on the rise. 2 Most incoming students are super excited to design objects, yet lose their enthusiasm when confronted with the fact that they first must learn to draw a cube in 2-point perspective or make a perfect cube out of foam core. It is hard for students to see the importance of foundational knowledge in design. It is difficult to learn patience when trying to achieve a high level of craft. We should be able to teach the abstract principles of design along with empowering projects that include empathy, collaboration and curiosity.

The Term “Real World”

“In the real world” is often used in the context with the actual application of skills and knowledge, which were attained within the academic space, outside of academia. 3 When faculty or a guest refer to the real world, they emphasize the separation between the academic space and the world outside of academia. But it is problematic that “in the real world” could be interpreted in various ways. Often it comes across in a derogative, belittling way. For example, the feedback “This is a nice idea, but in the real world it would not work because of xyz” is not exactly actionable. Further, the student’s perception might be that the
the classroom experience is of lesser value than the post-graduation one. The best critic would require the student to reflect and discover potential room for improvement. The feedback would be much better utilizing questions. “I often see such and such happen, have you thought about this and that in your project...” In this context, faculty should consider giving guests guidelines prior to the critique to ensure that the feedback is honest and actionable. Academia’s “real world” encourages students to navigate an exploratory journey and to make mistakes without grave consequences.

Making the Student Journey Real

In order to overcome the mental separation between academia and the working world various ways of connecting theory with practice are already happening on campuses. The design professions and their applied nature make this the norm. The trendiness of innovation and the fact that the business world discovered design as a tool creates new opportunities. Depending on the self-driven personality level, some students engage in campus programs, consulting or seeking internships. Some courses integrate an application outside of the classroom in the learning outcome.

One body of evidence to support this is that design research findings are increasingly contributing to design practice, design guidelines and design regulation. This outcome is advanced in interdisciplinary incubators. Here are two examples:

Live Well Collaborative (LWC)

The LWC is a non-profit organization founded by the University of Cincinnati and P&G that hosts innovation projects for member companies. The focus is on improving the quality of life for the affluent baby boomer generation. Students learn interdisciplinary group work, how to incorporate qualitative design research in the design process and the value of understanding the needs of multiple stakeholders. Student are required to participate in at least one LWC studio before graduation.

Blackstone LaunchPad

“The Blackstone LaunchPad at Syracuse University connects the campus innovation ecosystem with a global network that provides support for aspiring entrepreneurs.” This is a perfect example of creating a place where students from diverse majors get together to pursue an entrepreneurial spirit. Participation is self-driven, students learn to understand business viability demands, how to pitch ideas to prospective investors and what it takes to be successful in an interdisciplinary setting.

Design Foundations

Pursuing extracurricular on campus innovation activities or internships is often in the hand of the individual student. Faculty can recommend or alert students to certain events or activities that enrich the learning environment. Seasoned faculty understand what skills the industry is looking for in recent graduates and cultivate these in project based learning (PBL).

In order to develop desired design student habits early, the first year curriculum needs to be structured with content to educate T-shaped designers. That approach nurtures highly desired skills such as curiosity, critical thinking and empathy. We should capitalize on our students’ enthusiasm and curiosity at the beginning of their college careers and provide experiences to broaden their perceived role for tackling complex problems.

Before the introduction of the new first year experience at SU in the school of design (SoD), students took the foundation courses on the college level. All those courses took place in buildings outside the SoD and for the majority were taught by non-SoD faculty.

Since 2015, the school of design controls and carries out the first year experience. In the fall semester students take DES 101 and 103 in the SoD, both taught by full-time SoD faculty, along with a writing course, a design/art history course as well as either a studio or academic elective.
In the spring semester, the students take DES 102 and a discipline-specific studio course. Further, they have a choice of studio or academic electives along with a required symposium. One of the strengths of the SoD is that students can take academic electives from other areas of Syracuse University, which results in a variety of minors. That ability to focus undergraduate education is adding a valuable facet to differentiate oneself when applying for jobs.

In the school of design at SU, faculty are striving for an excellent experience for their students through a redesigned first year curriculum. This has resulted in the broadening of the students’ perceptions of their role and promoted continued curiosity, collaboration, empathy, and performance.

Conclusion

The goal of this paper was to describe the why academia is part of the real world. The use of the term “in the real world” can be dysfunctional and therefore faculty and guest critics should avoid its use. Some key points of emphasis are as follows:

*Understand the stakeholder “student”*

Faculty should use their own design research skills such as empathy to understand the holistic situation of our students. Faculty should seek students’ unique vantage point to help them discover future opportunities. In addition, encourage hands on interdisciplinary PBL learning in the core curriculum and recommend participation in incubator programs.

*Understand the stakeholder “prospective employer”*

Faculty know which skills are sought after in their field. Conversations with prospective employers help to align details in the curriculum and to adapt changes in fast-paced job requirements. Students may have to be shielded from unethical considerations if the business goals of a project sponsor are not in sync with the learning objectives of the course.

*Coaching guest speakers/collaborators on how to give feedback before they are in front of students*

Seek a conversation about how to help the student to make better decisions in the future. Share the idea of asking appropriate questions that allow the student to reflect and improve their work.

**Motivation**

In the big picture of life, the student’s and the faculty’s reality overlap for a small amount of time. However, that overlap happens during a distinct discovery phase in life. Students will draw from the studio experience through their whole career. In fact, some consultancies try to replicate the powerful dynamic of a collegiate studio. Faculty are obligated to provide the best possible student experience.

**Notes**


3 https://envato.com/blog/12-questions-lisa-campana-head-design-moo/


On The Interdependence of the How and the Why: Notes from a First-year Drawing Instructor

Brian Schumacher, University of Cincinnati/Myron E. Ullman Jr. School of Design

We live in a time of flux. In the field of design education, pedagogies are stretching and changing to adapt to new technologies, language is shifting and being redefined, influenced and informed by a new generation of students who bring new ideas and new sensibilities to the design studio at a rapidly increasing rate. Within this sometimes-tempestuous condition, contradictions abound, and design faculty struggle to find common ground—or, at least this has been my experience over the last four years of teaching beginning design in one of the nation’s top public design schools.

The NCBDS conference for which this paper is composed provokes a contradiction between the increasing presence of “adaptive and agile, systematic and integrative thinkers” with the notion of “focusing on disciplinary adherence and skill building,” suggesting that we must perhaps choose between the two. As educators in the many allied fields of design, our ethics rightfully compel us toward such questions, and in so seeking we must continue to assess and question the value of both our pedagogical approaches and our curricular content. While it may be well understood to observe that “in situations in which the outcomes are ambiguous or the parameters unknown, today’s curricula needs to focus on developing adaptive and agile systemic and integrative thinkers,” it does not necessarily follow that to “focus on disciplinary adherence and skill building” is a mutually exclusive or incompatible endeavor. Perhaps we need not choose one over the other, or place one ahead of the other in a model of linear, sequential unfolding. Perhaps it is no longer meaningful to choose a priori between the How or the Why of design pedagogy, but to see and embrace that they are in fact one and the same—interdependent modes of human inquiry that occur in relative simultaneity, each informing the other in a dynamic, habituated feedback loop, each inseparable from the other. In the face of flux and change, where there is little room for fixed notions, we must acknowledge that the urge to redefine and reposition ourselves by such exercises as placing How ahead of Why, or vice versa, is more akin to debating whether to inhale or to exhale is the more important gesture in breathing, and that the very nature of unpacking and reordering our who/what/why/where/when/how dialectical urge is itself an inheritance from the past that we must move beyond.

As a design foundations educator immersed in the soup of diverse and abundant content coupled to a student body skilled at retrieving this information as a real-time feed within the classroom, I have come to all together question the meaning and utility of crafting a studio culture underpinned by any of our previous teaching skills and strategies, including the practice of entertaining whether we should place the How or the Why at the masthead of our efforts. When I then position this thinking within the context of the just and progressive imperative we face to embrace our many new diversities (gender, socio-economic and otherwise), this imperative seems even greater.

To survive this existential crisis, which is to say, as a practicing educator, to problem solve how to keep teaching amidst such questions, I began to experiment with and explore what would happen if I began to strip down my design foundations pedagogy to a bare minimum, removing both questions and answers, and in so doing leaving no narrative, no author, and thus no “oth-
er”. In practical terms, this meant rather than asking “how?” or “why?” of my students, I presented them with simple, concise circumstances, then set them free to address such questions on their own, forgoing the didactic lecture and handbook of methods and means, and instead providing prompts and directives.

**Draw the Figure, Make a Box, Translate Paper to Form**

One of the many foundational design studios I teach has an immersive six-week figure drawing component where students draw from the nude everyday in three hour, concentrated blocks of time. Many years ago, both in my own experience as a student of figure drawing, and later as an instructor of figure drawing, I would have had both more time to practice and more time to incrementally and sequentially teach, step by step, what is for me the complex subject of figure drawing. In the first few years of needing to teach figure drawing in a dramatically compressed six week context, to students who had never or rarely drawn from the figure, at first I relentlessly and tirelessly sorted and shuffled the many, many important theories and practices of figure drawing that I valued and deemed most essential, prioritizing some and foreshortening others in the spirit of “packing as much as possible into six weeks”.

Almost from the pure exhaustion of seeing students struggle under these conditions, and certainly from pure exhaustion of I myself struggling to chase content around and around in my head, I began to show up to studio and just let my students draw, of course with the figure as their subject. My only prompt was that they should try to draw what they saw, and to my surprise it worked better than all of my efforts to-date combined. I saw students observe each other’s efforts more carefully. I saw students compare notes with each other at breaks. I saw students researching “figure drawing” on their phones. And most importantly, I saw students experimenting openly to figure out just what the hell it meant to draw what they “saw”. It wasn’t that I gave up and left them to their own, but that the reframing of their experience liberated them to search and organize the abundance of information already readily available to them, and liberated me to spend more time with my students one on one, discussing their findings, and coaching them in their pursuits. I encouraged my students to simply do their best, and I affirmed to them that “everyone has a good instinct for the human figure” (just as everyone has the potential to become a good designer), that all that they needed to draw the figure well was to be vigilant about their preconceptions, and take the time to educate themselves with the many resources readily available to them.

I discovered almost immediately that the student work began to get better, much better, in the sense that students were achieving a greater likeness and living presence of the human figure in their drawings than they had before, successfully bringing their own personal agency and their own sensibilities with their own found methods and strategies, harnessed in their own way.

The essence of my discovery was that when I presented my students with simple circumstances and constraints and a directive to educate themselves, they did, and well. It was remarkable to see and compare results from my “old school” methods where I spoke earnestly and profusely about my own relationship to the What and the Why of figure drawing, to this new method where I set my students loose to find their own way. I have since begun to explore this pedagogical approach in other design studio environments and seen similar suc-
cesses. To be clear, though, it isn’t that the How and the Why are never discussed, but that one is not placed in front of the other at the head of the class. Each is given their due as the circumstance presents itself.

Certainly one of the many positive outcomes of this methodology has been to see students begin to produce work that is very different than what I might have encouraged of them or engendered had I been more controlling about my own relationship to the What and the Why. To whatever degree we embrace that the future will be different from what we know now, and that we must evolve our current pedagogical practices always to some degree, we cannot then be selective about what will follow. When any amount of change happens, all things change to some degree, true in design, and equally true within design education.

Perhaps much of what we hold onto with regard to debating the How or Why in our pedagogies and curricula has to do with our unconscious desire to retain a certain preconception of how we think our work should look, and that as we face the need to revisit the front end of our workflow, we must revisit the outputs as well.

It is a sticky wicket to speculate about the weighty subject of pedagogical inquiry, and to do so is in such a cursory manner as I have done here is surely to provoke the raised eyebrows of theorists and philosophers deeply entrenched in informed debates on the nature of human inquiry. For the purposes of this paper, however, and for the purposes of the practice of beginning design education, perhaps it is enough to second guess the nature of our core conversations, and that in so doing we should not altogether forego the asking of How and Why so much as to understand that such questions are more similar than different, and that in being so undifferentiated, beg a different kind of inquiry all together if we are to truly expand our understanding of design education.

Notes

i The Myron E. Ullman Jr. School of Design in the College of Design, Art, Architecture and Planning at the University of Cincinnati, Cincinnati, OH.
ii NCBDS Conference Theme statement: http://www.cap.utah.edu/ncbds33/
iii ibid.
Empowering Students with Design-Build

Nick Senske, Iowa State University

Introduction

In their second semester of architecture school, seventy-seven undergraduate students across five studios worked together to fabricate and construct a 20'x25' installation with 2300 unique pieces in their school atrium. The project, titled TwoXTwo, represented a curricular realignment to incorporate digital methods, studio-wide collaboration, and full-scale construction into the beginning design sequence. The theme of this paper is student-empowered learning in design-build: what it means, how it can create learning opportunities, and how it can go wrong.

Scholarship of design-build may seem like an oxymoron. It is often tenuously close to storytelling. Lacking strong methods, such as ethnography, it can easily digress into the anecdotal. However, this should not devalue what is shared. Educational research in general has challenges of methodological rigor. Design-build, specifically, is a complex activity, dependent upon institutional policies, facilities and other resources, and the preexisting traditions and student culture of the school. Thus, any findings from research about design-build may not be directly transferrable—at least not without significant adaptation. This is not to say that data about design-build projects cannot be collected and new ideas cannot be learned from the experience, but these are often inseparable from their context. With those caveats in mind, the following is a case study, presented as a candid discussion of a project with a reflection upon its lessons for future efforts.

Empowerment

The notion of empowered student learning is central to a critical understanding of TwoXTwo and its lessons. The term “empowerment” has become overused in education of late, so that its actual meaning has become obscured. Today, many assume that empowerment means students being in charge of the classroom in some form or another. While allowing students greater agency is a dimension of empowerment, there is more to the definition. For the purposes of this paper, empowered refers to student motivated and able to act in their own interests in support of learning. This objective aligns with the commonly-held idea that students must “learn how to learn” as part of their post-secondary education. The hypothesis of empowerment holds that if students are self-motivated, focused, and capable, this should improve the effectiveness of their learning compared to direct instruction. However, to be clear, this does not mean students are in control. Instructors must create the conditions for empowerment to occur and to be sustained. The lessons of TwoXTwo illustrate the difficulties and potentials of student empowered learning as a pedagogical strategy within design-build. This will be the focus of the latter half of the paper.

Before summarizing the project and introducing the assessment methodology, it is necessary to understand more about empowerment. Thomas and Velthouse’s paper on the cognitive elements of empowerment presents a series of conditions under which empowerment is thought to occur. First, work must have impact. It is motivating when one believes that their work matters and makes a difference. Second, the individual doing the work must feel competence: in possession of the necessary skills and knowledge and confident in their capability to perform the task. Third, the task must mean something to the individual intrinsically (i.e. meaningfulness), with respect to one’s values.

Fig. 1 Students interacting with TwoXTwo. Photo by Chris Gannon.
and ideals. Internal motivation of this sort is not concerned with completing the task, but about the care and quality of the work involved. Fourth, the individual must have choice: the ability to influence the goals of tasks and choose the methods they use to complete them. Choice is often what many people focus on when they think of empowerment, but the framework followed here demonstrates how the cognitive picture is more complicated. In order to learn well, one must possess the motivation to want to learn (both from external and internal sources) as well as the ability to learn.

**Course and Project Overview**

TwoXTwo was a full-scale design-build project completed in the spring term of 2016. It was a continuous surface – assembled primarily of 2x2 lumber and inspired by SHoP Architects’ Dunescape – that integrated multiple spatial conditions such as inclines, overhangs, ledges, pockets, etc. The uses of these areas were left to the occupants and were intended to promote a more engaged and playful relationship with public space. The project is noteworthy because all of the students in ARCH 202 participated in its development and execution and because it occurred so early in students’ education.

The course in which the build took place, ARCH 202, is the second semester in our professional architecture program. Five instructors taught a coordinated studio together in five sections of 15-16 students. Our class of seventy-seven students was fifty-nine percent male and forty-one percent female. Overall, the studio was six percent minority. Thirty-four percent of the class were international students, representing eight different countries. At this point in their education, students have limited experience with design (particularly projects on this scale), do not know each other well, and uneven experience with construction. For instance, many students at Iowa State come from a rural background and are comfortable with heavy machinery and carpentry. But the majority of our students had no such experience. TwoXTwo was a half-semester seven-week project, issued at the start of the term.

The primary objective of the project was to understand public space and challenge conventions of program, formal proportions, and privacy. The project began with precedent studies of public spaces, such as the Trevi Fountain and Millennium Park. Students also conducted spatial and ethnographic analyses of public spaces within the site and around campus. The intent of these early studies was to make students aware of the qualities of public space – everything from function to phenomenology.

![Fig. 2 Rendering of proposed installation.](image)

In response to the precedent analysis and research, students created proposals for a 5’x20’ intervention in the atrium, taking into account the constraints introduced by the earlier precedent: nominal lumber with a strong sectional quality. The class discussed these proposals and voted on the most successful in each of the five studio sections. During a 24-hour charrette, the five proposals were developed into a single 25’x20’ proposal representing the efforts of the entire second year.

![Fig. 3 5’x20’ student proposals. Photo by author.](image)

The structural system and detailing emerged from a series of intensive workshops. Students created and tested full-scale mockups to understand their performance and determine a construction sequence. Structural consultants visited the studio to evaluate the proposals for safety, elegance, and economy.

Once the design was approved, the students created workflows in Autocad, Rhino, and Grasshopper for converting 3D models into construction drawings and instructions. Moving into the construction phase, messaging apps and realtime spreadsheets
were used to coordinate construction shifts and track progress. Fabrication and final assembly took less than three weeks.

**Outcomes**

TwoXTwo was completed on schedule and there were no accidents or significant injuries during the assembly of the project. The installation lasted three weeks and was well-received both within and outside of the school. In terms of its stated objective to reconsider public space in the College, TwoXTwo seems to have been successful. Besides increasing the density of occupation in the atrium, the installation became the site of several “pop-up” activities: a dance recital, art exhibition, a space for lectures, and the occasional party. The installation had an unscheduled extended engagement when a request was made that it be moved to a local botanical garden for use as an outdoor public space. The following summer, over 50,000 visitors experienced and played on the structure. It was recycled into lumber and mulch at the end of the garden season. Later that year, TwoXTwo was recognized by ArchDaily as one of the best student design-build projects of 2016.6

The benefits of this addition to the curriculum appear to have been significant to the students, school, and community. The outcomes of the project were as one would expect from a successful design-build. Over the course of the project, students learned a variety of research, communications, and computing skills, as well as construction and safety skills. They also learned about project management, negotiation, and teamwork.

Design-build was an excellent framework to teach these lessons in an integrated way while demonstrating their relevance to students. For the most part, faculty, staff, and visitors reacted positively to the installation, which further gave students a sense of pride and ownership in the work. TwoXTwo’s success in activating public spaces on campus and bringing exposure to the architecture program has led to sponsorships and a request from the College to retain a full-scale design-build project as an ongoing addition to the second-year studio.

At the same time, as the paper will later show, not all of the students felt they were full participants in the build and not everyone’s experience was completely positive. On a curricular and administrative level, institutionalizing design-build has opened up criticism and discussion about its relationship to the department’s pedagogical values, use of resources, safety and liability, and a host of other concerns. None of these controversies are new to design-build projects7, even when design-build is not a requirement, but they must be addressed, nevertheless. This study, and others like it, is one way to better understand and avoid the issues discovered during the project, before the next iteration of the studio.
Assessment Methodology

Assessment of TwoXTwo took many forms and was designed not only to determine performance but also to help everyone involved learn more from the experience. As this was the first time ARCH 202 attempted a full-studio build, the instructors sought to measure the impact of the project and identify issues for future projects. Towards this end, students completed surveys and submitted peer assessments and written statements reflecting upon how they worked together, what they learned, and the extent to which they challenged themselves to grow as designers. Instructors recorded personal observations and collected the student evaluations required by the University.

Discussion

Several decisions were made early on to enable such a large and inexperienced group of students to work together a single project. First, the introduction of a precedent project seemed to be effective, as it presented a pre-determined material (wood) with established structural details and a demonstration that the concept would indeed work. This provided the students with a set of constraints and helped to limit the workload during the design phase. Second, the typology of the lofted section, borrowed from the precedent, allowed the students to design both “locally” on designs for smaller pieces and “globally” when those pieces were brought together in series. This had the effect of giving ownership to studio sections as well as the studio as a whole. Third, combining the five studio sections together as a collective studio for the purposes of one large project had the effect of equalizing the distribution of skills, knowledge, and talents among students. If a student was a skilled carpenter, for example, she added to the project and helped her peers learn and work collectively, rather than to the benefit of her section alone. One would also hope that coming together as a collective studio improved the culture of second year, but this remains to be seen.

The overall student response to the project tended to be positive, but among the negative and critical student responses, several themes emerged. There was some resentment because not all students thought they were involved in the design process. Early in the project, students worked in teams of three to develop 5’x20’ concepts, five of which were selected by voting in studio sections. The voting process was prefaced by group discussions about the advantages and disadvantages of the different submissions. In the author’s section the chosen design was a hybrid of two group’s designs. Nevertheless, some students rejected the constraints of the precedent and felt that their authorship was thwarted by the authority of the instructors and the will of their peers. On one hand, this happens regularly in the profession. Not everyone’s ideas can be used; there is seldom a sense of single-authorship. However, on the other hand, the students’ responses cannot be dismissed as a lack of maturity. Indeed, they raise a valid and important question about the role of both the precedent and the composite design in the project. With these established constraints and the constraints of the studio itself (mostly, the need to stay on schedule), could the design-build studio effectively allow such a challenge? Are students only empowered if they agree with the group? If they feel rejected, where can they find motivation to contribute in other ways?

Another issue was the fairness of how student labor was distributed and applied throughout the project. The instructors coordinated regularly with the students through all-studio meetings and presentations, but it soon became clear that some kind of delegation would be necessary to handle immediate issues outside of class time. Student leaders were needed to do things such as correct documentation drawings, keep track of tools, schedule construction crews, etc. Two students, a male and a female, were made project “forepersons,” who would help coordinate between the various groups and the instructors. These students were recognized as responsible individuals and had leadership qualities which seemed to be appreciated by most of their peers. The other students were encouraged to volunteer for task groups and to select leaders within these groups. This was accomplished with the expectation that students would be able to choose activities where they felt an interest or proficiency, rather than by arbitrary assignment. If there were any significant imbalances, the instructors stepped in to correct them, but a large part of the students’ organization was voluntary.

Fig. 5 Group of students performing quality check. Photo by author.
What did these groups look like and how did they form? One early example is instructive. Before the build phase could begin, assembly of the 20’x25’ master model from the five proposals occurred digitally. The instructors created a version and distributed the file to the students. A group of students convened on their own and stayed up all night to make corrections to the model, which were later accepted by the instructors as improvements. This group, comprised of some of the most skilled digital modelers in the class, was almost entirely male and Caucasian. In similar ways, working groups tended to become led by non-international students who asserted themselves at specific tasks. This had the effect of making the diversity of nationalities in group leadership lower than it should have been, given that international students comprised nearly a third of the studio. Gender representation among group leaders was nearly equal, however. (It is unclear whether this choice was conscious on the part of the students, or circumstance.) Within the smaller groups, students self-selected with a better mix of genders and nationalities, often with their friends. Very few of the students changed jobs during the project, which was unexpected. As the project moved forward, the instructors planned to have students rotate in and out of various jobs in order to experience the full measure of the build. However, once they understood their tasks, most students wanted to continue in the same role. All students contributed to the final assembly, particularly as documentation and fabrication tasks ended.

At this point, the issue of empowerment can be reintroduced. The second-year students were allowed to self-select their tasks and to self-appoint for leadership— in effect, to determine how they would work and (ideally) learn. The students could have been assigned to these positions by the instructors, to ensure an equal balance of gender, race, and nationality, in the hope that those students would learn and grow from the experience regardless of their initial comfort and interest. This is potentially more fair and equitable, but, would it affect their level of engagement if students were not allowed more choice? To be sure, the pedagogy does not need to be so binary as described, but the two sides of task assignment, as presented, raise the question of whether such choices about teamwork are made by instructors because they are better for the build or better for students’ education. As will be seen, these may not be mutually-supportive goals.

Design-build can be a valuable educational experience, but it may not be so for everyone. This is the main problem facing the faculty’s decision to make it a required part of the curriculum. Even at its best, design-build has aspects that can be boring, dangerous, and even exploitative to students. A student design project might fail, but with a public build (particularly one for a client) failure is, effectively, not an option. This can place enormous pressure on everyone involved, which can result in students working overtime while performing tasks that range from uncomfortable to sheer drudgery. It is fair to ask whether this is ethical— to say nothing of educational.

This fear of failure or “failure to fail” can result in problems within the social dynamic of the studio, when students or groups of students are perceived as undermining or failing to contribute to the build. This contributes to clique mentalities, bullying, and other forms of peer pressure, subtle and unsubtle. The instructors saw this happen many times during the course of the build and acted to intervene. One could argue that empowered learning is expected of design-build studios. Projects are complex and developments constantly occur outside of regular classroom hours. Students are in a position to solve problems and contribute new ideas on-site. Some degree of autonomy is useful and self-motivation is encouraged. Difficulties occur when this autonomy interacts poorly with the autonomy of other students and especially with those students who are thought (or think, themselves) to have authority— such as the group leaders. Indeed, this is where the majority of the conflicts occurred.

**Empowerment and Lessons Learned**

Reflecting on the observations and assessment information gathered in terms of the cognitive framework for empowerment provides some insight into the positive and negative outcomes of the TwoXTwo project. Why were some students empowered and others not?
Senske

**Impact**

The impact of the project was perhaps the most successful dimension, in terms of empowered learning. It did not take long for students to register the significance of producing a full-scale build in a prominent location within their College that would be experienced by their peers. Their precedent research included an analysis of public spaces on campus, which helped students to appreciate opportunities for intervention and the difference this would make in the space. This aspect of the build seemed to have importance for most students.

**Meaningfulness**

The project was clearly meaningful to a small group of students (about 25% of the class), who took on many of the leadership positions in the groups. These students worked the most extra hours and nights of anyone in the studio in order to solve problems and ensure that the build was completed on schedule. This group reported a sense of pride in their accomplishment and recognized a connection to the work and their professional studies. Further down the spectrum, most students (about 65%) appeared to feel no strong alignment or dis-alignment with the values or ideals of design and construction. They approached it as an obligation, like shift-work, putting forth an earnest effort as they felt required to do. The meaning of the project to them was primarily as schoolwork. This is not to say that the students did not enjoy themselves or learn, but their motivations were not as strong as the first group. A smaller group (10%) seemed to question the value of the enterprise, which they felt was a distraction to their focus on learning design. The piecemeal nature of some of the work disagreed with their expectation of independence. They were not as interested in construction and did not see opportunities for themselves as the process moved forward.

**Competence**

One of the most celebrated benefits of design-build projects is the opportunity for students to learn about documentation and construction in a “real” setting. All ARCH 202 students had training in CAD, but not in creating measured construction drawings. Although, their existing skills seemed to be sufficient enough for them to learn on the job and to work together as a diverse group. This contrasted with the competence dimension of empowerment for the fabrication and assembly groups. While all students were required to undergo wood shop and safety training prior to the build, many students appeared to be less comfortable with their construction skills. (This could also be due to the dangers of construction versus computer work.) Self-selection contributed to unequal group distributions, as a majority of female students elected not undertake a representative share of the fabrication and assembly tasks – in spite of instructor encouragement otherwise. Reflecting on the studio, more time should have been spent ensuring that all students felt competence and confidence in this area, so they might have chosen to participate in greater numbers.

**Choice**

The most critical dimension of empowered learning during the project was choice. In many ways, a lack of oversight led to some serious problems, particularly: the perpetuation of inequalities and missed opportunities to develop learning and leadership. Was allowing students to self-select their groups a mistake? The scale of the project and size of the studio appeared to require a decomposition of tasks and a need to delegate oversight of some processes. The organization of the students, who created their own procedures, assembly line, quality checks, etc. was impressive both to the instructors and to outside observers. Groups of students, unprompted, created their own documentary videos, presentations, and other publications to support the project.

![Fig. 7 Still images from a student-created documentary film.](image)

The ambition of the students when given more freedom dramatically multiplied the learning outcomes of the studio beyond the expectations of the instructors. At the same time, this was not true for all of the students. The organization of the studio and that same freedom created conditions for unequal student participation, where some students were not able to contribute as they liked and felt left out of the build.

**Conclusion**

Is student empowered learning a useful framework for design-build pedagogy? For this post-mortem case study of TwoXTwo, the concept of empowerment provided some insights into why certain groups of students fully engaged and others did not. To
better understand the application of the framework, one could conduct other studies of design-build studios to determine the dimensions of impact, meaningfulness, competence, and choice and their influence on project and student outcomes.

A lingering question from this case study is the relationship between empowered individuals and empowered learning in groups. How can a required design-build studio for a large group accommodate students’ varying needs for motivation? And how can studios balance personal choice and equity when the stakes for builds are often so high?

![Fig. 8 TwoXTwo opening. Photo by author.](image)

Ultimately, is a required design-build project at this scope and scale a wise choice for beginning design students? Or are smaller projects with fewer students a better means of achieving empowered learning while learning about design and construction?

Empowered learning is an active area of educational and cognitive scholarship. This paper explored one particular model of empowerment, but motivation and learning are complex subjects and there is work to be done to develop a more critical interpretation of empowerment as it relates to beginning design. As of this writing, a new design-build project in ARCH 202 is in the final stages of planning. The author is in the process of applying ideas of student empowered learning to this latest iteration and expects to follow up with a future publication on any findings.

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**Notes**

Five Years of Flipped Classrooms: lessons learned
Nick Senske, Iowa State University

Introduction

In recent years, flipped classrooms have gained in popularity at many universities. However, they remain uncommon in design education. This paper presents the author’s experiences creating and teaching flipped classrooms for required computing and communications courses over the past five years. In each of the two case studies, the introduction of flipped classrooms produced improvements in student learning outcomes, student engagement, and more efficient uses of school resources (e.g. contact hours, classroom space, TA’s, etc.) compared to non-flipped versions of the courses. The author presents the details of the course structures, assessment methodology, and outcomes for the studies. The intent of presenting these studies is to share ideas about creating effective flipped classroom experiences and to help beginning design educators determine whether flipped classrooms are appropriate for their needs.

Flipped Classrooms

The use of online media – streaming videos, collaborative discussions, readings, etc. – is changing education. Students are teaching themselves through YouTube tutorials, independent courses such as Kahn Academy, and open-source efforts like edX. Online courses like these are often discussed as a lower-cost, more accessible alternative to traditional education. But can this same media be used to improve the learning experience for students when they meet together in school? This is the main idea behind flipped classrooms, which first developed as a learner-centered, technology-supported model in high schools in the late 2000’s. More recently, one of the drivers of the flipped classroom movement in higher education is the need for universities to accommodate increasing enrollments with limited resources. Two-thirds of universities are using already using lecture-capture software -- in many cases, to support flipped classroom efforts.

Briefly stated, a flipped classroom involves taking content which would normally be delivered in a classroom, such as lectures and tutorials, and assigning it to students outside of the classroom, often via online videos. Assignments that would typically be given as homework are addressed in class instead, thus “flipping” the classroom. An advantage of flipped classrooms is that they can provide more time for interaction between students and instructors, often in the context of inquiry-driven group work and discussions. Additionally, students have the opportunity to ask more questions about the lesson materials and receive immediate support for their assignments as they complete them in class. In this manner, the traditionally passive classroom experience is transformed into more productive active learning.

Despite encouragement from universities, the growing popularity of flipped classrooms has not yet reached most beginning design programs. The following are two case studies of required computing and communications courses that experimented with flipped classrooms.

Case study #1 – Computational Methods

In 2011, the author began teaching a required course in computational design at the University of North Carolina at Charlotte (UNCC). Computational design is often considered an advanced subject, but at UNCC it is taught within the foundation sequence to third year undergraduates. Because it was an
The author began collecting data during the first year and continued to do so for each new version of Computational Methods. In addition to required department evaluations and recorded grades, students completed pre- and post-class online surveys of their attitudes and opinions about the course content and teaching methods. An average of 75% percent of students participated in the surveys.

The first version of the course used traditional labs of 20-25 students (4 sections). The labs met twice weekly, followed by an all-class lecture at the end of the week. This format was not only challenging to teach – requiring the delivery of the same lab tutorials by the instructor four times a day – it was also not well-received by students. In their course evaluations, many students complained about the difficulty of the subject and the perception that it was not relevant to their future careers. Only 65% of students reported they were satisfied with their experience.

The lecture / lab teaching method, used in the earliest iteration of Computational Methods, is the traditional course format for many courses that teach computing skills. However, it is not necessarily the most effective or equitable means of student learning for this subject. Following tutorials in the classroom can be difficult for some students, particularly those with less computing experience, such as the economically disadvantaged. Women, also, can feel intimidated by the male culture of computing and inherited biases about technology use. At the same time, it can be difficult for instructors to manage the lesson when the tutorial has to stop because a student needs help. This creates a situation where the class is not able to learn at the same pace. Furthermore, students tend to learn rote technique in the labs. The application of these methods is arguably where they begin to have the most significant impact upon learning, but also where students need more individualized instruction.

In response to feedback from the 2011 class, a flipped classroom format was used the following year. Online tutorial videos were recorded on YouTube and assigned to students prior to the class, while the lab activity shifted from tutorials to a project-based class. The new lab assignments were designed to teach students problem-solving skills and design thinking while applying the lessons from the videos. Students collaborated with self-selected partners on the in-lab projects. The instructor and TA’s worked directly with students in the labs to discuss assignments, troubleshoot problems, and provide encouragement. The Friday lecture remained, but with additional time allocated for discussing common problems from the labs.

The switch to flipped classrooms dramatically impacted the students’ learning experience. Over the next two years, student pass-rates (C or better) improved from 86% to 97%. Student satisfaction rose to 94% and then 98% the following year. There are several potential explanations for this. First, students could watch the videos to learn at their own pace: replaying steps if they were lost and playing videos at a faster speed if they were confident. This seemed to improve the overall level of computing skill among students before attempting the lab and allowed for later remediation and review. Second, female students and international students could work together to solve problems; they did not have to be concerned about being embarrassed for interrupting a tutorial to ask questions. (In computer science, all-female groups have been shown to improve learning.) Third, students received much more one-on-one time with the instructor during the project-based labs. This helped to guide the lessons toward students’ abilities and interests and produced a more positive teacher-student rapport. Last, the additional time spent on projects instead of tutorials helped the class to appreciate the importance of computation within design. When asked whether computational methods were relevant to their future education, 92% of students from the flipped classroom responded affirmatively. Compared to earlier surveys, nearly twice as many students said they would take an advanced version of the course (32% vs. 60%).

In 2014, the launch of a specially-designed active learning classroom on campus brought a third iteration of Computational Methods. This new space featured group tables with microphones and HD monitors as well as a wireless...
Five Years of Flipped Classrooms

microphone for the instructor. In place of the Friday lecture, the students participated in small group activities meant to summarize and respond to questions about the week’s lessons, followed by shorter lectures on concepts, precedents, and theory. The student outcomes of this version improved slightly, from 97% passing to 100%. Most importantly, this version of the flipped course reported the highest satisfaction compared to previous iterations. 93% of students remarked that they preferred the new active learning format rather than a traditional lecture.

The unique technology in the classroom helped to inspire the active learning lecture, but it was not a requirement. The group tables and whiteboards were the most necessary equipment. Small group activities and shorter lectures kept the room engaged better than a traditional lecture. This final change helped to further flip the classroom from passive to active experiences.

Case study #2 – ARCH 230

At Iowa State University, ARCH 230 is a required visual communications course taught in the second-year undergraduate program. As the first and only required communications course in the curriculum, the content covers a wide set of topics: architectural drawing conventions, computer drafting, three-dimensional modeling, photo collage, desktop publishing, and basic computational design and digital fabrication.

In 2015, the author experimented with making ARCH 230 a flipped classroom. Like Computational Methods, previous versions of the course utilized a lecture / lab format. The new version moved communications lessons out of the computer labs and into the second-year design studio, with over 90 students working in the space together, using their personal laptops at their own desks. Students watched online video tutorials before class (and sometimes at the start of class), then completed weekly assignments in pairs. The class met twice a week. The first day of class, students started their projects and were shown precedent examples of the communications methods with high-definition screens on movable carts. Later in the week, the second day of class was reserved for answering questions and for pin-ups of work in progress. Students submitted their projects for grading at the end of the week. The flipped classroom format was repeated a second time, in 2016, with new videos and some updates to assignments.

Flipping the classroom into the design studio presented its own unique challenges. Because students are working at their desks and on their own machines, it can be easy for them to lose focus and distract themselves with other tasks: watching television, working on studio projects, studying for tests in other courses, etc. One must be careful not to allow students the sense that the course is a study hall. In large classrooms, where students are spread out over the space, classroom management and lesson design are essential. It can be tempting to let the students work on their own and wait for them to ask questions, but staying actively engaged as an instructor helps everyone. Teaching assistants may have to be trained in strategies for approaching students, as they are not always naturally inclined to do this. In addition, structuring “break-out” sessions, where students leave their desks for discussions, pin-ups, and short lectures is another way to keep students on task and interested in the work.

Data from the lecture/lab version of ARCH 230 was not available but student outcomes and evaluations collected for 2015 and 2016 were well above average. The average grade was 86.5% and the overall evaluation was in the top 10% of courses within the department. The most important impact of the flipped
classroom version of ARCH 230 was its improved efficiency. This will be discussed in the next section.

**Discussion**

The following section is a summary discussion of lessons learned from the two case studies and the author’s five years of flipped classroom experimentation.

**Learning how to learn**

One way flipped classrooms are said to improve learning is through the use of online videos, which is a form of media many students are comfortable with and often use to learn on their own. Furthermore, the use of active learning strategies, as opposed to passive learning, are supposed to improve student engagement. However, this does not mean that students will always learn better from flipped classrooms. Indeed, in earlier iterations of both case study courses, some students were unprepared for labs and complained that they felt the flipped classroom model wasn’t teaching them effectively.

Fig. 5 Students benefit from training in how to learn effectively from flipped classrooms

Follow up interviews concluded that many students did not understand how to watch the videos actively: in their group pairs, discussing together, collecting notes and questions, and following along with tutorials. They were simply watching the videos, often in another computer window while doing other activities. Although many K-12 schools are also experimenting with flipped classrooms, the format remains new to many students, who often carry over bad habits from the ways they typically engage with media. To help students get the most out of flipped classrooms, they must be taught how to learn from them. Towards this end, it can be helpful to design the first lesson in the course so that active learning behavior is clearly modeled and encouraged. This way, students immediately learn the mindset and habits necessary to succeed. When the author introduced training in active learning methods to his courses and syllabi, complaints about the format decreased significantly.

**Improving efficiency**

Many colleges encourage the development of flipped classrooms as a means of cost-reduction while maintaining a high quality of education. Improving teaching efficiency may not be possible for all types of courses, but with regards to the two case studies, the flipped classroom resulted in some savings, particularly in terms of space and teaching assistants. Teaching Computational Methods at UNCC required only one TA as support staff, to help with lab coaching and grading. Other courses of a similar size had two or three TA’s. At Iowa State, teaching ARCH 230 in the architecture studios eliminated the need for a large 90-person classroom for lectures. This space could be removed from the department’s teaching budget. In addition, because students used their own laptops for in-class work, this opened the use of the College labs for students and other courses. In terms of teaching assistants, the course was originally taught with five – one for each studio section. This was later reduced to three TA’s, but, because of the format, the course was able to absorb this reduction without difficulty. Both case study courses were large – about 75 students on average – and so flipping them may have created more efficiencies than with a smaller class size.

**Instructor effort**

A common concern about flipped classrooms is how much work it requires. Students tend to think instructors in flipped classroom do less work, because they are merely showing (and re-showing) videos. Instructors worry about the additional time it might take to produce videos. In the authors’ experience over the last five years, it is not the case that flipped courses require substantially more or less effort, but rather that one’s effort is distributed differently than in traditional teaching. For Computational Methods and ARCH 230, the online tutorial and lecture videos needed to be prepared, recorded, and edited. This required an upfront investment of time, which was returned when the videos were later reused for multiple semesters. The time saved teaching tutorials in lab was used to “coach” students which required at least as much effort as teaching the lab before. In terms of personal teaching style, engaging with the students in this manner was more comfortable and felt more rewarding than attempting to deliver specific content from a script (often multiple times a single day) and resolving technical issues with classroom equipment.

One teaching area where the author noticed a significant change was the time spent responding to students’ requests for help via email. In the traditional class with the labs, the author might receive three or four emails per lab because an
instruction was unclear, a student missed a class, resolving technical issues, etc. After introducing the flipped version, the volume of this type of email was reduced to almost zero. This is likely because students could replay the videos, receive help from their partner, or because those issues could be resolved in labs. Something else to consider is that instructors who are not as familiar with recording software may also need training and additional time to be able to produce and upload their lecture videos. As discussed in the previous section, flipped classrooms can help teachers with limited resources, but saving time or effort may not be a strong reason to experiment with the format.

**Video sharing and accessibility**

Streaming videos are often a critical component of flipped classroom strategy. In addition to providing the best course content for one’s videos, consideration should be given to how student will access them. When the first version of the flipped classroom was developed for Computational Methods, the author made the decision to upload all of the videos to YouTube. This decision was both pragmatic and altruistic. At the time, the YouTube user experience was superior to the University’s own courseware, both for uploading and viewing. Camtasia software was used for screen capturing, which had many features that helped make computing tutorials clear, such as highlighted cursors and click feedback. Compared to other, similar tools, Camtasia uploads directly to YouTube at full HD resolutions, which can help students see the software interfaces better. YouTube works with a variety of devices, such as mobile phones. This turned out to be important because a surprising number of students watch their course videos on their phones and follow along separately on their laptop. Providing open access to the materials was also a priority. In the interest of sharing knowledge, the videos were uploaded as public and kept ad-free.

An additional benefit of using YouTube for the flipped classroom has been the improvements in captioning over the past seven years. Videos uploaded to YouTube now receive automated captions, which can help with comprehension. Many of the international students in ARCH 230 use the captions to follow along in English or their native language. The English captions, at least, appear to be very accurate. The author was surprised to find that the captions manage to translate computing terms and software commands well. As enrollment of international students in architecture schools continues to rise, providing accessibility is a consideration when selecting learning technologies.

**Impact of online resources**

Many schools have their own tools for flipped classrooms, such as Panopto, which has advanced features for adding video annotations and student interaction. In some ways, these tools may provide a better experience for student learning compared to sites like YouTube, but they often limit viewing to users within the campus computer network. With this in mind, another benefit of flipped classrooms is that open access online resources created for the course can generate impact beyond the institution. For example, the videos created for Computational Methods and ARCH 230 have been collectively viewed over one million times on YouTube11 by users in dozens of countries. At last count, eleven architecture programs have used the author’s videos in their courses. In 2016, the author’s channel was cited by ArchDaily as one of the top channels for architects.12

Making the videos public, rather than restricting them to a University system, was one reason why so many others were able to make use of this media. Another helpful strategy was to consistently tag the videos and provide clear descriptions with timestamp “chapters.” This had the effect of making the videos easy to search, so they would consistently appear in Google results. Being able to refer to the videos has been helpful for lessons in other studios and the school appreciates being associated with a useful resource. For tenure-track faculty, the popularity of learning materials among peer intuitions, professionals, and publications is a potential way to demonstrate the impact of one’s work.

**When flipping fails**

Not all students learn best from flipped classrooms. In the author’s classroom evaluations, about 4 percent (on average) of students reported strong dissatisfaction with the format. Lecture and tutorial videos can present problems similar to those of traditional classrooms; some students still do not learn well simply by watching a video. A few mentioned they would prefer to learn tutorials in the lab, with the instructor present, because they find it difficult to follow the videos. Others
reported that they would prefer to take the course online, as if there was nothing more to the course than the content itself. Occasionally, students have difficulty working together in groups and reject this part of the experience. One or two individuals have shared the opinion that the flipped classroom is “not teaching.”

While the majority of student experiences appeared to be positive, these criticisms and concerns should not be overlooked. Learning is highly individualized and while flipped classrooms can be more flexible than more traditional courses, the possibility remains that students may struggle with these methods. Instructors need to be aware of this and watch for signs that students are not learning. In flipped course syllabi, it can be helpful to mention that alternatives can be arranged, such as one-on-one tutoring for students who have trouble learning from the videos and other lessons.

Conclusion

Although the effectiveness of flipped classrooms is still a matter of some debate\(^{10}\), over the past five years, experimenting with flipped classrooms has been an overall positive experience for the author. In the first case study of Computational Methods, the transition to a flipped classroom helped to make a difficult subject more personally relevant and inclusive for students. The second case study, ARCH 230, demonstrated how a flipped classroom format can be used to introduce the teaching of visual communications and computing skills into a shared studio space. The benefit of this change has been a more efficient use of school spaces and personnel, while maintaining high student performance and satisfaction. Regardless of any changes in student outcomes, flipping classrooms provided the author with intellectual challenges, invigorated his teaching, and resulted in increased exposure for the author and his institutions.

Universities promote the use of technology in order to accommodate more students while preserving the quality of education. Many believe that online-only courses are a solution. In a field such as visual communications in beginning design, which depends so much upon skill, craft, and nuance, an online course does not make much sense. Flipped classrooms appear to be a happy medium where technology can be used to create efficiencies whenever possible so class time with students can be used more efficiently. Those who worry that recording tutorials and lectures might spell their own obsolescence can still argue that the role of the instructor is critical for engaging the class through coaching, encouragement, and spontaneity. More experimentation is needed to improve these methods, but for some types of courses, flipped classrooms are a productive addition to design education.

Notes

11. See https://www.youtube.com/user/nsenske/
Crafting Values

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Introduction

The design foundation studio in our institution tended to emphasize on providing basic knowledge and skills in design, mainly in formal principles and techniques in representation and fabrication. However, within this context, we would like to activate our vision that a good designer is a responsible and sensible designer who is sensitive to existing conditions. For this purpose, we took from Richard Sennett’ meditation on craftsmanship two keywords, that is, engagement and negotiation.¹ We devised a project on wearable architecture as a way to introduce the engagement with materials and the human body. More specifically, we framed the project as a series of negotiations with materials, the human body, the collective, and time. We choreographed the project as a set of exercises, each of which challenged students not only to discover formal and tectonic properties and act on those discoveries, but also to question appropriate design responses that took into considerations the impacts on the body, the others, and the environment. Students first explored materials derived from found objects. Then, they worked in pairs to study properties and limits of the body and also to engage with the dynamics of social interactions. We asked students to develop design iterations based on findings and considerations of materials and the human body. Further, we challenged students to work within time constraints. Students had to produce a full-scale artifact. In the end, students formed groups to test their design iterations on their peers. Along the way, we emphasized the documentation of the process, the findings and the thought process through drawings, models, mock-ups, and diagrams. In this vein, we ask how can we activate drawings and models as an interlocutor to stimulate the thoughts and conversations on the sense of responsibilities and values?

Wearable Architecture project

We designed the project as a two-part exercise that spanned the second half of the semester, with pedagogical goals that included the materiality, drawing, diagramming, abstraction, and formulation of design intents. The first part dealt primarily with materiality, asking students to explore several materials. As a start, we provided them with cardboard and asked them to engage it through tearing, peeling and cutting the cardboards in various ways and directions. Then students collected materials, with an emphasis on everyday, discarded objects, and applied the same inquiry on those materials. We asked them to think categories for the interventions on materials, such as the use of mechanical tools or affecting chemical transformations. We asked them to observe and document changes in the properties of the materials, such as changes in rigidity, strength, and pliability, using drawings, diagrams, and photographs. More importantly, we asked them to find words to describe their findings. The intent of these processes was to stimulate the sense of a play with materials. However, the rigor of observation allowed them to develop a sense of control over the play. Further, we directed students to ask questions about the findings or about the results of the play, by way of comparison and contrasts. Therefore, the play with materials became intentional, systematic, and methodical.

The next exercise challenged students to investigate ways of connecting modules of their materials based on the findings from the material play. They might construct this through weaving, using dove-and-tails, or adding connecting pieces. We directed them to be more intentional by exploring rigid and flexible joints. Similar to the first phase, we asked students to always reflect back, document, and observe the findings to instill the notion of directed plays. At the end, we discussed the findings and the evidence. A major question in the discussion was the way students engaged the materials. The discussion categorizes the engagements, both in the material investigations and...
joining of tiles, into three attitudes: working with materials by following the properties of materials, negotiate with materials by dealing with restrictions that the materials posed, and imposing their ideas on the materials. Another question was whether students were able to create a new material through the act of joining

We then shifted gear in which students worked in pairs to observe and document the human body in quantitative and qualitative manners. The former asked them to focus on the formal structure of the body, including the geometry of the body and the organization of these geometric shapes. The understanding of the formal structure served as a framework to measure the body and produce drawings. The qualitative observations asked students to identify various postures and movement of the body through multiple techniques, including gesture drawings and photographs. The series of analytical studies of the postures, gestures, movement and the geometry of the body served as the starting point for generating the ideas for the wearable architecture project. Each student identified a particular feature from their series of drawings and diagrams, expressed through a keyword that reflected the most prominent aspect of the human body. A student saw triangle as the most prominent shape that appeared in various scale on the body, while another student found the prominence of curvaceous lines. A student found that the lines of muscle as the essence. Several students were drawn into collage of the movement of the body, such as a fan-like composition of the movement of the hand or a superimposition of triangular shapes. Students draw these keywords through a series of round-table discussions in which each shared his or her analysis. Often, the choice of keywords emerged from suggestions from other students. Based on the theme, each student translated drawings and diagrams into three-dimensional artifacts, then study models on small mannequins. The refined study models led to a full-scale mock-up. Similarly, these iterations were then discussed in a series of round-table discussions. The common table became a media on which ideas were played out. The brief specified that the wearable piece was not for themselves to wear, but a design for others. In a way, other students acted as a stand-in for the client of the project. This shifted the focus of the refinement of the design ideas from primarily formal concerns into the notions of comfort and personal preferences of users, shifting from the subjectivity of each designer into an area of inter-subjectivity.

The final part of the project challenged students to construct the final deliverable of the wearable architecture using materials and joints from the first part of the project. In these translations of the ideas into the final construction, the earlier discussions on working with, imposing on, and negotiating with materials take on a new significance. The brief called for the construction of the wearable pieces out of modules of materials, stimulating students to establish rules for the construction. This requirement would subject materials to operate in a certain manner and condition the techniques of construction. As the final deliverable took shape, each student had to fit in their construction on their partner. The feedbacks from the user should inform the adjusting of deliverable. In the final presentation, students presented their work in pair, in which the designer explained the thought and the construction processes and model the experience in wearing the artifact.

Section A

In this section, after the cardboard phase, one of the students found her material of choice to be sea glass packs from Target. She was fascinated by the calm color of the pieces and the play in contrast between the varying pieces in their colors and shapes. She started thinking about the different connection and tectonics that she could construct using these pieces and introduced a secondary material of choice to serve as the connection to avoid the use of glue. The aluminum connections offer a lot of variability in form. However, the studio discussions and iterations of the studies led her to realize the issue of sustainability in buying the materials. She also experienced difficulties in formulating the underlying narrative of the idea behind the form and the pieces. These constraints, however, offered her a different trajectory in formulating her design intent. She started thinking about going to the Chattahoochee River and finding trashed bottles of beer, wine, glass in the river and the natural environment. Through this process, she constructed her idea around found pieces in nature. She became much more comfortable
Crafting Values

with the narrative of helping clean the dangerous, sharp pieces thrown in the river. She also noted that each piece offered a message, because it carried a story and history on its own. She found even more variability in color and shape in the pieces she is finding. The intent that emerged then was repurposing glass. However, this design intent also posed another set of challenges. The weather and depth of the water hindered process of going to the river and collecting the glass pieces. Besides, the amount of time that it took to find pieces out in nature was prohibitive. Her solution was asking friends and family members to recycle their bottles to be used in her project of raising awareness around an environmental issue. She reasoned that everyday use of glass bottles that were not recycled was destructive to the environment. The student carried this intent over to the wearable architecture assignment, intending to put these pieces on the human body to raise such awareness. The design process aimed at poetically and symbolically putting these sharp pieces of glass that they have unconsciously left in nature back on their body to remind audience of the consequences. Her solutions in joining the pieces of glass using hot glues around the perimeter of the pieces countered the sharpness of these edges. As a result, when a person wore this wearable architecture, it actually felt very soft against the skin because all the pieces had a layer of hot glue on their edges to avoid sharpness. In formal terms, she intentionally placed the artifact around the neck to grab attentions, by making people pause and asked “what are these sharp pieces doing around one’s neck?”

Another student explored with various cut patterns to study the durability and variability of a range of material. He set up a methodology that was repeated on varieties of materials, including papers and metal sheets of different thicknesses, corrugated plastic, plastic with paper underlays, tiles, glass, leather, fabric, producing more than fifty cut patterns and materials. He experimented with a series of horizontal, diagonal cut pattern with various dimensions and spacing in the cut pattern grid. This intentional engagement allowed him to discover the limitations and offerings of each material, leading him to select corrugated plastic as the material to introduce to his “Wearable Architecture” project. To construct the artifact, he had a series of cut patterns on different pieces, which he stitched together to create a garment that would cover the top half of the body. He wanted the material to take shape around the body just as a piece of clothing would. His argument was that only by applying the material around the neck, arm, spine, and chest that he could really test how the material and cut patterns would allow to accommodate the body and adjust to the necessary comfort levels. He discovered that each cut pattern offered a different level of bendability and stretchability on corrugated plastic. The construction phase led him to specifically place the more flexible cut patterns on the joints to allow for bending of the arm, neck and accommodate for human comfort levels.

Another student explored hexagonal and triangular modules, through the use of fold and cut. His discovery was that those geometries were more rigid than squares or rectangles because of less shear stress. By etching each hexagon into six radians, the module could bent in two directions. He also figured out a possibility to construct a fluid system by introducing a secondary structure, such as ribs, veins, or wire going through each module, allowing for bendability and flexibility of the whole. He chose to use corrugated plastic because of its material properties, including its lightness and transparency that allowed variations in the filtrations of lights. Also, the different planes created by this method of etching-corrugated plastic, once the construction expanded, allows for light refractions through the artifact. The student brought over these findings to the wearable architecture project, setting up a dialogue between the tectonic system and the charge to be responsive to the human body and its comfort level. One of the challenges was the rigidity and stability
of the iterations, as while the model seated, the artifact appeared set and rigid, yet when the wearer stood up and walked, the construction moved and swayed freely like a cloak. One of the challenges was that the hexagon, while efficient and effective, did not allow for the creation of a rounded surface. His solution was by creating a sub-module, which he called “the soccer ball,” adding pentagons, which when fit together allow for a dome-like structure. He translated this findings the construct the hood for the wearable piece. With the new pentagons affixed to the structure, the hood was able to better conform to the shape of the human head. The deliverable was flexible, yet very strong. The intent of the student’s project was to create a helmet-like structure that protected the head, much like the human skull. He also added a string of LEDs that light up the spine of the wearer to accentuate the anatomy of the human body.

Fig. 4. Wesley Shaw (Photo: Demirchelie)

Section B:

The process revealed the way in which students learned about materiality, joins and the human body. In the first part of the project, some students tried to impose their formal ideas on the materials. Another group of students quickly preferred to follow the materials, while others tried to navigate between their ideas and the limitations of materials. These ways to identify with materials appeared to have informed the subsequent progress of the project. In one example, a student had a very strong idea to articulate the muscle as the generative idea for the project. In his material study, he explored flexible and pliable materials. Thus, in developing his design, he single-mindedly chose duct-tape as his materials and weaving as his preferred connecting techniques, intentionally ignoring other findings from previous studies. However, as his design took shape, he realized that the weight of the pieces caused his design to deform. He then realized that his other techniques of incorporating other materials from the previous experiments would strengthen his construction. This move required him to adjust the design. Another finding during the process was the comfort of the user, which required minor adjustments in shaping and sizing of the modules of duct-tape. In another example, a student intended to construct his wearable architecture out of cardboard, aluminum cans, and nylon fabric to form a series of triangular modules over the body. In this example, he let the way he constructed the artifact to inform the process, much in a trial-an-error way. Instead of imposing his ideas, he thought through his hands. The findings through the making of the artifact guided him in deciding the dimensions of his design as well as adjusting the artifact to the comfort of the user. Another student worked with discarded drinking straws and she found that these straws could be manipulated into geometric modules of various sizes. She also figures out that the artifacts that she constructed out of these straws could generate interesting phenomenon as they interacted with lights in the patterns of lights and shadows, the patterns of the modules, and in the way the artifact filtered lights.
Another student got interested in the idea of wrapping a body with a poncho. His materials of choice were cardboard and drinking cups. The challenge that he set for himself was to create a new material combining these two, which would be strong but also flexible. In the end, his deliverable did not perform as expected, as the poncho proved to be too rigid for the wearer to move. He figured out that his time management did not allow him to refine the construction of the new material. However, he realized that these shortcomings were his biggest learning from the project. A student was fascinated with discarded things from the kitchen and she determined to elevate these materials. She settled on working with keurig cups and fabrics. The challenge that she encountered was on constructing panel made out of these cups. She had to find a way to create rigid connection to construct the panels and flexible joins to connect the panels. Her engagement of the hands with materials and joins informed the trajectory. However, her final deliverable generated the questions on the working mechanism that she did not realized throughout the process. One student was pre-occupied in constructing perfect pieces for his artifacts. In the end of the project, he could not delivered a finished piece of wearable architecture. In a way, his obsession with the qualities of craftsmanship proved to get in the way in accomplishing the task.

The notion of negotiating with materials and techniques was carried over into the way students developed their wearable architecture. The pairing of students was a set up to allow students to apply this notion of negotiation in the social setting, as they were expected to communicate with their partner. This set up intended to condition students to develop a work plan with their partner, developing common expectations as well as working out a strategy that both could agree upon. An interesting observation was that a student who tended to impose the formal ideas also preferred not to work with other people, asking for permission to work alone. As the project progressed, it seemed that the dynamics of the class was also growing. Students then tended to work in conversations with other students, in which they asked feedback from their peer as they work on their desk. However, these exchanges happened in a certain patterns, in which each student tended to have interactions with a preferred student or a couple of students. An overall interaction that involved the whole class only happened under the instructor’s directions.

**On Making Things**

In his meditation of the making of things, Richard Sennett began by referring to the argument that his teacher, Hannah Arendt, made between *animal laboran* and *homo faber*; the former only acts mechanically much in a way of beasts of burden, while
the later is a thinking subject. More specifically, Arrendt argued that *animal laboran* was pre-occupied with the question of "how," while *homo faber* entered the realm of judgment and asked the question of "why." Through his book, Sennett argues against his teacher, proposing instead that making artifacts was one of the ways to develop human consciousness. For Sennett, engaging the process of making things is a form of thinking through the engagement with the qualities of things, which hinted at considerations of techniques in producing such things. By learning how to produce artifacts of high quality, in Sennett’s view, humans could arrive at an understanding of broad categories of “good.” He pointed out that humans possessed a basic impulse to “do well.” Indeed, reflections on the role of techniques of production suggested a constant dialogue between the head and the hands, between making and thinking. Sennett laid out his argument, beginning with skills as a form of knowledge that emerged out of bodily practice; thus, a form of knowledge through haptic engagement. This bodily practice then informed technical understanding, which expanded through humans used of language. Language allowed humans to become imaginative. Skills, technical knowledge, and the use of language, in the end, depended on motivations. In this vein, Sennett referred to Georg Simmel’s argument on art of self-displacement and estrangement, in which strangers had to continuously adapt with the new society that they entered in. Drawing from this view, Sennett suggested that technical skills could develop meaningfully in a condition in which one was forced to deal with unfamiliar conditions. At the heart of his argument, Sennett essentially suggested that learning and reflecting on making of things was a technique of experience. He argued that high quality of experience happened most often when one regarded consequences as part of the actions. This concrete experience of enjoying high quality and artifacts producing in a correct manner has a social implication. This basic impulse of “doing well” then could inform the way humans interact with others. As Thomas Jefferson has put it, “learning to work well is the foundation of citizenship (290).”

Engagement with making of artifacts relates to the care about materials. Sennett suggested that humans would be interested in materials if they could impact changes on the materials in which these alterations would be visible and had meanings. Alterations of materials could emerge out the way humans went about connecting different pieces or varieties of materials. Lessons learned from these processes then could be applied and expanded at different scales and on different contexts. In applying techniques, humans tended to emphasize the marks of their presence as a sign of doing and executing the procedure well. Historically, the importance of details came out of the concerns of leaving marks of doing things well. History of the built-environment also suggested that humans tended to associate qualities of artifacts and qualities of craftsmanship with proper virtues in the social arena. The notion of truth to materials was an example of this tendency. Engagement with materials also meant that humans learned how to deal with unexpected circumstances that materials presented. In other words, humans learned to deal with resistance that the process of making exposed, which would be an integral part in the development of skills. Sennett identified several ways in which humans address, including by reformattting the problems, working with patience, and identifying with resistance. Referring to John Dewey, the moral of dealing with resistance, according to Sennett, was in learning one’s limitations and in understanding resistance rather than aggressively counter it.

Sennett’s reflections on craftsmanship as a form of knowledge generated by the body echoed Donald Schon’s study on human cognition. In his book “The Reflective Practitioner,” Schon explored the formation of knowledge in spontaneous activities, which he called as the knowledge of reflection-in-action. He categorized this form of knowledge as knowing-in-action, in which knowledge was embedded in the actions, such as in sorts or in making of traditional artifacts. Another category was reflecting-in-action, in which a subject had to invent language to describe the activities. The last category was reflecting-in-practice, in which repetitions of task involved multiple corrections to achieve better results. Essentially, Schon argued that technical skills was not simply a form of applications of basic knowledge as a means to achieve the goals, but more importantly was a form of knowledge in itself. In this line of thought, several factors had to exist as a constant to allow for the formation of knowledge from actions. The first was the media, that is, language and repertoire that practitioners used to describe reality and conduct experiments. Knowledge would develop over the capabilities to manipulate the media. In the context of architectural design, media included drawings, diagrams, and models. The second factor was the constant system of appreciation to frame the problem, evaluate the process, and reflect on the actions. The third factor was the overarching theories to make sense of the actions. These theories did not provide rule to execute the task, instead, they offered language to describe problems and actions. The last factor was the frame within which subjects set their task and through which they bound their institutional settings.
Discussions and Concluding Remarks

In this project, we attempted to bring together multiple requirements for educating beginning students as well as opening up the conversations on issues that affected design in general. Besides issues inherent in the design process and thinking, it also attempted to stimulate the conversations on impacts of a design. The intent of the design brief, wearable architecture, was a choice to introduce the notion of the client to the beginning students, bringing that idea into a concrete presence rather than an abstract, imaginary condition. The set up required students to work with other people on their artifact, facilitating this intent. Hence, it aimed to stimulate the awareness to and mindfulness of impacts of a design on other human beings. Also, the decision to start the project with material investigations with an emphasis on everyday, discarded materials also aimed at stimulating the conversations on the ways design processes related to wider issue, hence, raising awareness to them.

Reflecting on Richard Sennett’s meditations on craftsmanship, one notion that stood up from his writing was the word “negotiate.” We found throughout the project that this word resonated on many levels. To begin with, the brief of the project was a general theme for all of the sections in our first year studio. However, as the documentation of the process illustrated, each section came up with different methods in formulating the way the project would unfold. An example was that some sections would be more overt in bringing in contemporary issues such as sustainability, while others would be less overt in discussing and integrating such issues in the trajectory of the design process. This condition reflected the negotiation that each instructor conducted throughout the process. In these negotiations, each of us was confronted by challenges and opportunities that each student as well as the dynamics of the group presented to us. The different teaching methodologies, despite the same pedagogical goals, and the adjustment that we made, reflected the negotiations in our part.

The documentations of the pedagogical process revealed several themes. In both sections, the documentation illustrated varieties of experiences of students’ engagements with materials. One of the thoughts that Sennett argued in his book was the notion of engaged materials consciousness, in which humans tended to be invested in things that changed as a result of their acts. It appeared that this type of engagement sustained the trajectory of this project. Students became aware of the nature of their materials as well as mindful and conscious of the impacts and affects of their interventions or alterations. The process demonstrated the way students navigated their way around the requirements, reconsidering their ideas, dealing with materials, and constructing the joins. Some of the examples exemplified the process of the transposition of a technique from one material onto other materials. Ultimately, the wearable architecture had to fit to the body. In this context, the construction of the artifact became a series of conversations involving the materials, the joins, and the shapes and the movements of the body. Each student had to continually adjust their ideas, in terms of overall shapes, shapes and scales of the modules, and the construction techniques. Failures became very important lessons to learn. Joins that they created for small module might not work as they were scaled up. More importantly, flexible and rigid joins might break apart as they were applied to real movements of the body. In another situations, these joins might hinder movements. The scale, shapes, and joins might also prove uncomfortable for the user, although the design for the wearable piece appeared perfect. Some students had to reformat their ideas, while the other reformat the construction process. Besides the formal and tectonic aspects, students also realized the important of time management, as the process turned to be longer than they expected. This reflection-in-action allowed for the emergence of the design intelligence. In relation to materiality, students discovered the limits, which going back to Sennett’s thought reflected the presence of resistance in making things. Experiences documented in this observation reflected the skills that one developed to deal with resistance. Sennett argued for finding the path with the least resistance for that purposes.

These skills that students developed in working out with materials, connections, and their limits appeared to be played out in the process of designing and constructing the actual wearable artifact. The notion of the negotiations, hence conversations, with those factors also happened in the social realm. The process of negotiations, with the partner in the observations process, in the design development, and, crucially, in fitting out the artifacts on each other body continued the development of this skills. This stage of illustrated the importance of words and language that articulated the emerging consciousness of the cognitive process. At the end of the semester, we staged a show of students work, which brought the awareness and consciousness that a design always operated in a social setting. The shortcoming that we realized after the end of the project was that we did not set aside a specific format for student to reflect and draw conclusions on the less tangible learning process of the project, that is, formulating the awareness to others and to the environments. In the end, we aimed at opening up the ethical dimension of a design process through small steps, by embed-
Setiawan, Demirchelie

ding that in process of making things, hence making that integral in the cognitive process of the design.

Notes


3 ibid., p. 290.

4 ibid., p. 119-146.

5 ibid., p. 214-227.


7 ibid., p. 270-90.
Diagramming History

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Introduction

In our institution, courses in history of architecture are a sequence that spans from the design foundation into the professional program, organized into four courses in a chronological manner. The beginning design phase includes courses that cover the history of architecture from the ancient to the neoclassical era as well as global architecture. Basically, the courses emphasize introductions to monuments with heavy emphasis on the formal properties of monuments produced in each period in architectural history. These monuments also stand as examples of formal solutions to a given set of issues that emerged from cultural context. The structure of the courses includes reading assignments and discussions of examples of built-structures, giving examples of historical architecture and a degree of theoretical explanations. Within this set up, the author expands the inquiry in history of architecture. Instead of approaching architecture and its history as a set of formal problems that is self-referential or driven by personality, the author asked the question of how to explore architecture as an emergence of consciousness toward environmental and social constraints, limitations, and opportunities. The instructor frames the delivery of the courses around the notion that the subject matter of architecture fell within five categories: spatial, formal, programmatic, tectonic, and performance. The first concerns with the definition and organization of spaces, including the ordering of spaces. The formal aspect refers to the formal structure, including geometry, formal orders, and formal typology and morphology. The third aspect relates to the organization of activities inside a structure, including functions and its typology. The tectonic aspect indicates materials and construction techniques, including details and articulations of properties of materials, such as colors and textures. The performative aspect covers the quantitative and qualitative performances of a building. The former relates to measurable performances, such as thermal comfort, while the latter relates experiential qualities, such as light and shadow phenomena.

The courses relate these factors to human needs, natural resources, climatic conditions, and shared social values. Human needs would inform programmatic settings and responses, from simplest forms of dwellings to large settlements. Natural resources would inform varieties of building materials used throughout history. Places with plenty of muds led to the emergence of adobe structure that eventually led to the emergence of bricks architecture. In other geographic locations with forest, which provided an abundance of timber, wooden buildings would be predominant. Stone structures occurred in places with rocky hills and mountain. The availability of materials for building construction would inform the techniques of construction that group of people developed, such as wall-based structures or post-and-lintel constructions. The climatic conditions would inform responses in developing building systems. Historically, passive systems in controlling comfort in the built-environment emerged out of responses over time to the climatic conditions. Building forms could also be a form of responses to the climatic and environmental conditions, such as in the shapes of roof. Shared social and communal values would manifest themselves in the emergence of art and architecture, in which buildings became refined and articulated to articulate these shared values. These acts embedded man-made structure with symbolic values, be that religious or political values.

Literature Review

The writings of Sibyl Moholy-Nagy offered the initial thoughts in the history course. Moholy-Nagy argued that the history of architecture was basically a history of the relationship between human and the natural environment. Essentially, she argued that architecture was about creations and definition of space for habitation that responded to distinctive conditions of sites, climates, and purposes. Thus, this was the idea of shelter as the prime reason for architecture. She saw the evolution of human civilizations began with the primordial intuition of humans to find protections for them, their offspring and their fire. In this
vein, she emphasized the transitions from hunter-gatherer into agrarian stages as the emergence of humans as builders. These transitions led humans to the second stage, which was the emergence of humans’ ability to construct cultivated environments. In particular, this emergence of this ability indicated humans’ faculties to turn limitations and constraints into opportunities. The notion of the cultivated environment reflected efforts of humans to intentionally separate human environments from the natural environment. Further, these acts also reflected distinctions between the mundane from the sacred. These intentionally gave meanings to the human environments. These emerging powers eventually led to the development and evolutions of technology. In this context, she emphasized the values of everyday, vernacular buildings in the emergence of local knowledge to achieve adequate and appropriate responses to specific conditions of a place. She noted that the emergence of architecture was informed by diversities of form and function, economy of resources and upkeep, and durability of materials and spiritual symbols.

Latter, Moholy-Nagy elaborated her arguments by discussing evidence and examples following several categories.\(^5\) She began by articulating that history of architecture exemplified expressions of sites and climates. She pointed out that humans selected sites for their settlements and buildings in relationship to the geographic make-up and natural characteristics. In this selection, humans tended to prefer sites with desirable features for their modes of habitation. The geographic make-up informed the climatic conditions. She stressed that humans produced diversities of solutions that were appropriate to particular sites and climatic conditions, noting that the basic problems and laws of nature would always be constant. Features such as varieties of fenestration and overhangs were examples of diversities of responses to similar problems. She then pointed to varieties of expressions of forms and functions. She argued that forms mediated properties of materials, such as their strengths and weaknesses, and the interior spaces. Throughout history of architecture and civilizations, varieties of groups of people in different places created different forms of spaces out of different materials. The last factor in her arguments was the expressions of materials and skills to construct the spatial enclosure. She noted that the selections of materials and techniques came under the influences of the adequacy of tooling and joining and the passage of time. The former hinted at the evolution of human technology, while the latter hinted at arts and craftsmanship.

Moholy-Nagy emphasized the utmost values in studying the everyday and vernacular, which she termed as the anonymous buildings. She argued that anonymous architecture offered us “beautiful examples of the successful relationship between settler culture and settler architecture: providing enclosed space . . . that correspond precisely to unique, never quite duplicated conditions of site, climate and specific purposes.”\(^3\) She argued that humans’ responses in the form of the design of the built-environment were never the same, although basic problems in constructing them would be similar. This argument highlights the role of architecture as form of knowledge that relates to specific temporal and spatial contexts. In this line of thought, Stanford Anderson proposed to frame architecture as a carrier of collective knowledge and memories, in which he categorized that knowledge as “memory through architecture” and “memory in architecture.”\(^4\) The former meant architecture as a carrier of collective memories that were formalized as a form of knowledge. Examples of this form of knowledge were traditional architecture, which consisted of varieties of ways of designing the built-environment at various scales. It also included traditional knowledge in building constructions. The latter referred to academic architecture, in which architecture emerged as a discipline, with its institutions, professions, and education system. In this form, knowledge in design have been codified and formalized. The education of an architect went through specific forms of pedagogy. Meanwhile, the profession established sets of conducts and regulations that govern architectural practice. In other words, the discipline established a set of canon that governed and regulated the practice and the pedagogy. In this mode, the discipline designated certain buildings as exemplars of the canons of the discipline. Thus, in terms of “memory through architecture,” structures embodied societal memory; while in terms of “memory in architecture,” structures carried disciplinary memories. Further, Anderson sharpened his argument, proposing that any design work in architecture could carry both social and disciplinary memory.\(^5\) He stated that “vernacular architecture in its purest sense, in the hands of un-self-conscious builders in indigenous cultures, may represent the fullest identification of social and disciplinary memory. . . . I have pointed to the maintenance of memory in a range of “vernacular usages” that I find exemplary — even into highly abstract modernism.”\(^6\)

In this line of thought, he argued that architecture always possessed “quasi-autonomous” attributes, in which certain formal and tectonic forms, such as post-and-lintel or courtyard type, developed independently in different places, time, and cultures. In addition, the formal, spatial, and tectonic forms and order also performed different symbolism and purposes. Hence, this
“quasi-autonomous” state indicated that architecture emerged not deterministically from social factors. 

Design and deliveries of the courses

These perspectives frame courses in survey of history of architecture. Although the syllabi still followed common ways of categorizing history into major periods based on stylistic and temporal stratifications, the discussions and presentations of materials of each topic in the class shifted away from discussions of major monuments and their formal and stylistic features. Instead, the courses focused on typical buildings and structures from each historical period. These structures served as examples, which were dissected and analyzed in terms of their formal, spatial, tectonic, performative and programmatic properties. Structures from each period served as a type that represented the way a society that inhabit a certain place in a certain period of time responded to constraints, limitations, and opportunities that the environment imposed as well as to cultural forces.

As an introduction to each topic, the courses presented the geographic locations and features of the area where it took place. This started from the very macro scale of satellite images then zooming in to aerial view before getting into views of the local environments from the human eyes’ perspective. The geographic make-up provided an introduction to features of the land, including local climatic conditions and possible materials for building constructions. However, this approach also avoided framing of history of architecture as a function of environmental determinism. Hence, the course also discussed social and cultural developments that occurred, focusing on social structures and religious beliefs that accompanied such developments. Together, the environmental contexts and socio-cultural traits formed the background for discussing examples of building as type from each historical period.

Thus, in the earliest course in the sequence, the buildings from the Mesopotamian period were discussed in relationships to the emergence, development, and sophistication of brick-masonry buildings, as well as in relationship to the evolutions of agrarian societies. Pyramids and temples from Egyptian period were presented as types of that period, with their relationships to the stone building technology, local environment, and the social structures of the Ancient Egyptian.

The sessions covering Greek architecture focused on discussing temples and cities, each of which was presented as a type of human constructions of two different scales. Similarly, sessions on Roman architecture emphasized on the building technology, especially the use of concrete, and its impact on building typologies, including types of Roman temples and public buildings. Further, the discussion related building typologies the ideas of republican and imperial societies. The parts that covered the Post-Roman empire in Europe used small churches as a type of masonry buildings. Parallel to these parts, the sessions on Byzantine architecture used large scale Byzantine churches as a type of masonry buildings at a large scale. The dynamics of the way they constructed building were related to the contexts of people, technology, and availability of materials. Similarly, the sessions on Romanesque and Gothic discussed cathedrals and castles as types that embodied engineering feats that related to socio-cultural and historical dynamics as well as to environmental contexts.

Renaissance architecture and the subsequent classical traditions were discussed in similar fashions. Although the social, economic, political, religious factors and the developments of science and knowledge provided a broad context to these parts of the history course, the attentions to the impacts of the environment on structure remained the same. Italian palazzo and ideal churches were not only discussed in terms of formal ideas, but also in relations to local and regional environments. This portion of history of architecture provided an opportunity to further discuss complexities that emerged out of the bigger web of relationships between cultures and historical influences. The discussion of the arcuated structure was an example of a type of construction that evolved in relationships to changes in social and cultural conditions. It also related to the dynamic in the history of technology as well as to interactions between people from different parts of the world. The subsequent development of classical architecture in France and English provided opportunities to discuss the dynamics of the types, as it encountered not only different shades of cultural values, but also local resources and vernacular building practices.

Regarding global architecture, the course covered architecture and urbanism from the Islamic world, the Indian world, the world of China and Japan, and America before the arrival of the Europeans. Sessions on architecture of the Islamic world introduced students to common features found in structures that existed over three continents and almost a thousand years. This part focused on the types of arcuated construction and their relationships to the spatial and formal organizations. The spatial and formal organization came about as a surface appearance of shared values of the Muslim world. Their building technology was discussed in terms of their linkage to previous periods in history, mainly the Romans and the Persians, as well as the ma-
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terials commonly available in those regions. Thus, the formal, spatial, tectonic, performative features reflected the diversity of the Islamic world. The topic on the Indian world followed the same tract. The stone architecture of the sub-continent eventually led to types of spaces of Buddhist architecture and Hindu temples, in which similar techniques and materials evolved in varieties of designs. Further, the extent of the sphere of Indian cultures out of the sub-continent and to Southeast and Far East Asia illustrated the sophistication of stone architecture. The spread of Indian architecture to the greater Indian world exemplified the way the types evolved and adjusted in different environmental and socio-cultural contexts. Sessions on architecture and urbanism of China and Japan focused on the types of timber post-and-lintel structure. The evolution over time, such as in terms of scale and sophistication and formal, spatial and tectonic terms, reflected the dynamics of the social and cultural life over time in the East Asia. Differences of buildings in China and Japan reflected the way similar type evolved within different contexts. Similarly, within each cultural milieu, the appearance of different formal features over time also reflected the cultural dynamics. The topic on architecture in Americas before the arrival of the Europeans discussed stone buildings as a representative type. In particular, the course discussed the way this type emerged and evolved differently from types of stone structures that emerged in the old world. The absence of faulting and dome system exemplified one of the distinctions of history of architecture of this part of the word.

**Students’ performances**

The examinations and quizzes asked questions that geared to stimulate students to draw relationship between the emergence of a particular type in a particular place and specific time to the socio-cultural contexts and environmental context. Following this trait, the final project of the courses asked students to investigate the way natural factors informed the production of space and form in particular place, time and period in the history of architecture. Natural resources informed materials and building construction and location affected building performances. It also asked students to link that inquiry to socio-cultural contexts. Students worked in group, in which each group started by studying on and selecting basic construction systems in architecture, either post-and-lintel or wall systems, including its derivations, such as arcuated and adobe structures. Each group should focus on studying and researching the way structures performed relative to the environment, including in terms of tectonic, materiality, and climatic. Then they had to research and find study cases from different place and different time that represent the type that they focused on. For each example, they had to research and collect information construction methods, building materials, details, and building performance such as light, ventilation, and passive system. They should produce diagrams of construction sequence, diagrams of building performance, material palette, study of comparisons and contrasts though diagrams and written explanations. They also had to relate their research and findings to the social, religious, and cultural contexts of the examples that they studied.

In one case, the students analyzed and compared stones constructions from the Mayan and Mycenaean civilizations. They collected examples of typical constructions from each civilization. From these examples, they built digital models to recon-
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They also noted the fact that corbel vault remained the method that existed in Central America for a long time, while, on the other hand, this vaulting system spread in the Mediterranean region and eventually was replaced by true-arch systems. By reconstructing the structure, they also attempted to investigate the building performances. One of the aspects that they tried to speculate was the natural light for the interior space in both structures. Obviously, photographs of the interior space for both edifices were available. However, by modeling the structure, they became aware of the relationship between design elements, such as the dimensions, scales and orientations of the openings to the lighting conditions in the interior space. They also attempted to connect the design of these openings to the circulations of air inside the interior space.

Another group of students researched and analyzed post-and-lintel constructions that were used in the Roman world and in China. The intent for this group sprang from the interest in the different materials that each of the civilization used, concrete and marbles for the Romans and timber for the Chinese. They were also interested in the different scales of examples from each civilization. Thus, the group selected a typical, small-scale Roman temple and multi-story Chinese pagoda to be analyzed. They first compared and contrasted the methods of construction from each example. Through examples of drawings that they collected, they realized that the Romans constructed their stone columns out of assembly of smaller modules. Through digital modeling, they explored this method of construction. This model allowed them to visualize the method for connecting the drums, in which the Romans used square pegs as a connector. By diagramming the construction the three-dimensional fashion, they could visualize the geometry of the construction elements that allowed for the drums to stay on their place. As a comparison, the findings from the research for Chinese pagoda gave them an understanding of the timber construction made out of multiple small elements that worked together as a system. They became fascinated with the connection mechanism for these wooden pieces in which the Chinese did not use any nails. They then diagrammed to basic principles of the distribution of weight in wooden structural system. The diagram, the findings of the loose joints that allowed the structures to wiggle, and the findings on the overall behavior of the structure, that is the “snake” structure, allowed them to grasp the picture on the way the timber structure developed within the context of the geographic location. They were able to grasp better the notion that the Chinese developed and evolved a system that would work in a region with earthquake. These findings helped them to visualize the mobility and flexibility of the structures in China. The diagrams of the section cuts of a typical Roman temple and a typical Chinese pagoda allowed them to grasp different formal features. On the one hand, the Roman temple featured straight lines while the Chinese presented curvilinear lines. They noted the similarity of Chinese columns and bracketing system to trunks and branches of a tree. These features helped them to visualize the contextualization of similar basic construction system. They also noted the material aspects of the examples through comparing the textures of materials. While the Chinese used timber, the Romans used concrete for the wall and marbles for the columns. They noted the features of the veneered walls and marble column in the historical relationship between the Romans and the Greeks.
Another group of students also took on a similar topic, comparing wooden timber from China with Greek temples, with examples of a large hall from China and a large-scale Doric temple. They were interested in the same similar feature in plans of both examples, such as in the use of long, rectangular shape and the row of columns on the perimeter of the halls. They were also interested in the different shapes of the roofs. The digital models that the generated allow them to visualize the different methods of constructing the columns, one is made out of modules of drums, and the other from a monolithic piece. These models led them to compare the materials, in which they compared the textures and colors. The digital models allowed them to also speculate on the environmental factors, such as the natural light and the flow of air. Simple features in the software allowed students to visualize different light conditions by modeling the sun path.

The study of drawings also led them to the reasons for the preference for heavy roofs that would help to hold the building down while it oscillate during an earthquake. The bracketing system worked in conjunction with other elements. Underlying the development of this structural system was the availability of cypress. Another feature of Japanese structure that the students identified were features that were informed by heavy precipitation in Japan. Besides the heavy roof, structures also featured the presence of extended roof edges. This feature would prevent water from entering the interior space and protect the wall from direct exposure to water. The roofs were covered with tiles made out of clay. The materials provided relatively lightweight and waterproof covering for the roof. Another feature related to the precipitation was the elevated floor.

A group of students (Trinidad, Malik, Oliveira) studied Japanese and Greek buildings. They started by identifying features that characterized the natural environment in Japan, in which they identified the frequent earthquakes, the presence of monsoon and snow, the hot and cold seasons, and abundance of cypress. They then identified features that often appeared in Japanese structures, including shinbashira, tokyo or the Japanese bracketing system, the point foundation, elevated floors, and heavy roof with wide overhangs. The research on the sections and details of buildings allowed them to visualize the behavior of a structure. Through studying the section drawing of typical Japanese structure, they were able to visualize the emergence of several distinctive features as indigenous responses to challenges in the environment. Thus, they were able to grasp the mechanism of a particular foundation system as a response to the way of connecting a structure to the earth in a place that was prone to earthquake. They were also able to relate the emergence of the shinbashira as a response to the similar problem of earthquake in Japan. This method allowed a structure to oscillate, thus working with the lateral forces during an earthquake.

As a comparison, they studied Greek architecture. They identified some basic features of the environment in Greece, including hot and windy climate with direct sunlight, chances of earthquake, and the abundance of marbles. They studied diagrams of vernacular buildings from the region, which allowed them to visualize several strategies for passive cooling that
emerged over time in the region. They identified the emergence of courtyard house as the basic type of dwellings in the region. They also noted the openings in these buildings and the orientation and positioning of those openings. The courtyard facilitated the circulation of air through the courtyard and the openings. They also noted the form of the roof of the region based on the sloped roofs. In terms of earthquake, they noted the drum system also contributed to the response to make structures relatively flexible. Comparing and contrasting similar basic system, students were able to draw conclusions. These conclusions included the achievement of durable and relatively flexible structures, albeit the use of different materials. In terms of responding to the elements, they noted responses in terms of materials. The Japanese used clay tiles as well as cypress wood, both of which were water resistant. Stone masonry was a technique and features that emerged and evolved in Greece, in part were informed by the elements. The elevated floor and the overhang roof were also features that were informed by the elements.

**Discussions and Concluding Remarks**

The courses intended to expand the current format of our history courses, by adding layers of the filters of investigations of great architecture from the past. In particular, in the context of beginning design, this form of approach emphasized the intentionality of each design. Each society, in different places and different time, produced forms of architecture as intentional acts. These intentions emerged out of the awareness of the social, historical, cultural, and environmental settings. Further, these intentionality were a manifestation of negotiations that a group of people conducted with limitations and possibilities, constraints and opportunities that those settings posed.

The results at the end of the semesters illustrated the ways students comprehend the way in which buildings from the pasts emerged out of intentional acts. Especially in the project for the semester, the engagement with drawings and literature research allowed students to grasp the formation of design intents. Through the diagramming of the examples, especially through the process constructing digital models of those types, students became aware of the relationship of these intentionality to the web of forces and factors from the contexts. In a way, this assignment brings into the course the ability for visualization, through the reading of drawings and diagrams as well as through the productions of those forms of visual means and models. The construction of the model also offered students with opportunities to experiment with simulations of the environmental conditions. Indeed, one of the intentions of this set up was to relate the discussions of architectural exemplars from different temporal and spatial settings to other core courses in our institution. These core courses included courses in design communication, structure, and environmental technology. At the micro level, in the context of our pedagogical framework, this mode of delivering course in history aimed at opening up the awareness that design is an interconnected activity. Each factors was not exclusive and separate, but worked together in formulating and developing design intents. However, the assignment also demonstrated some shortcoming. Students easily got fascinated by the investigations in formal, spatial, tectonic and performative diagrams. The part in which they supposed to relate to the social, cultural, and historical setting often proved the weakest part. Hence, it could easily slide into environmental determinism, or even technical determinism. Hence, the aspect of critical thinking in part of beginning students still needed to be cultivated further.

On the other hand, the awareness that emerged out of the efforts to simulate the performances of and circumstances around examples helped to highlight the awareness of diversities in architecture. These diversities manifest themselves through evidence of varieties of formal, spatial, tectonic and performative responses throughout the history of architecture in particular and the history of human civilizations in general. These exposure became a close experience for students. In the end, the intent of the mode of the course was to open up the awareness of the formation of design intents as a functions of the awareness of and the consciousness to the settings and the resulting diversity. It is this notion of dialogue and negotiations with the environments, both manmade and natural, that could be helpful for the beginning students.
Notes


3 ibid., p 55.


6 ibid., p 21.

7 ibid., p 21.
Critical Optimism: Pedagogical Framework for Innovation

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Introduction

In beginning architectural design pedagogy we are situated between two predominant forces: fostering innovation and instilling foundations. Foundations are frequently associated with tradition and skills, while creativity is often thought of as novelty for novelty’s sake whether it is of experience, form, or program. Two predominant questions come to bear on instructors of beginning design students. How does one teach skills and concepts without being too prescriptive? And how does one teach students to be innovative and creative without becoming unhinged from traditions? In this paper I propose a pedagogical framework through which instructors can frame curricula, assignments and discussion. And students can pursue innovation in a meaningful way. This framework hinges on a concept entitled critical optimism, a binomial relationship. This paper explores multiple definitions of the terms ‘critical’ and ‘optimism’ and proposes a framework through which to reconcile the seeming tension between these two concepts. Critical optimism becomes an alternate way for architectural pedagogy to manifest and support a framework through which students can be instructed towards meaningful innovation.

Present Pedagogical Frameworks

When surveying the landscape of existing beginning design pedagogies, one finds two distinct approaches to beginning design education. There are pedagogies that privilege development of skills. The others privilege creativity. Those that focus on the development and installment of skills through beginning design pedagogies focus their curricula on ideas of architectural elements, organization of form and space, and craft of production. We find the root of these approaches in the two schools of thought that have dominated architectural education for the past hundred and fifty years: the Beaux-Arts and the Bauhaus. Though these two schools have often been thought of as marking the ends of the pedagogical spectrum of architectural education we now find them closely related. Architectural education must now be understood not as a spectrum marked with two ends and consisting of a single axis, but as a complex field with multiple axes.

Though Beaux-Arts and Bauhaus have their differences they are both bound deeply to traditions. They have strictures in their histories and accumulated discourses. They have “languages” based on elements, signs, and syntaxes that prescribe how they are to be deployed in a proper way. In curriculums influenced by the Beaux-Arts tradition one finds exercises derived from the practices of the Analytique in which a student begins with an Esquisse (a sketch) and develop a project through the study of proportions, the classical orders and architectural elements with the use of the orthographic projection. In those curriculums influenced by the Bauhaus movement—passing through John Hejduk—one finds the kit of parts problem, pejoratively called “spots and dots” design problems. In such projects students are given a kit of parts (a limited number of pieces) and a finite field in which to deploy them with the intent of defining, organizing, and shaping spaces. There are rules that define how a student is to fulfill the exercise. The projects are largely carried out through models and are documented graphically using all three architectural projections. Both schools of thought gain cultural significance through their histories and the manifestation of their processes and elements in the world.

On the other hand, when one surveys the existing pedagogies focused on fostering innovation or creativity; one finds a spectrum defined by the means of production: algorithmic and material experimentation. This spectrum is defined by continuous experimentation and can devolve into unintentional, self-referential, autonomous form making. On the material end of the spectrum one finds morphological studies rooted in a material’s properties and conditional contingencies. Such studies find their roots in such work as Richard Smithson’s land art. On the other end of the spectrum, in the algorithmic realm, we find the
actualization of data as form. An example of such a process would be capturing data from one source (e.g. sound recording, traffic levels, etc.) and running the data through an algorithm that assigns spatial coordinates for each data point and then produces surfaces or meshes between the points that can be manifested via a 3D printer or CNC router. Though the work on this spectrum pushes creativity and innovation and allows for the production of seductive forms that stretch the possibilities of architectural form. Reiser and Umemoto highlight the dangers of this condition when they state “…the risk is that the seduction of these tools creates an illusion of rigor, which obscures the role of active critical assessment.”\textsuperscript{11} It becomes overly autonomous and removed from meaningful cultural and spatial engagement. The autonomy of this form making often finds its way back into architectural production as facades and screens. This contribution, though it may be quasi-performative—reacting to sun path, view, etc.—are often dismissed as ornamentation having only aesthetic affect on the architecture with which they are associated.

The architectural pedagogies that have developed over the past hundred and fifty years form a field with each axis marked by one of the four pedagogies described above: the Beaux-Arts and the Bauhaus defining one and material and algorithmic exploration defining the other. The proposed pedagogical framework of Critical Optimism is not a refutation of these pedagogical approaches per se, rather it is an attempt to develop a framework through which to leverage aspects of these frameworks by making explicit the bilateral relation between innovation and history—innovation is a historical necessity and innovation is rooted in history.

Definitions

To understand the potential of this approach to pedagogy an examination of the definitions of the words critical and optimism is required. In the initial query, two common connotations of the words seemingly put them in opposition. The word critical in its common and general usage becomes associated with negative or harsh statements. On the other hand, optimism is wrongly taken as a form of naivety or viewing the world through rose-tinted glasses. However both of these words have more specific and nuanced definitions. The word critical has two primary definitions: one of judgment and one of importance. Optimism is also characterized by two meanings, one of understanding and one of outlook. These definitions allow us to look beyond the initial understanding and use of them instead, to comprehend and explore the productive capacity of their coupling.

Critical

The word critical has become associated with many definitions of judgment—from the subjective to the objective, the most intuitive to the most rational, and from the most reactionary to the most considered. Critical can be reduced to general judgment, subjective or otherwise. However, for this discussion I am choosing to utilize a more specific definition: critical judgment. Critical Judgment is judging something based on its own merits or worth. It is not a subjective judgment based on the likes or taste of the one judging. Rather, critical judgment evaluates internal coherence of a logic or system upon which the subject being judged is based. Using critical judgment precludes a need to take a side. One can judge an idea on whether or not it makes sense based on inherent logical consistency. An example related to architectural education is when a beginning design student asks if a model is good or bad—a question I have heard from students of all levels. One could subjectively judge this based on personal preference and the appearance of the model and choose one or the other. Critical judgment releases the confines of this dichotomy towards a broader query of design intent. Critical judgment would switch the criteria from one of good or bad towards engagement in understanding the logics of the model, the design intent of the student, the organization scheme, etc. to develop criteria upon which to judge the efficacy of the model.

The second definition of critical that is important to developing this pedagogical framework is one in which the word functions as a descriptor of something that is of necessary importance. This can be understood in its adverbial sense in such phrases as “critically important” or in its adjective form such as a “critical moment.” Both forms carry with them a sense of resoluteness and of consequence. In this sense one can understand critical as having the power or the quality to decide or influence future events. This power is derived from the necessity of the entity, whether it is a moment in time, a point in a process, or a part in a system affecting the gravity or magnitude of subsequent consequences. For instance, a critical moment in time, or stage in a process, is a moment that necessarily must come to pass. In its passing, the course and process is decisively and fundamentally fixed. The notion of critical in this definition is not teleological. It does not require an end to which it is heading, but rather must be understood in terms of its relation to the magnitude of its outcomes. Take for example a critical part in a system. It is critical for the mere reason that it has that capacity to complete the system. This part is not critical in that it facilitates the whole system running or not at any given moment. Rather the critical quality is solely about its capacity and not the execution of that
capacity. This distinction is illustrated by understanding this necessary importance as a disposition. For example, “A round ball on an inclined plane possesses disposition, and it need not roll down the hill to retain that capacity. Disposition locates activity not in movement or event, but in relationship or relative position.”

Optimism

The first definition of optimism is that it is a distinct understanding of the world. This understanding is that the world is the best possible world at any given moment. This view tends towards a definition of naivety or wearing “rose-tinted glasses”. As with the general understanding of the word critical, this general understanding and use of the word optimism obscures a much more complex definition. Contrary to this general understanding of the word optimisms claim that the world is the best world at any given moment does not purport that the world is perfect or argue that the world couldn’t be improved. Optimism does not require affinity—one does not need to like the world to believe that it is the best possible world that could have come to be. It is not a utopic understanding of the world that denies all of the imperfections and atrocities that exist. Rather optimism is a positive understanding that given all alternative worlds, it is the best that could have come to be. Likewise, though there is a value judgment in optimism by claiming that the world is the best possible world it is not teleological in the sense that the world is heading toward some ultimate state. One can find such an understanding of the world in Hegel’s Phenomenology of Spirit in which he claims that the world is dialogically evolving towards a single state of Concrete Spirit. Rather this understanding of optimism more closely aligns with Manual De Landa’s articulation of the Neo-Darwinists principle that that evolution has no foresight.

The second definition of optimism is a disposition towards the future in which there is a positive outlook towards outcomes. The previous definition addressed the world as it is found in any given moment. This definition is focused on the future. Remember, in opposition to the general understanding of optimism, this is not rooted in the fulfillment of ones desires. This understanding of optimism is not predicated on the outcome of an event matching a predetermined result. Further it is not the denial of results that deviate from a desired outcome. It is not a belief that only good or positive outcomes will occur. Like the previous definition, it is not an operation to sanitize ones understanding of potential outcomes. Rather, it is an outlook that is willing to accept an outcome whether or not it fulfills ones desired outcome. There is a cascading effect from the process of accepting an outcome. The first is that one becomes empathetic and is able to engage other perspectives. The second effect is that by engaging other perspectives there is an opening up of other possibilities and opportunities. By understanding of others’ perspectives one can comprehend the means to expanding and building on positive outcomes or overcoming those which one does not find positive. The third effect is that it protects one from what Nietzsche termed ressentiment—acting out of ressentiment—which makes aspiration and hope impossible.

Couplings

Though each and every definition of these words could be instructive and productive in an approach to a pedagogical framework, it is not until the definitions are connected to one another through a set of multivalent interactions that they expose their full potential (see diagram). The cross-pollination of these definitions creates four combinations that produce the tenets of this pedagogical framework. The four combinations are: critical judgment and optimistic understanding, critical judgment and optimistic outlook, critical importance and optimistic understanding, and critical importance and optimistic outlook. These combinations work at multiple scales simultaneously (the world in general and a finite condition of an educational exercise) making explicit the connection between the logics and processes of the world and those of architectural education. Through the examination of these combinations we will see how the their interplay produce a pedagogical frame work that not only requires the students to engage, judge and project but does so in a way that the students are required to position themselves at the nexus of tradition and innovation.

![Fig. 1 Diagram of terms and couplings.](image-url)
The first coupling of terms is that of critical judgment and optimistic understanding. By bringing these two terms together one makes explicit that in order to understand the world one is required to engage and judge that world. The position from which one must do this is from a non-cynical position. One must engage it as the best possible world or condition that could be and by doing so not affirm or criticize but rather ascertain the logics and processes that are at work in its production. This combination also requires that one judge the condition based upon these logics—is there a coherence or incoherence to the found condition’s logic. This type of engagement with the world or condition has two primary outcomes that are useful in a pedagogical framework. The first is that a deeper understanding of the world or condition exists, a world in which there are external criteria beyond the subjective through which to make decisions. The second outcome is that the judgment of the world or condition gives the student grounds from which to act. Through the process of understanding and evaluating these criteria, the student is also required to comprehend their relationship to the condition. This requires an oscillation between external assessment and self-assessment further giving a student firmer ground from which to act and a stronger understanding of how to engage the existing world.

The second coupling of terms is that of critical judgment and optimistic outlook. What evolves is an ethos to act upon one’s judgment in an affirming and positive way. This is not content specific, in that it is determining what is right or wrong, but rather it is dispositional. This combination does not determine the agenda for the way in which one moves forward on an exercise or responds to a judgment of the world or situation but rather how one acts—one engages the problem in an attempt to solve it, not to comment on it or undermine it. Stan Allen illustrates this in his discussion of architecture’s role in the human condition in his essay Infrastructural Urbanism. In this essay he cites Robin Evans remark that a building was once “an opportunity to improve the human condition;” now it is conceived as “an opportunity to express the human condition.” vii He states that “architecture...has, in in some fundamental way given up on the possibility of ever intervening in that reality...[and] has surrendered its capacity to imagine, to propose, or to construct alternative realities.” viii This highlights what is lost when we don’t act productively or affirmatively in the desire to improve the human condition. This approach sits in opposition to many other approaches such as: indifference when one acts without engagement or judgment, or when one acts out of cynicism or resentment, and as in this case, when one merely comments on the world. As a tenet of this pedagogical framework the combination of critical judgment, which requires one to deeply engage a condition and draw conclusions from it, and an optimistic outlook, which requires one to accept an outcome and project how to expand or overcome it, requires that a student engage the design process as a means to productively improving the condition at hand and ultimately the human condition.

The third coupling of terms is that of critical importance and optimistic understanding. Through this coupling the importance of the present moment is made explicit. It may sound trite when expressed as “Now is important!” but when one engages the complexity to the present moment and the world one finds him or herself beginning to understand the importance of understanding the logics, processes, and actions that have generated the present condition. Likewise, one comes to understand how complicit in the future world the present moment is. This complexity and gravity are illustrated in Martin Heidegger’s discussion of Dasein’s (a being’s being) historicity. He connects one’s understanding of one’s self as a historical being and the potential for authenticity through one resoluteness in the present moment. ix In order for a person to be authentic one must respond resolutely to the world that is being continually handed down to them. The combination of critical importance and optimistic understanding requires the students engage the present world, condition, assignment, with an understanding of its gravity and the importance and the necessity of the decisions one is making now that will affect the future.

The fourth coupling of terms is that of critical importance and optimistic outlook. By coupleing these terms one is required to define how one wants to act. It is in this combination of terms that one must make value judgments and define in which way one wants to act. Unlike the second coupling, which required one to act in an affirming and engaging way in an attempt to improve the human condition, this coupling requires that one define what it means to improve the human condition based upon the judgment of the first coupling. For example, if through the first coupling a student comes to understand that there are two competing spatial or formal regimes emerging within their project they must begin to explore the relationship between the competing regimes. The relationship may be one that is potentially symbiotic or one that is mutually exclusive. This coupling requires one to define one’s values and intentions and how one intends to deploy these intentions. As such the student needs to make an explicit value judgment based on their evaluation of which option to pursue. Similar to the previous coupleings this coupling functions at multiple scales—world, humanity, subjectivity, architecture, education, exercise, etc. As students begin to define and connect these scales of values they begin to under-
Critical Optimism

stand assignments in a larger context and the significance something as small as an assignment has at a larger scale.

Conclusion

As a pedagogical framework that must serve as an integrated set of philosophical ideas and values to inform and motivate the instructor of beginning design students in designing and facilitating specific learning experiences, I believe that Critical Optimism and its multiple couplings of terms provides a rich grounding for developing a framework for architectural innovation. Through these couplings emerge four prominent themes:

- A curriculum should be designed and implemented to challenge the student to engage the world, condition or assignment to such a degree that they understand the logic and systems that are at work in it and to the degree that they are able to develop a set of criteria by which to judge its internal consistency.

- A curriculum should be designed and implemented to require students to engage the assignment and the world in a direct way so as to effect change. The student cannot remain at arms length as an observer merely commenting on what is found. The curriculum and instruction must push the student to attempt change.

- A curriculum should be designed and implemented to emphasize the gravity of the present moment and to go beyond the “here-ness” of the present moment in order to engage the complexity of what has informed this moment and the importance of this moment for the future. The student should be encouraged to have resolution in there choice to act.

- A curriculum should be designed and implemented in such a way as to require a student to produce a value judgment on the present moment and formulate their intent to affect it. Neutrality should be discouraged.

Through these four themes innovation becomes an important act that connects the past and future and charges the act with the gravity to shape the future. De Landa states, “…both organic and cultural change involve replicators and that new structures arise by selective retention of variants.” Highlighting the necessity for an understanding of historical material (logic, systems, formations, structures, etc.) and the need to selectively retain portions of them—innovation cannot happen outside of this historical milieu. Likewise it becomes an important moment in which the student learns how to form a basis from which to act, a personal responsibility to engage the problem, an understanding of the importance of what they are doing and the necessity to formulate values through this process. Through the interaction of these four overlapping themes it is possible to derive a pedagogical framework that fosters innovation that is engaged in improving the human condition through architectural design education.

Notes

1 For a concise history of design pedagogy in the United States see Madlen Simon’s chapter Design Pedagogy: Changing Approaches to Teaching Design in Joan Ockman’s Architecture School: Three Centuries of Educating Architects in North America.

2 See The Study of Architectural Design (1926) by John F. Harbeson


5 Manuel De Landa, A Thousand Years of Nonlinear History (New York: Zone Books, 1997), 139.

6 Frederick Nietzsche, Genealogy of Morals (New York: Vintage, 1989), 36-44.


10 De Landa, 141.
This paper addresses the very beginning - the first studio projects in the first quarter of the first year of Cal Poly, San Luis Obispo’s architecture program. Positioned at the beginning of a 5-year studio sequence, these projects are formative experiences in the realms of abstract and three-dimensional thinking. In situating this work, it is useful to consider the broader context of architectural education at the present. We see ourselves in what Stan Allen describes as a “climate of increasing pluralism.”

Clearly no single design direction dominates schools today, and while it is possible to map shifting intellectual agendas, the situation is not so much that one agenda supplants another as it is that one is layered over another, multiplying the possibilities and points of view. This can be confusing to a student, who is often thrown back on his or her own resources. Young architects need to cultivate intellectual independence, but students need stable landmarks as well.

The notion of “stable landmarks” in an otherwise shifting terrain is useful for beginning design students. When stable landmarks are presented to students in the form of historical precedent, they provide an opportunity to learn about trajectories that have influenced the present. They also offer an opportunity for students to position themselves relative to a particular history, asking questions of what is still relevant, or, in Allen’s terms, whether anything remains stable.

There were two curricular objectives in this first studio. One was to establish a shared vocabulary among the students - both graphic and verbal. This enabled students to communicate with precision about their work. The other objective was to introduce representational skills including drawing, digital modeling, and material and machine processes in the context of the college’s wood and metal shop. This provided students with a broad set of skills with which to effectively represent ideas.

This paper will describe two projects given to a group of 230 first-year architecture and architectural engineering students. The projects explored concepts of abstract and concrete through a variety of two- and three-dimensional media. The focus was on developing a shared vocabulary of composition as a foundation for precise communication.

As abstraction was the motivation for these projects and processes, students were expected to clearly understand its meaning and value. Its value is two-fold. Abstraction facilitates the distillation or simplification of an instance, and it also allows concepts from a singular instance to be applied to other contexts. Abstraction is critical to any architectural design process: it is how an architect takes the overwhelming amount of information about the site, proposed use/users, building codes, precedents, and other data and distills it to come up with a solution. In this case, the method of abstraction was geometric in nature; but the critical thinking engaged at this level serves as a foundation for the abstraction of more complex and multivalent subjects.

With an emphasis on material form and composition to enable the development of a vocabulary and skills in making, the Bauhaus is an obvious pedagogical precedent. The Bauhaus has had a significant influence on architectural education in the US, beginning with the arrival of key Bauhaus instructors in the US in the 1930s, including Walter Gropius, Ludwig Mies van der Rohe, Josef Albers, and László Moholy-Nagy. Their teaching philosophy was complemented by American progressive educational ideas (particularly those of John Dewey), with an emphasis on “learning by doing”: which also happens to be the motto of Cal Poly.

The Bauhaus incubated the idea of distilling form to its essence, which was useful to frame our approach to composition, and also to oppose it. In “Bauhaus Fundaments,” Leah Dickerman describes “a key impulse at the Bauhaus” as, “an effort to define the primary elements of visual form, in a parallel process to the attempt in the Preliminary Course to return to the basic core of the student’s mind.-sectional relationships were a starting point for our students, we refuted
the ideas that the human mind could be returned to its essence—removed from context—and that superior creative performance would be enabled by this primary state.

We also distinguished between grammar, which is defined by fixed rules, and vocabulary, which we understood as evolving and collectively developed. In his description of the Preliminary Course (Vorkurs), Walter Gropius describes grammar and vocabulary as follows:

The elements which constitute the ‘grammar’ of creation are its rules of rhythm, of proportion, of light values and full or empty space. Vocabulary and grammar can be learned, but the most important factor of all, the organic life of the created work, originates in the creative powers of the individual.  

In our studio, there were no rules of composition. We focused instead on the precise use of geometric descriptions used to observe and describe relationships. This vocabulary was built by the group, with more precise and nuanced language developing over these first few weeks of studio.

As a vital counterpart to the abstract and semantic content, these projects promoted skills in making. According to Richard Sennett in The Craftsman, “The necessity of Imagination appears in the use of tools.” These projects promote higher order thinking, including Analysis and Synthesis, through skill-building. Bloom’s Taxonomy describes “Deconstructing” as an action within Analysis, and “Constructing” as an action within Synthesis. This sequence mirrors the project methodologies, emphasizing abstract analytical thinking and concrete material manipulations simultaneously.

The two projects were intended to be compared. They share the subject of line, surface and volume as compositional tools. They differ in material and material process. They also differ in use of precedent. The first project, Solid/Void, began with precedent analysis. The second, Sheared Shapes, did not—though the models, in some cases, were informed by the analytical work students did previously. Additionally, they share the constraint of a six-inch cubic bounding box. The “cube problem,” inspired by Gestalt psychology’s interest in perception of space and form, has been a pedagogical tool from the Bauhaus in the 1920s (Gropius, Kepes) to the University of Texas at Austin in the 1950s (the Texas Rangers) to Cooper Union in the 1960s (Hejduk). In a paper entitled the “Ubiquitous Cube,” which outlines the history of the cube exercise and its strengths and weaknesses, the authors state: “As a means for inculcating spatial cognition, the cube is not likely to be cast aside any time soon.” The methodology for each cube exercise is subsequently described and examined.

Solid/Void

The first project, entitled Solid/Void, asked students to interrogate the three-dimensional, spatial potential of two-dimensional abstract paintings by artists from the Bauhaus, De Stijl, and Russian Constructivism through diagramming and modeling. A constellation of early twentieth century abstract paintings served as stable landmarks, with the intent to situate ourselves in a continuum of design and representation methods. The final product that resulted from this analysis was a cubic cast form interpreting the formal composition of the original painting.

The premise of this project suggests that Cubism and ensuing art movements were critical to the Modernist conception of space. The Renaissance approach to representation, in which visual experience was privileged over the other senses, was maintained for 450 years, until it was finally challenged by Cubism. The Cubists instead represented aspects of daily life through abstraction, material juxtapositions, and fragmentation of form— their works existed at the threshold between representational and abstract.

The first mention of Cubism was in The Architectural Record in May 1910. The article includes an interview with Georges Braque, a founder of Cubism, in which he says:

It seems to me just as difficult to paint the spaces ‘between’ as the things themselves. The space ‘between’ seems to me to be as essential an element as what they call the object. The subject matter consists precisely of the relationship between these objects and between the object and the intervening spaces. How can I say what the picture is of when relationships are always things that change? What counts is the transformation.
Here, Braque is explicitly stating the importance of negative space - the space between. A project in which students must construct the negative space as formwork heightens their awareness of the compositional characteristics of the negative space itself.

The Bauhaus, De Stijl, and Russian Constructivism were distinct movements in the fine and applied arts that quickly evolved from Cubism. Common to all of these movements is an interest in abstract (non-representational) compositions. Each artist chosen for analysis developed his or her own method of geometric abstraction.

Students were asked to read Robin Dripps’ “A Primer on Composition”: not to instruct them in how to compose, but rather to give them a basic vocabulary to describe the artist’s compositional strategies. This vocabulary included:

- solid / void (figure / field)
- negative space (subtractive form)
- geometric order
- hierarchy
- phenomenal transparency
- Gestalt

**Objectives**

This project was devised to guide students in developing analytical, interpretive, and representational skills fundamental to architectural design. At the conclusion of the project, students were expected to be able to analyze a work of abstract art using an architectural vocabulary. They developed methods for interpreting three-dimensional spaces and forms from two-dimensional compositions, and developed an understanding of solid/void relationships to exploit the potential of negative space. With regard to representational skills, students utilized the following: free-hand diagramming, process modeling, formwork construction and cast models, and hard-lined drawing, including orthographic, oblique, and isometric.

**Method**

This project asked students to interrogate the three-dimensional, spatial, potential of two-dimensional works by an artist from: the Bauhaus (Josef Albers or László Moholy-Nagy), De Stijl (Theo Van Doesburg or Piet Mondrian), or Russian Constructivism (El Lissitzky or Liubov Popova). Students began by analyzing three paintings by one artist through 99 diagrams, produced free-hand on trace using pens for line and tone.

Choosing one painting, their analysis and interpretation evolved from two-dimensional, free-hand diagrams to three-dimensional massing models constructed of stacked cardboard. The construction of stacked cardboard study models simulated the solid mass of the final cube, and at the same time, it foreshadowed the formwork method developed for the final casting.

A method for the construction of an almost failure-proof and fully recyclable formwork was developed to minimize catastrophic failures and minimize waste. Both of these criteria were critical for an assignment with 230 individual student projects. Stacking many layers of cardboard, excising the positive space of the casting, compelled students to think in section and visualize the transformation of the section through the body of the 6-inch cube. The interior void surfaces were then sheathed in aluminum tape as a non-stick and leak-proof surface.
Working back and forth between 2D and 3D media was crucial for the students to understand and develop complex solid/void compositions in their three-dimensional interpretation.

The castings were completed as a group, with instructors facilitating the mixing and pouring of the plaster. Some students had formwork leaks, and others had portions of their model break off while removing the formwork, but these incidents were few. Overall, the method was very successful, minimizing both failure and waste. With regard to compositional results, beginning with the paintings as precedent gave the students a compositionally rich starting point, while provoking them to achieve the same spatial complexity as their projects took on a third dimension and concrete, material, form.

Sheared Shapes

In the second project, Sheared Shapes, the subject was part-to-whole relationships. The starting point was primitives, drawing on two meanings of the word “primitive.” First, the term is used to describe the character of an early stage in the historical development of something, and second, derived from digital modeling, it refers to a simple geometric shape generated by an operation. The project asked students to consider primitives in
the abstract – pure and seamless - and as constructed objects, made of a combination of flat parts requiring seams and fasteners to hold together as a whole.

Students began with geometric definitions of 4 primitives - cone, cylinder, cube, tetrahedron, each inscribed in a cube. They used pattern making to translate between abstract (primitives as theoretical constructs) and concrete (primitives as models made from sheet metal with dimension and thickness). In Sheared Shapes, a stable landmark was, simply, geometry.

Objectives

The students were expected to describe shapes through their properties (radius, center point, edge length, number of vertices, dihedral angle, etc.) rather than their appearances (round, organic, angular, blocky, etc.). This set of geometric terminology was an overlay to their existing compositional knowledge from their precedent analysis and the Dripps primer.

Because the project was iterative, and also their introduction to digital modeling in Rhino, students were expected to compose and to evaluate the merits of several versions of an idea. The criterion for evaluation was the degree of clarity of part-to-whole relationships in a model.

Method

The instrument of translation between shape in the abstract and the tangible object was the seam. Seams were understood as lines that could have powerful compositional effect, for example bisecting a surface or casting a shadow between two layers of material. Students worked with corner lap seams, full lap seams and standing seams, which could be either perpendicular or non-perpendicular to the faces of a shape.

In addition to seam placement and construction, there was a design constraint governing a model’s edges and voids. The students began by constructing primitive wholes and were allowed to slice them with up to 3 planes, resulting in a group of related parts.

We borrowed terminology from pattern making and mathematics to help students translate between two and three dimensions, and between digital and physical space. The first pair of terms we used were net and pattern. A net is a plane diagram of an unfolded polyhedron, or a developed surface. A pattern was defined as a physical template of a shape that can be folded or rolled into a three- dimensional representation. In contrast to a net, a pattern accounts for seam type, seam location and material thickness. We used annotation for part number, edge number and bend sequence.

Students used chipboard prototypes as an intermediate step between digital and sheet metal models. These prototypes gave students a way to adjust seam placement and evaluate its influence in a composition at this intermediate stage in the process. This improved the work in its craft, in the adherence of parts to a compositional whole, and also in instilling in students that design continues after an idea has exited digital space.

Meanwhile, the students received a day of training in the sheet metal shop on the shear, brake, punch, spot welder and rivet tools. This new language of the machines, their operations, and the effects they produce served to reinforce the development of precise compositional vocabulary as the chipboard prototypes gave way to sheet metal models. Fasteners were either welds or rivets, and had properties of diameter and depth. They had the potential to depress the surface, causing digitally taut planes to appear soft. Bends had a radius, which, when compared to the sharp edges of two sheared pieces meeting, also softened the appearance of the shape. In order to describe the models with precision, the term “plane” had to be expanded into the category “surface,” including those that were taut, soft, dimpled or punctured.

Color was also used as a means of describing part-to-whole relationships. Students were asked to paint a portion of their models to identify shearing planes or delineate a spatial condition (i.e.: an interior).
The constraint of working with three slicing planes initially seemed restrictive to students. Many wondered how a “design” project - especially one explicitly about composition - could be successful with such limits on formal maneuvers. Even with the constraint in place, some projects were formally exuberant, with so many standing seams they resembled stegosauruses. The most successful projects were those with a clear relationship between the whole and the parts.

Fig. 7 Sheared Shape, Foster Westover, 2016

Fig. 8 Sheared Shape, Tejal Patel, 2016

Conclusion

The ability to design depends on the ability to describe - to oneself and to others - the essence of the idea. This is not unique to architecture or engineering. Developing skills in communication, both graphic and linguistic, was a primary objective of this set of projects. In the first project, students began with precedent, through which they could familiarize themselves with a fundamental compositional vocabulary. In the second, the students, now familiar with some compositional terms, began with the primitive as a geometric definition. Their vocabulary expanded and became more precise, with terms for form and formal relationships now being associated more explicitly with material behavior.

One of the challenges of evaluating the work was that, because there was an emphasis on developing a body of language that was shared among the students in each studio section, the clarity of a student’s language was not always matched by the quality of their model. It was easy to evaluate the student’s abilities and growth in the realm of verbal description. The processes were intended to allow students to move from a vague understanding of how to describe shapes and space to a nuanced and specific one, and it was clear when they succeeded in this. It was less clear which projects had succeeded, and often the metric of craft was excessively influential. Of course, a student’s skills also impact his or her ability to communicate visually and spatially. The parallel development of material skills in casting and sheet metal work supported our ambition of clear and precise communication.

The success of this pair of projects was in framing the first-year design studio as a place for the development of a design language. This was presented to the students as a flexible and collaborative process that would continue to evolve throughout their career.

In a comprehensive survey of design pedagogy in Architecture Schools: Three Centuries of Educating Architects in North America, Madlen Simon states:

...the contemporary North American design studio continues to draw on aspects of both art and craft...design studios are more likely than ever to be hybrid workspaces filled with two- and three-dimensional investigations and the equipment, processes, and products of both manual and digital work.12

These first projects in the first-year design studio sequence are an attempt to foster literacy and communication between analogue and digital methods, and literacy and communication of ideas.

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Notes


2 Ibid.

3 The curriculum builds on these skills in the second quarter, introducing the human figure and architectural scale. In the final quarter of the first year, students design and construct proto-architecture.


11 Dripps, R. D. "A Primer on Composition."

12 Simon, 284.
What Precipitates Change in Cultural Diversity Awareness in Multicultural Design Studio Practice?

Maya Desai, Angelika Seeschaaf Veres, Nancy Snow, OCAD University

“Diversity has become a code word for ‘all those other folks’. The problem with code words is that they’re lazy: They’re broad rather than specific, and can provide cover for inaction — the “I don’t know how to do this or what it means, so can someone else please do the work for me?” maneuver.”

Overview

The authors of this paper hold the belief that design—no matter it’s specific discipline—works simultaneously in cultural contexts and produces culture. This preliminary study set out to identify what current efforts and design-specific pedagogical approaches—that connect to “cultural diversity” in studio-based classrooms — were being used at OCAD University, a Canadian-urban art and design university. In order to consider broad questions—What is “culture diversity”? How does “cultural diversity” manifest (or not manifest) itself within educational aspects of design education?—the authors sought out to identify and critique current phenomena in the studio classrooms of three of the six design disciplines at OCAD University: environmental design (ED), graphic design (GD), and industrial design (ID).

Methods

Semi-structured interviews were conducted with a small sample of participants, self-identified as working with beginning design students and who engage with notions of “cultural diversity,” inclusion, and/or accessibility in their studio-based classrooms. The participants include: Dr. Peter Coppin, Assistant Professor in Industrial and Inclusive Design; Bruce Hinds, Associate Professor and Chair of Environmental Design; Howard Gerry, Associate Professor in Environmental Design; Howard Munroe, Assistant Professor in Industrial Design; Sheila Sampath, Assistant Professor in Graphic Design; and Ali Qadeer, Assistant Professor in Graphic and Industrial Design. Using approaches from grounded theory (Strauss and Corbin, 1990) interview transcripts were analyzed to identify categories and subcategories found within the phenomena.

Starting in Assumption: “Cultural Diversity”

In the OCAD University classroom half of learners identify as non-white and from a range of different ethnicities. This, however, is not currently reflected in the faculty complement nor in established design education teaching practices. This study questions design culture on two fronts: one of ethics—what value does the succession of a dominant design culture have to a contemporary learner—and one of enhancing design practice—learners enact that which they learn, therefore perpetuating a design culture that is no longer reflective of contemporary Canadian society, hinders the advancement of design practice, and limits the opportunity to create new knowledge.

Therefore the authors wished to assess and critique current classroom practices of studio-based learning—assignment structure, design process, the setting of the learning space, critique, and the assignment outcome(s)—considered through a lens of “cultural diversity.”

In order to establish a common starting point for each participant’s interview, the UNESCO definition of “cultural diversity” was provided specifically because it emphasized “cultural diversity” as “opportunities for dialogue.” The authors found this meaningful to the design education context where design should be permeable and provide fluidity between art, technology, and society.

“Cultural diversity is a dynamic process whereby cultures change while remaining themselves, in a state of
permanent openness to one another. At the individual level, this is reflected in multiple and changing cultural identities, which are not easily reducible to definite categories and which represent opportunities for dialogue.” (Koichiro Matsuura, 2009)

The participants responded to various aspects of the definition of “cultural diversity” in context to their experiences as educators in the classroom, design practitioners, and individuals. What emerged was a very rich contextual landscape of individual definitions on what cultural diversity could mean in the context of first-year design studios:

Sheila Sampath (GD) spoke from the perspective of positionality and analysis of power structures: “My issue with “cultural diversity” and “multiculturalism” [I tend not to use terms like cultural diversity, and I definitely don’t use terms like multiculturalism] is that it assumes an exchange void of power, and so my acceptance as a person of colour, of white-dominant culture is...first of all it’s not consensual...that’s the nature of colonialism, but the lack of acceptance for my culture is political violence.”

Ali Qadeer (GD) spoke from the perspective of design in context to it’s origins, “[Design] comes from a very culturally located place. I think that there’s an impossibility towards creating a completely diverse and inclusive classroom in these fields in the same way that I think that diversity in something like English [literature] isn’t necessarily entirely a possibility... permanent openness to one another: I think that’s a very accurate utopian vision of diversity.”

Howard Gerry (ED) spoke in context to the complexities of culture and heritage, “[I have] observed that often culture and heritage are intertwined and confused and/or separated. There are many people who have strong ties to their heritage, but don’t practice [it’s] cultural norms. So, the question of culture, heritage, practice, I think it’s always in flux...There’s a culture within a given workplace or within an institution, there’s a peer culture when, for instance, our students come together. There is a private culture at home that may be at varying odds with say the work culture”.

Howard Munroe (ID) also argues definitions of culture as heritage and asks students the question: what is your history? “Maybe you need to be going and interviewing your grandma about those histories that they’ve lived, so [students] get an understanding of that and then [students] can start to pass that information along...[and] blend this knowledge [about heritage] into their design process. I tell my students not to be afraid of doing that.”

Bruce Hinds (ED) spoke from a perspective that favoured embodying cultural behaviour, habits and perspectives in environmental design over cultural pastiche, “I do think that the idea of cultural diversity ... [is] necessarily a direct representation of a cultural identity imposed on say a project. But there may be ways of discussing space [and] the use of space.”

Peter Coppin (ID) frames industrial design as “a highly universal practice. Because it’s dealing with issues to cut across the globe that every culture faces”... “each body is different, but they’re different relative to certain similarities [a human body].”

While UNESCO’s definition of cultural diversity could serve as a bridge to individual interpretations of the concepts of “cultural diversity” offered by the study participants, it has become apparent that “cultural diversity” cannot be absolute in its definition. Its contextual nuances need to be explicitly stated for it to be rendered actionable in a given environment. Across the disciplines, multiple meanings of “diversity” were revealed during the analysis of participant discussions and predominant areas of focus emerged:

A) Lived experience: Valuing lived experience as expertise and honouring individual learning processes.

B) Language: Opportunities and limitations of language as a tool for understanding and articulating design intent.

C) Discipline-specific dominant design practices: Addressing the challenges of embedded disciplinary practices that limit the inclusion of varied cultural perspectives and practices.

Levels of Engagement

As showcased in the variety of perspectives on “cultural diversity” offered by participants at the onset of their interviews, analysis of discussions on educational aspects of studio-based classrooms—assignment structure, design process, the setting of the learning space, critique, and the assignment outcome(s)—led to the consideration of the means by which “cultural diversity” is made tangible in the studio classroom.

“Anything that moves the individual towards a more inclusive, differentiated permeable (open to other points of view), and integrated meaning perspective, the validity
What Precipitates Change in Cultural Diversity Awareness in Multicultural Design Studio Practice?

The following matrix diagram (fig.1) plots levels of engagement as offered by each study participant.

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<th>GD2</th>
<th>ED1</th>
<th>ED2</th>
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A1) Sharing Heritage

Howard Munro (ID) provides an example of an information gathering method that he uses in the “Metaphor chair” assignment which has a student create a physical chair that represents a fellow student. Through the use of interviews, students—as part of their inquiry and discovery within the research phase—learn about particular behaviours, habits, and cultural practices which is then embodied in form of a chair.

Howard Munroe (ID) explains the process as follows: “The way the assignment is set up is that the student has to interview another student to learn about, interpret, and synthesize key points about their peer. [So for example] you might have a student that’s from Peru and a student that’s from Canada, and the student from Canada is trying to understand key points about the Peruvian student and vice versa. Then they’re trying to synthesize, interpret, and embody these findings into a “metaphor chair”. What the student is intending to do is trying to fill in those gaps because you only have a certain amount of time to interview the student, so it forces them to do a little bit of research on their own, what more do I need to know about my peer’s culture that I can only find out through an interview. The student has to actually try to interpret the culture of this person and that forces them to learn about somebody else.”

Through a facilitated intercultural dialogue, students are challenged to confront and overcome cultural stereotypes and understand cultural practices on a personal level through peer interviews.

A2) Accommodation through Critique

Howard Gerry (ED) uses group presentations as a tool to support those who are not confident in public speaking. He states in group settings the individual student feels supported by their peers—when each member has to cover some aspect of the presentation—and they can practice their particular component and present it in context to the group instead of being singled out to deliver the presentation on their own.

When critiquing an individual project, Howard offers students the option to present publicly or individually during office hours, as well as provide the possibility of gaining feedback inside or outside the classroom from the instructor. In the case where a student is really challenged by the idea of presenting to the class, the instructor offers to present on the student’s behalf, “I will present the
work, I’ll put the work up and so the students can see it and gain feedback from their peers without the individual having to actually present their work. That seems to work well for individuals that have problems with presenting.”

By gradually integrating students into the critique environment, Howard creates a safe space for students to improve their public speaking skills and slowly gain confidence when speaking in front of a class.

B) Language

Many of our participants identified language as critical to design but also a challenge in the classroom. Language (oral and acquisition) as opportunity and/or limitation in reference to understanding of assignment intent, articulation of a concept or idea, and discussion in a critique setting was a predominant occurring area of focus with most study participants. This included actions such as peer translation of oral presentations, faculty presentation of student work, clearly written assignments further augmented in class for clarity, encouragement of process work developed in native languages, providing support through group presentations and on-on-one meetings to target specific areas of skill development (public speaking) and written transcripts of class proceedings for clarity and accommodation.

The following two examples provide specific details of how supports for language comprehension, articulation and deconstruction are being made actionable in the studio classroom.

B1) Modes of Communication

Sheila Sampath (GD), states that she emphasizes the value of clearly written assignment instructions to support understanding, “[I use] clear written instructions, going through those [written instructions] really thoughtful in class, explaining them, using different types of words. I might communicate it in academic language, or in professional terms, but also in conversational terms to make sure that different kinds of people can understand the instructions. And also just being available to answer questions, showing [visual] examples.” Struggles with language are not limited to the language learner and language is not reduced to simply understanding words. Sheila acknowledges that students have various experiences with the use of language and therefore consciously uses multiple modes of communication to ensure her intent for an assignment is clear for a variety of learners. In doing so, she facilitates a student’s understanding and learning of design.

B1) Deconstructing Typologies through Language

Bruce Hinds encourages students “to use language in a much more sensitive way.” When presented with a project brief, students are asked to deconstruct and reconstruct the intent of the project through the conscious use of language (oral and written). Students are encouraged to question established typologies, and culturally and contextually examine “defined and definable key words so that we understand if we are talking about something like a market, what is a market, what does that actually mean? I think that opens the opportunity to bring cultural diversity certainly into the conversation and it puts the studio and the brief on a level playing field.” For Bruce, language not only serves to communicate intent or idea, but is a means to discuss and explore the significance, use, meaning, and behaviour within a given space across many cultures. In this studio classroom practice, language becomes a creative driver.

C) Discipline-specific Dominant Practice

The analysis of the participant discussions revealed the challenges and limitations of embedded disciplinary practices within a “culturally diverse” classroom context. Discussions with study participants exposed that embedded practices have become naturalized and being critical of those practices creates a paradox between an academic mandate (critical engagement with embedded practice) and being prepared for current professional design practice and culture. This included a limited range of actions from study participants such as the investigation and challenging of established typologies, recognition of risk-taking that challenges the prioritization of exquisite form-making in evaluation, and shifting critique from a master-apprentice model to one of dialogue in a safe space.

The following three examples provide insights into how the discipline-specific dominant culture is being challenged through actions in the studio classroom.

C1) Creating Consensual Spaces

Sheila Sampath informs her approach to in-class critique by first unpacking the dominant critique practice and questioning how and if it should be part of the learning environment. She creates a consensual agreement among students and herself in the classroom and asks students to explicitly express the ways in which they would like to be critiqued and motivated. “I think that critiques are just something that we do because we do them, and so being
really clear about what you want from it and then in terms of those presentations I often ask students ... because what I’m trying to do is build collaborative classroom environments as opposed to competitive classroom environments. In terms of the structure for critiques—it tends to be informed by conversation. So yesterday, as an example, we came up with a respect agreement...‘I need to be challenged in my critiques, I want you to tell me what’s not working’ ... ‘if that’s your first and last sentence—this isn’t working—that actually doesn’t motivate me, it just shuts me down’” So as a class we came up with a rule for, critique as a place of support, and also give suggestions and next steps for how to move forward. [For example] if you tear someone down in that class it is okay. They all seem to want that, surprisingly, which is going to be a challenge for me because that’s not my style. But after you tear someone down, here’s how you can reassemble those pieces.”

In building a consensual space, the unexpected challenge that Sheila faced was that some students requested the dominant form of critique, a form of critique that is not congruent with their practice of creating a safe space in the classroom. However, the student’s intent is respected by providing ways in which the practice of critique can be beneficial to all participants.

C2) Dominant Voices in Critique

Ali Qadeer (GD) is very aware of certain dynamics—often gendered—in the critique environment, in which a limited number of students dominate the space of discussion and feedback.

In the following example he explains how these power dynamics presents itself in the classroom:

“What do I [as the instructor] is not talk too much, [and] I’m trying to figure out how to neutralize the voice of eager men. I’ve noticed there’s a dynamic in my classroom, which are 80% percent female usually, that there are male students who are good students, intelligent people, but who start to dominate the conversation in the classroom...I am trying to find ways to, not shut that down, and not make them feel like their voices are unheard, but to make sure that this is a classroom environment where everyone should feel comfortable to be able to respond and talk and dialogue and the other thing is that, and sometimes this isn’t even gendered. Like sometimes this archetype can be female as well.”

Although challenged to experiment with ways in which this dynamic can be changed systemically, he does respond circumstantially in the classroom when the situation presents itself.

C3) Collaborative Knowledge-building Practices

Peter Coppin (ID) runs a “three-part assignment in which the first part they [students] come in with their ideas, then in the second part we cluster them [ideas] on the wall and everybody does a model of the diversity of their ideas, it’s like periodic table. [This is called an infinity map]. And it’s important for them to understand how to make a [conceptual] model. The great thing about a model or a periodic table is that the gaps are just as important as the parts that are identified”... “it helps you figure out what that element might be. And so, this process, it’s called infinity mapping, it leads to each student then producing a model of how they think the ideas fit together in the class, that’s the second part, and then the third part, they design teams. This allows students to come up with ideas that they’re passionate about, it also allows them to come up with ideas that are meaningful to them. And by that I mean in a technical way where if you imagine that knowledge is like a tree, the more it [learning] interconnects with the tree that’s emerging from someone’s background and experience, I think the more the knowledge is retained, the more it interconnects.”

Through the practice of infinity mapping, the master/apprentice model is challenged with the intent of creating new knowledge through the integration of diverse student ideas and expertise.

Conceptual Model: Levels of Engagement

In reviewing the interview analysis, the authors observed the levels of engagement to be cyclical in nature. Often the focus of the answer to a question included a prompt (e.g. some students dominating in-class discussion), with faculty identifying a type of confrontation (e.g. faculty observes the same students contributing to in-class discussions while other students are not, even though it is known [body language, one-on-one discussion] that a student has an interest in contributing) and reacts with a circumstantial response (e.g. does not always pick the person with their hand up first). The faculty might then reflect on the confrontation (e.g. how do I balance eager participant engagement in class) to make a purposeful response or what the authors call an “action” (e.g. offer a variety of discussion styles that allow for more varied participation in class.) This might then create a new situation (e.g. greater in-class participation from more variety of students) that could generate a new prompt (e.g. eager student starts talking to friends in-class because they do not want to wait to share ideas) which
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could either lead to an evaluation of the situation, resulting in a new prompt, or it might go unacknowledged by the instructor. The focus of this paper was to reveal the varied responses from faculty in addressing “cultural diversity”. The conceptual model visualizes these findings in form of a flowchart (fig.2).

The findings of the study reveal how current classroom practices of studio-based learning at OCAD University are challenging dominant design culture, addressing the value of lived experience (student and faculty), and recognizing the key role language plays in classroom communication and the design process.

![Fig. 2 Levels of Engagement Conceptual Model.](image)

**Limitations**

The authors of this paper are aware that this study is limited to a small sample size and focuses on the faculty perspective. As this study progresses, additional design disciplines will be examined (Material Art & Design, Illustration and Advertising) along with greater sample sizes across all six disciplines. As the study uses procedures from grounded theory, interviewing will take place until saturation has been determined. A similar pilot study will investigate the crucial student perspective.

**Conclusion**

“‘Diversity’ sounds polite and hopeful....However much it might feel good, though, diversity talk is not enough.”

The findings also revealed many situations where faculty were addressing certain challenges as they occur or through one-on-one interactions. Even though faculty reflected upon the need to build in tangible components for their studio classrooms that address larger systemic issues, they were hesitant as to how they might be addressed. In light of these discoveries there are two key outcomes from the study. First, “cultural diversity” has multiple simultaneous meanings. The findings have made it apparent to the authors that “cultural diversity” cannot have an absolute definition as contextual nuances need to be explicitly discussed and determined, otherwise there is risk of hollow words (coded words). Secondly, in light of this awareness, it is also apparent that “diversity” can only happen when it is made actionable. Design education must respond critically to the cultural and contextual realities of contemporary Canadian society and a climate of increasing globalization, by exposing students to multiple ways of seeing, knowing, and engaging with the world. In doing so, we can have confidence that emerging...
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practitioners and educators will come together to question embedded practices and create a more sincere future for design.

Notes


ii Wood, L. (2016) Student data presentation to Academic Planning Committee, OCAD University (particular image: Ethnicity Undergraduate students, OCAD U 2014 NSSE)


iv Ellen Berrey, Diversity is for white people: The big lie behind a well-intended word. October 26, 2015, Salon.com
Necessity for Learning Abstraction in Representational Thinking

Stephen Temple, Department of Architecture, University of Texas at San Antonio

Abstract

A primary difficulty with representation in architectural design thinking was pointed out by Bruno Zevi, in *Architecture As Space*, when he stated that no matter how representations might seem to aid as a transformative devise in design thinking, when representations move away from an origin in “direct experience” they abstract a designer from the physical and even the spiritual aspects normal to experience. Art theorist, Rudolph Arnheim, further defined abstraction from a Gestalt perspective as a seeking of relations between the general and the particular, methodologically between conceptualization and our myriad sensory perceptions of the world. If drawing is in fact a form of reasoning on paper, then learning representation as a necessary aspect of architectural design thinking must recognize that drawing’s abstraction from, rather than connection to, actual embodied experience is a fundamental threshold for beginning design students to cross. But uninitiated beginning students encounter difficulties with thinking design through plans, sections, and elevation and paraline views because until they realize the abstract mechanism of the “viewpoints” of section-cut and picture plane, a means only drawn out of reality through a way-of-looking not natural-to-experience. Using architectural representation without comprehension of its underlying abstract mechanisms often becomes a needless initiating ordeal that confuses rather than clarifies. While digital modeling may offer virtual three-dimensional images of reality that may seem, by contrast, not quite as abstracted from natural experience, these images are nevertheless framed in terms of their own abstractly non-physical, yet seductive, algorithmic computational otherness drawn out of actual experience at an atomized level that is hidden to users, and thus from design thinking.

It is the premise of this essay that design thinking, as part of beginning design pedagogy, cannot become realized without also learning representation through its authentic origins in abstraction. It is the purpose of this essay to define abstract processes at the origin of representations and propose early design thinking learning experiences that account for the necessity of teaching, and not merely assuming, abstraction as a basis for representation. Representations abstracted from actual experience are reductive and thus become both revealing and confounding for design thinking. Reducing experiential information has benefits for design thinking because it can allow for design decision-making on singular issues and on a comparative and/or categorical basis with other singular issues that can result in conceptual clarity less clouded by particulars. However, design thinking without the particulars that are embedded in experience can lead to concepts that are untenable in the fullness of actual experience. A pedagogy that accounts for the abstraction of representation seeks connections, rather than distinctions, that can link abstractions to actual experience. Pedagogical approaches to beginning design learning experiences will be addressed with an objective of initiating representation as a transitional learning experience more readily drawn out of experience and ultimately made more concrete for use in design thinking.

Introduction

An observation over twenty years teaching design is that most students enter design programs new to the abstract processes of design representation and that learning to comprehend the world through the lens of abstraction that underlies representation causes confusion and uncertainty. Students find that their everyday experience of the world is called into question by abstract operations that disconnect from experience and contradict perception as a source of knowing the world. In his book, Bruno Zevi stated that no matter how “preparatory” representations might seem for design thinking, when representations move away from an origin in “direct experience” they are abstracted from “everything in us that is physical and spiritual, and above all, human.”(1) Representation in architectural design thinking constructs abstract distance from the meaning of engagement in living experience that Juhani Pallasmaa characterizes as, “the silent understanding that lies hidden in the human existential condition and our specific embodied mode of being.”(2) Certainly, architectural design education relies upon representation as in instrument of thought and development but it must also be recognized that learning to think design through representation is compound-

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ed due to its abstraction from the concrete experience of the world. Learning how architectural abstraction transforms everyday perception into representations can lead beginning design students into an undoing of personal meaning in experience within a needlessly disorienting initiation that obscures and confuses design thinking. If drawing is in fact a form of reasoning on paper, then within learning representation as a necessary aspect of architectural design thinking it must be recognized that drawing’s abstraction from, rather than connection to, actual embodied experience is a fundamental threshold that beginning design students must cross. Furthermore, learning to find a place within design activity for architectural abstraction requires an understanding that abstract operations have their own self-determining logic. This transformative understanding does not come easily to beginning design students and must become better recognized as a primary agenda of beginning design pedagogy.

This essay will define primary abstract processes and further explicate how abstraction underlies design representation. As used in this essay, the term, abstraction, will not refer to the aesthetic character of architectural forms but will instead be concerned instead with operative aspects of processes of abstraction. It will be shown that various mechanisms of abstraction cause representations to be reductive and simultaneously reductive, confounding, and revealing of design thinking. It will be proposed that early beginning design pedagogy should no longer assume abstraction but instead should account for its effects as a basis for representation. A pedagogy that accounts for the abstraction of representation seeks connections, rather than distinctions, that can link abstractions to the concreteness of actual experience within design thinking. Mathematics education offers a parallel pedagogical model that employs a three-part instructional strategy that moves from concrete to representational to abstract notation that models math problems more connected to concrete origins in a way that makes them more operative. Exercise will be demonstrated that initiate representation as transitional learning experiences that can be more readily drawn out of experience and made ultimately more concretely operative for processes of design thinking.

The Structure of Abstraction

A dictionary definition of abstraction states that the act of abstracting is a transformation away from concrete actuality, as if drawn out of, or drawn from, the concrete as a continuum from the particular and sensorial to the general and symbolic. According to Sybil Moholy-Nagy in a 1959 lecture, the use of processes of abstraction in art and architecture emerged in relation to the prior development of relativistic theoretical perspectives that abstracted through scientific experimentation and transformed our relationship to the world into a search for the essential within these relationshps. As stated by Moholy-Nagy, “Physical reality was gradually pared down to a point where it conveyed to the beholder not a “window into nature” or literary allegory, but the distilled abstract of those visual fundamentals that constitute the building stones of the perceptible world.”(3)

Defined as basic to the realm of art by Sigfried Giedion, abstraction is defined as an active mechanism that transforms physical reality in a “distillation of the essential elements from an intangible multiplicity of forms.”(4) Giedion clarifies the act of abstracting in perception in two ways. The first regards abstracting as “withdrawal” from the particulars of an object in order to discern its general essence from among the great abundance of inputs within our perceptual attention. The second form of abstracting isolates one aspect of an object from all other aspects to separate part from whole, for the purposes of perceiving significant relations between parts instead of subsuming them unto the whole. For Giedion, the complexity of parts and relations is partially resolved in Gestalt psychology - that the whole is greater than the sum of its parts. The concrete perception of a thing occurs when “the parts are derived from the whole, which alone determines its character.”(5) Giedion’s primary interest in the use of abstraction is for the role it “plays in the human mind by its power of concentration upon absolute essentials.”(6) This mental abstracting transforms the everyday appearance of the subject into non-naturalistic, symbolic essences. Abstraction thus occurs as a mental distilling simplification and concentration of natural features within essential forms such as transparency, simultaneity, and movement. If abstractly withdrawn far enough from the natural, these essences, “raised their power of representation to a new level of potency” that are experienced as universals that can become transcendent. Giedion’s primary concern for abstraction is when used as a transformation of perception versus a transformation of inner experience.(7)

Rudolph Arnheim describes the act of abstraction in terms of a removal, “since the verb abstract means to actively draw something away from somewhere and passively to be drawn away from something.”(8) Arnheim develops abstraction within acts of generalization as a conceptual order that is generative of a more comprehensive whole in which representation is an active and instrumental restructuring of the processes of abstraction.

“Primary abstraction cannot be said to presuppose an act of generalization. Instead, percepts are generalities from the outset, and it is by the gradual differentiation of those early perceptual concepts that thinking proceeds toward refinement. However, the mind is just as much in need of reverse operation. In active thinking, notably in that of the artist...wisdom progresses constantly by moving from the more particular to the more general.”(9)
Arnhem distinguishes representation and the artistic production with which design is engaged as part of the same cognitive activities, due to the iterative character of active thinking in design activity. Within acts of design thinking, particulars are considered in terms of generalized concepts which are then transformed due to the particulars. New conceptualizations then have an affect on the transformation of particulars.

The conceptual abstraction of Arnhem differs from another form of abstraction that draws away from the actual to be transformed into totally symbolic form. According to Philosopher Godfrey Vesey, “seeing as” occurs when attention is “not directed to seeing things for what they are,” but is instead toward taking the appearance of a thing is taken more seriously than its actual material particulars.(10) The observer of appearances seeks a relationship to categories of prior experience as the thing known instead of the particular character of the material thing itself. “Seeing as” is a kind of perception that always involves separation from the world through judgments “we make by selecting and emphasizing some data and ignoring many others.”(11) “Seeing as” requires: 1) seeing the world as wholes instead of “being perceptually aware of the fully determinate qualities of material things,” and 2) seeing these wholes as part of symbolic reordering of the world within personal subjectivity.(12) The objective of architectural design processes is not to manipulate the appearances of the designed world only for the purpose of symbolic engagement but to determine the distinct qualities, configurations, connections, soundness, and so forth, of material things as the subject of experience. Because it disrupts propensities toward “seeing as,” learning abstraction will initially be view as a negative experience for beginning design students whose prior perceptions were primarily in terms of signification.

Problems of Abstraction When Learning Design

A sense of direct veracity of the particulars of the world is usually associated with everyday experience, but abstraction is the foundation of mental existence and more typically associated with models, ideas, and concepts. External sensory realms and internal mental realms are closely correlated in actual experience. However, sensations of actual physical reality can be verified concretely while the mental realm is subject to mechanisms of reason, imagination, and poetics. An image or drawing may seem to be experienced with similarity to an external physical world but it remains primarily a mental phenomena, no matter its intention to represent with affinity. It is a fact of the abstract operation of representation that many aspects native to our experience of the external world are lost in the abstract reduction inherent in representation. Some examples follow this paragraph.

Abstraction is Reductive

The generalized abstract conceptualization of a form of representation relies on removal of the myriad particulars of the object available to experience. For example, a line drawing consists only of information about the configuration of the intersections of planar forms, or corners. Other defining information, such as texture, surface, color, softness, hardness, materiality, are not particulars necessary to the abstraction of a line drawing. Mechanisms of abstraction that cause representations to be reductive at the same time cause both the confounding and revealing of design thinking. Reducing experiential information has benefits for design thinking because it allows for design decision making on singular issues and on a comparative and/or categorical basis with other singular issues that can result in conceptual clarity less clouded by particulars. However, design thinking without the particulars that are embedded in experience can lead to concepts that are untenable in the fullness of actual experience.

Representation Conventions Insufficiently Describe Experience

In a typical beginning architectural design curriculum, design students learn to use physical models and floor plans, elevations, sections, and paraline and perspective drawings not to “use them statically but instead to form models and simulations of future possibilities, as architects work towards something actual – the realization of a building.”(13) This use of conventional representation is this way is instrumental, but signifies more than a realization of a building. Bruno Zevi, in his seminal work, Architecture as Space: How to Look at Architecture, clarified the problem of using representational drawings as tools of design thinking.

“The plan of a building, being nothing more than an abstract projection on a horizontal plane of all its walls, has reality only on paper. Architecture, however does not consist in the sum of the width, length and height of the structural elements which enclose space, but in the void itself, the enclosed space in which man lives and moves. What we are doing, then, is to consider as a complete representation of architecture that is nothing more than a practical device to put on paper specific measurements... for the purpose of learning to look at architecture [to experience it], this would be more or less equivalent to a method which described a painting by giving the dimensions of its frame, calculating the areas covered by the various colors and then reproducing each color separately.”(14)

As simplified representations of things, ideas, and perceptions, abstractions are necessarily disassociated from concrete reality as they exist principally as mental constructs. Conventional architectural representations abstract themselves from the concrete experiential reality of buildings while building an illusion that they are directly related to the respective build-
ing. Beginning students uninitiated to design thinking have difficulty developing adequate means of design thinking through plans, sections, and elevations, and paraline views partly because these result only abstractly by way of the unreal “viewpoint” of the section-cut and picture plane, a means only drawn out of reality through a way-of-looking not natural-to-experience. Another form, digital modeling, offers virtual three-dimensional images of reality that seem to students, by contrast, not quite as abstracted from natural experience, albeit framed by their own abstractly non-physical, yet seductive, binary machine language. The computational mechanisms of the machine abstract from actual experience at an atomized level which is hidden to users, and thus from design thinking. These abstract mechanism must be learned to be the abstractions they are. Design thinking pedagogy is not aligned with learning representation if abstraction is not addressed. A primary difficulty in learning to think/design through drawings is thus their abstract difference from reality, rather than their connection to reality. Because the imagery they contain is not achievable through everyday experience, they are fictions of buildings containing a narrative of artifice. Zevi describes how the indirect nature of architectural representation presents problems for architectural design thinking:

“All the techniques of representation and all the paths to architecture which do not include direct experience are pedagogically useful, of practical necessity and intellectually fruitful; but their function is no more than allusive and preparatory to that moment in which we, with everything in us that is physical and spiritual and, above all, human, enter and experience the spaces... That is the moment of architecture.” (16)

Architectural design may be generalized as thinking about building before constructing it, therefore Zevi’s statement infers that separation from the particulars of experience caused by abstraction has its primary cause in allowing that architectural design processes occur precisely within and because of abstraction. However, Zevi is clear that architectural representations are not just for the purposes of simulating the substance of architecture but, instead, in anticipating its experience.

Flow of Time is Absent

The flow of time is a primary distinction between representational drawings and lived experience that is especially disconcerting for beginning design students. In lived experience, the passage of time imparts to the experience of the world a sense of continuity while a representational image is that of a single moment in time, frozen, as it were. This distinction becomes most evident in consideration of the time elapsed in moving around in architectural space, experiencing multiple views of a building in relation to other sensory information that confers on experience a feeling of architectural space. By contrast, the singularity of a representational image appeals only as a single, and very still, moment of a visual representation of a small part of a building. Another example is thinking about natural light entering a building design by use of a vertical building section. This section can, at best, represent sunlight entering a building during only a single moment, when in fact the sun moves around a building in a continuous and varied manner that differs each of 365 days. A building section, if well rendered, can only specify the light and shadow of a moment while in fact daylight is a constantly changing phenomenon that greatly affects the feeling of architectural space and the character of its materiality.

Far from the fullness of experience, representation always seems an incomplete and, at best, a stand in, in the form of generalities that can only hint at experience. For beginning design students, this incompleteness of representation lacks any connection to the particulars so salient in experience and necessary for design thinking to feel substantive. This loss to abstraction is the single characteristic of representation most prescient to a beginning design student. Their experience is full and rich with multivalent sensory stimuli and feeling, while the representation presents as abstractly disconnected due to its reduction of connection to the real. The manner by which our minds communicate with the world through experience is one of the great mysteries of philosophy and psychology, and is frequently the subject matter of art. The understanding of the mental portion of experience is often defined as a structure of abstractions and the precise nature of thought itself is the subject of debate. That the mind in some manner utilizes representations of the physical world as an element of experience is not in debate here, however, as Pallasmaa states, “A work of art or architecture is not a symbol that represents or indirectly portrays something outside of itself: it is an image object that places itself directly in our existential experience”. (17) Similarly, the experience of architecture is not derived out of a mental formalism or interplay of symbols but instead arises out of authentic encounters in the fullness of everyday life, creatively contrived in consciousness into ongoing coherence.

Math Education as a Model for Beginning Design Pedagogy and Exercises

Math education offers a parallel pedagogical model that purposefully addresses abstraction’s disposition from the concrete. Math education employs a three-phase strategy of concrete-to-representational-to-abstract instructional sequencing that progresses from concrete to abstract notation, with each form building on the previous form. Its purpose is to first develop a concrete understanding of a math concept as a way of modeling math problems as operative abstractly while still meaningfully connected to concrete origins. (18) This enables students to be much more likely to perform and under-
stand math concepts at the abstract level. In math education, this process begins with modeling math concepts (i.e., addition, etc.) through concrete materials, followed by a representational stage where representational pictures are used in place of actual objects. Then in the abstract stage, math concepts are modeled at a symbolic level using numbers and other mathematical symbols standing for objects and operations (i.e., +, -, x, etc). Important is that learning begins with tangible and kinesthetic experiences to establish basic understanding as a basis for a representational understanding that leads then to fully abstract thinking. This process connects concrete origins to mental representations used in abstract thinking and also enables a deeper understanding of math concepts as foundational for future abstract thinking.\(^{(19)}\)

Concrete to abstract processes used in math education parallels teaching for understanding of basic representational skills in architectural education, or any design education where representational models stand in for full-scale objects in development. Students arrive in architectural beginning design programs with much experiential contact with buildings in the world and still others arrive with some experience with drawn representations (plans and elevations, some even digital models) of buildings. But few arrive with much understanding of how to think abstractly or conceptually with drawn representations because they have had minimal (if any) learning experiences that make connections between how buildings are concretely experienced and how they are to be thought about using abstractions in design activities. In fact, many can produce a plan, but few can connect the nuances possible within it, as architecture, to its many permutations with respect to the same building’s section and elevation, let alone issues like its structural system or how natural light enters or how people move through its spatiality.

The concrete to abstract structure of math instruction can be modeled on architectural education to achieve greater comprehension of how architectural representations can concretely connect to (or disconnect from) experience. The first step involves realization of the concreteness of buildings in direct experience. The second step involves deriving the abstraction in representation within issues like the section cut and picture plane in ways directly related to direct experience. For example, Figure 1 illustrates an example pedagogical tool for a concrete-to-representational-to-abstract mode of learning building section. A scaled model built of wood with interior floors and walls was dissected using a bandsaw and then the two halves scanned to illustrate the picture plane view showing interior elevation elements. This makes clear how abstracting transforms elements and experiences of a tangible nature into an alternate manifestation of thought and is easily understood as the basis for a section drawing.

Another example to convey the abstract idea of ‘cutting plane’ is to use a large knife to cut through a large piece of fruit containing a seed cavity. (see Figure 2) The dissected fruit will express well the idea of cutting through its solid walls while revealing an inner cavity that must be viewed as an elevation. This may seem trite or unnecessary but students who have trouble with the idea of a cutting plane who do not respond to visual representations of cutting plane found in drawing textbooks will comprehend well due to direct physical demonstration. In fact they will never forget this demonstration.

A transparent acrylic box (make one) can be used in the same physically demonstrative manner if placed over objects to illustrate the idea of picture planes that correlate with the six sides of an object in the orthographic format. Again, it sounds simplistic but this demonstration physically displays the abstract principle that underlies a drawing of unfolding the sides of a dice and the ‘unfolding’ of orthographic views such as those found in Ching’s Design Drawing book. Certainly some students can ‘get it’ through drawings but a great many more will fully comprehend the abstraction of the relations of pic-
ture planes, and will do so in a way that forever enables their deeper comprehension of projection of plan and elevation. Pedagogy must teach these issues, not assume them.

Other exercises aligned with this mode can be developed by beginning with a concrete experience that is then transformed from its concrete origin by an act of abstract transformation. These representational abstractions must be comprehended as models for only a certain way of visualizing that is disassociated form the experience of the building itself, that is, in the case of plan and section, by use of the mechanism of the cutting plane.

After achieving basic comprehension of underlying abstractions, using representations to facilitate design operations must be prescribed simplistically at first, as a means to learn to work abstractly with them. One example would be to cut a series of sections at two-step increments along one’s movement along a path through varied interior spaces of a building. This will also convey an equally important understanding that movement over time is not inherent to a single representation.

Conclusion

The framing of our actions, perceptions, or thoughts brought about within design thinking by use of conventional architectural representations takes form literally as frozen, visually abstract reductions that construct a mental distancing that reduces our experience to forms of thought apart from full and deep engagement in the world. Abstraction dissolves the world by separating it into disparate fragments that, in everyday life, lie hidden beneath conscious attention. Not yet having found its place in the intellectual life of a beginning design student, transformations of the world caused by abstraction debase design thinking form aspects of the world that give substance to design thought. Realization of intellectual constraints and recognition of new potentials is a necessary part of the educational process inherent in discovering the operative nature of abstraction in architectural representation. However, without being understood as grounded in its concrete origins in experience, abstraction in representation will continually cause disassociations within design thinking.

Learning abstraction is central to beginning architectural design education because coming to terms with representation is an inevitability early demand of design pedagogy. Increasingly, presumptions that students new to design already possess abilities to engage abstraction have lead to positioning abstract within intial learning experiences. However, students new to design thinking have ineffective or varied development of abilities to think or work abstractly and are unaccustomed to separating part from whole as a distillation of the concreteness of experience. If the goal is for processes of abstraction to become more greatly comprehended, beginning architectural design pedagogy must be shifted from accounting for performance with abstraction to enabling students to learn to use representations drawn from the concrete in gradual transformations that retain connectedness to its concrete origins. This better enables students to both accept abstraction’s distorting effects and learn to comprehend abstraction as a device of design.

Implications in addressing, or not addressing, abstraction in beginning architectural design pedagogy are many but I will address here two primary issues that will become evident in the near future. Abstraction inherent to digital applications raises very different pedagogical concerns because of the displacement of experience through abstractly discreet, hidden operations called algorithms. The intricacies of algorithmic operations are largely unknown to the designer but their output takes form only as abstracted virtual imagery. Understanding digital abstraction is more and more becoming necessary to design pedagogy, or the role of design may itself become replaced by algorithms. Design thinking uses algorithms, not the reverse. A second implication is that recent inquiries in neuroscience are revealing an intertwined relationship between the inner life of abstract thought and our bodily engagement with the world. Design activities based in abstraction that appeal primarily to thought do so with little regard for this relationship. Design pedagogy will find it must give increasing attention to on-going developments in neuroscience because these discoveries will transform the narrative between the particulars of perception and abstracting neurological processes.

Learning to design assumes a search for pattern and order in relationships between the environment and human endeavors. At a basic level, architectural inquiry seeks a place for the abstractness of human consciousness within the world of matter as a search for patterns of relationships between architectural ideas, how they take material form, and how human consciousness participates in it. Therefore, abstractions used as representational instruments to describe a building’s physical, dimensional, constructive characteristics, must simultaneously communicate concepts and references that reside within embodied experience. Instrumental description occurs by measures of mathematics, proportion, and geometry, while ideas are non-instrumental and come about through interpretation and reflective contextualization. (20) Using representation instrumentally in architectural design for the purposes of description can be learned almost entirely as mechanical technique, devoid of architectural ideas. However, learning to contextualize and interpret architectural representations while design thinking, or even that architectural representations are in fact subject to interpretation, are more highly abstracted aspects of design education that must first be addressed by comprehending abstraction within representation.
Without a beginning design pedagogy concerned with this, or worse, with pedagogies that assume prior understanding of abstraction, beginning architectural designers will learn design thinking with only limited conceptual relationship of their design work to human experience. Coming to an understanding of the logic of abstract operations is transformative learning that must become better recognized as a primary agenda of beginning design pedagogy.

Notes


5. Giedion, Eternal Present, 14.


17. Pallasmaa. The Thinking Hand, 135.


Empathy and Experience as Instruments of Design

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Introduction

Empathic design underpins a critical approach to contemporary design education, in contrast to the form-focused methods upheld by earlier architectural pedagogies. To prepare for the changing and increasingly anti-disciplinary landscape of design practice, students must develop an empathic design agency, an agency shaped from the human-centered design of places. How might research into the relationship between the senses, memory, and identity facilitate the students’ ability to advance this ethical design agenda? This semester-long undergraduate design studio emphasizes the integration of conceptual thinking throughout all phases of the design process. Recent shifts in the studio intend to encourage empathy to foreground place and experience.

Through a series of design exercises, students examined the relationship between music, memory, and design. They analyzed that connection through the fabrication of various mnemonic devices and through the design of a mixed-use project, and senior residences for those with memory loss, combined with a music center. Set fifty years in the future, seniors from the student’s own generation will occupy the program in the design project. These exercises prioritize memory and phenomenology over form-based design teaching to encourage empathic design skills. This connection, embedded in the identity of place, provides a simple and distinctive basis for conceptual design.

To begin, students worked individually to create autobiographical sensory-memory representations. Following this assignment, students worked in small groups to design wearable mnemonic devices. These informed the subsequent group design of memory-based interior spaces. This exploratory approach provides an understanding of memory as a construct, composed of emotions that continually influence cultural experience. Through physical modeling, students worked extensively to develop a concept that later served as a design generator for the residences and music center.

When designing and fabricating the mnemonic devices, students explored memory representations using multiple senses—sight, touch, taste, hearing, and smell. How does one visually represent an olfactory memory? How do haptic or auditory memories change the representation? How do these representations inform a built environment?

This emphasis on their own memories and the experience of designed places gave students a sense of agency, which allowed them to design more
empathically and critically respond to place and culture. Future design practice will be more open-sourced and less restricted by disciplinary territories and will require expertise, such as the method outlined herein, in areas of design outside of traditional architectural subjects.\footnote{9} This conceptual approach, rooted in the student’s empathic understanding of his or her own generation and the latent memories of their own past in a speculative future,\footnote{10} motivated students to excel in both the experiential and formal aspects of design.

**Pedagogical Approach**

The focus undergraduate interior design curriculum at the University of Tennessee, Knoxville shifts in this semester. Comprehensive design integration structured the studio, including design development and construction detailing. Past iterations of the studio disseminated very pragmatic work and focused primarily on the technical and aspects of comprehensive design. While sustainability-focused comprehensive studios comprise an indispensable part of design education, the curricular separation of experiential and technical design causes problems because students conceive of these design drivers as separate entities. The meaning of a comprehensive studio should broaden to include empathy and experience.

**Methods**

In this iteration of the studio, students must begin the design process by creating a memory-based sensory experience. This experience informed the final design project, a memory-care facility and music center set half a century into the future. Installations and apparatuses designed by students earlier in the semester shaped design proposals for the final project. In the first three weeks of the studio, a series of introductory design exercises required students to think about memory, its relationship to place, and the representation of those memories in spaces. Students designed autobiographical installations and mnemonic devices that creatively considered how others might have similar memory-based sensory experiences. Design proposals and technical details for the senior residences focused on the human condition, and how to reveal that shared experience to all (whether or not their memories persist). In this way, students formed a design concept based on an idea of collective memory in the everyday built environment.

**Mnemonic Devices**

There is a relationship between music and memory. A relationship between memory and the built environment also exists. As such, there is a relationship between music and the built environment. The Michael Rossato-Bennett film, *Alive Inside*, follows the work of social worker Dan Cohen and the Music + Memory Foundation. The film demonstrates that listening to music from one’s youth suppresses the effects of dementia and Alzheimer’s disease. Prescribing music as medicine revives a sense of self, combats memory loss, and aids in maintaining connections with loved ones by providing meaningful day-to-day interactions. We began with the study of music, memory, and design’s interconnectivity by watching this film.

As a way to reflect on the experiences of the people featured in the film, the students provided an autobiographical playlist, a list of ten songs that describe their life, songs that would provide the same kind of illumination if they someday suffered the effects
Empathy and Experience

of memory loss. While maintaining student anonymity, we compiled and shared the studio playlist. This exercise had two outcomes. The exercise demonstrated the breadth of cultural influences in Millennials and introduced empathy for present-day seniors suffering from dementia and Alzheimer’s disease.

Next, students designed a mnemonic device, specifically an instrument that aids in uncovering and preserving the autobiographical memories of the student through a sensory experience. Students used combinations of the five senses: sight, touch, taste, hearing, and smell in their designs. The autobiographical music playlists informed these abstract representations. Students used a variety of large format analog media to balance the primarily digital work later in the semester. To illustrate via one example, a student created a wearable memory box with her work entitled, Grandma’s House (fig. 3).

The apparatus blocks vision and emphasizes the auditory and olfactory experience. A hidden compartment contains mothballs and a windup clock, enveloping the wearer in the experience of being at her grandmother’s house. In the installation, Building Memory (fig. 1), the student secured two layers of bond plotter paper to the main corridor in the atrium of the Art + Architecture building. The two layers of paper covered the scattered vine charcoal fragments and with each footstep, the crushed charcoal mapped the direction and concentration of foot traffic in the building. These exercises, combined with the film and the autobiographical playlist introduced memory, time, and sensory experience to the students. The exercises reinforced identity, memory, and place, through a shared understanding of the student’s own identity and the youthful identity of the seniors in Alive Inside.

Memory as Concept

For the second exercise of the studio, students worked in groups to research memory, various types of senior residences, the Millennial generation, and the urbanity. They constructed an artifact that integrated this research. The analog work contrasts our digital world and the spatial and interpersonal implications of virtual reality, and the impact on place. Despite our society’s shifting relationship virtual and tangible spaces, research by Paul Eshelman and Gary Evans has shown that physical objects and relationships still provide the strongest connection to self-awareness for those with memory loss.11

The formal and systemic intentions behind the artifacts drove the final design concepts. For example, Looking Forward, Looking Back contains telescoping appendages with adjustable mirrors at the extremities (fig. 4). This

![Fig. 3 Mnemonic Device, Grandma’s House by Kristia Bravo](image)

![Fig. 4 Memory as Concept, Looking Forward, Looking Back by Sean McEahern, Rachel Mingle, Taylor Odom](image)
The wearable instrument permits concurrent observation of the entire spatial environment. The instrument gives the user the ability simultaneously to see where they will go and where they came from, a metaphor for memory and self-awareness. This group of students later designed the public areas of these senior residences with a focus on clear sight lines.

Analysis of Empathy and Memory

The success of the mnemonic devices and memory constructs could be measured in several ways, which would yield very different interpretations of achievement. For example, if the depth of application in the subsequent design project motivated the evaluation of the mnemonic devices, *Building Memory* would be the more successful of the two examples. This student studied palimpsest and applied this concept to the final project’s design concept and representation. If the integration of sensory awareness and empathy into the final design project measured success, *Grandma’s House* would be the most successful example. The auditory and olfactory experiences of the wearable device informed the final project. By wearing this visual barrier and mnemonic device, the user plunges into a deeply immersive experience providing an empathic connection with the designer. The tactile crushing of the charcoal and its visual effect on the paper defined the sensory experience of *Building Memory*. While this method has merit, the approach does not create a strong sense of introspective connection because these public acts do not engage the interiority in the same manner as a secluded auditory and olfactory experience.

Throughout the studio, we dedicated instruction to empathy and self-awareness in design. What is the most effective way to encourage empathy in an age group that some characterize as narcissistic? The empathy rubric used by the Japanese Cultural Community Center of Washington (JCCCW) provides a ranked list of qualities one needs for emotional understanding and connectivity. This tool can also be used to measure the empathy and awareness in students from this studio. In the JCCCW rubric, students may empathize in a several ways: a) fully empathizes, can cite personal connections, relates situations beyond themselves, b) somewhat empathetic, general sense of connection, may cite personal references, c) vague connection, unclear how relates to himself, d) may seem to understand, sees no personal connection or relation, e) demonstrates no understanding or link.

Based on the JCCCW measurements of empathy, these autobiographical reflections and the mnemonic devices promoted empathy through a reflection of one’s self—a secondary level of empathy because students cited personal references. A study by Erica Hepper, published in the *Personality and Social Society Bulletin*, supports this path to empathy. The study found that if organizers instruct narcissists to take the perspective of another person before an interaction occurs, empathy can occur. As such, empathic design stems from reflection based on autobiographical experiences. Later in the semester, students visited memory-care focused senior residences and interacted with people who have memory loss. Because of these visits, many empathized...
beyond their own experiences and related to the situations of others.

**Music, Public Spaces, and Memory**

These design research assignments set up a studio problem that required the students to consider themselves, their memories, and the relationship of their identity to society. By looking within ourselves, our experiences and senses, we gain a greater understanding of our collective identity. By acknowledging that seniors also were once teenagers, passionate about music and their friendships, students can imagine themselves fifty years into the future. This acknowledgment, paired with research into senior housing typologies and volunteer work at centers for seniors with memory loss, built empathy between students and senior population.

Students spent time with individuals with memory loss and observed how this condition influenced everyday interactions. Through the visits to the senior housing centers, students also observed and documented how caregivers modify the interior environment to aid in memory retention and engagement. Readings and precedent studies on senior residences supported these observations. Students analyzed “Dementia Village” in Weesp, Netherlands—an enclosed community for seniors who have dementia. The neighborhood simulates everyday urban life through intentional replication of familiar places: residences, grocery store, library, café, etc.15

Students also used the Empathy Tool Kit, developed by design professor Amy Huber.16 The Empathy Tool Kit contains a collection of wearable devices that simulate the physical effects of aging—goggles with Vaseline to simulate macular degeneration, packets of popcorn kernels inserted in insoles to mimic corns on the feet, layered latex gloves to simulate nerve damage on fingertips. Students wore these devices and completed a task in the Art + Architecture building to appreciate how a person suffering from dementia might be physically impacted by a poorly planned space. After using the Empathy Tool Kit, students engaged in reflective practices and researched senior housing.

![Fig. 6 Dining Area in “Orchestrating Space” by Cayla Adams, Kristia Bravo, and Alexis Jolly](image-url)
Following this exercise, the studio’s design provocation asked students to project themselves into a world in which they are seventy years old. In this world, the global population totals about seven billion and the United States population represents a minority-majority status. Americans over the age of sixty comprise about thirty percent of country’s demographic.17 Today, over five million Americans suffer from Alzheimer’s or dementia. Two-thirds of Americans with Alzheimer’s are women.18 By 2050, if nothing changes, between thirteen million and sixteen million Americans will have Alzheimer’s disease.19 Students imagined a world in which the United States has a publicly funded healthcare system, providing access to safe, affordable housing for seniors with memory loss. How might senior residences change in the next fifty years – due to these socio-political forces? Students imagined a world in which seniors integrate into society, where younger people visit congregate living centers because of a shared interest in music and the arts, a place where they thrive because of these shared connections.

The site, an iconic high-rise tower in Midtown Atlanta, brings together diverse populations of the city. Georgia Tech, public transit, housing, retail, and office spaces comprise several of the adjacent program features near the Bank of America Plaza. Despite its centralized location, the tower is essentially an empty shell and functionally obsolete.20 After the real estate bubble of 2008, Bank of America reduced in size, leaving the majority of the building empty. Nearly a decade later, vacancy rates still hover at over fifty percent. Completed in 1993 and designed by Roche and Dinkeloo, the materiality of the tower exemplifies the excesses of production and consumption in the late ‘80s and early ‘90s—perhaps one of the reasons for its vacancy rate in our current era of austerity, remote work, and flat corporate hierarchies.

These site constraints exacerbate the urban issues and new workplace paradigms found in the project brief. During this time, the Millennial senior population will be a large age-group in American society. If we have these three conditions: a) Millennial seniors who have always preferred to live in the city, b) partially vacant Postmodern towers and c) an unmet need for memory-care senior residences, then one solution could be memory-care senior residences inside former corporate high rises. These residences would have a community component that removes isolation from society as a whole. With this project framework and newfound empathy in hand, students began work on the project.

One student group collaborated on a design that orchestrates memory activation via architectural elements that have interactive and musical properties. The interactive, music-making architectural elements ignited the senses and memories, in the same way that the Alive Inside film demonstrated memory activation through music. The main circulation path of the space connects a series of activity stations. These spaces engage the individual in experiences that relate to nature, music, physical and creative activity activities. By activating sound, smell, and touch memories and experiences will be intensified. Partitions that act as wind chimes, quiet zones for enjoying music, and practice areas for resident musicians create opportunities for interactive engagement between seniors and the architecture.

As a strategy to maintain vitality in seniors with memory loss, research recommends that designers provide a variety of types of social spaces in senior housing.21 As such, the project brief includes a live music venue for the enjoyment of the public and the residents. Live music serves two purposes, engagement with society and memory activation. Because of the depth and clarity of the design research in this group project, these students received a EURēCA award for excellence in undergraduate research.
Empathy and Experience

Domesticity, Private Spaces, and Memory

The final phase of the studio focused on the design development and construction detailing of the residences. Of the private residences of the earlier group project, students chose a residence to design and detail. Students worked as individuals on this phase. They utilized the frameworks established in the earlier phases and applied the same thinking to the private domestic spaces. In many cases, students found it helpful to construct a narrative about the individuals living this particular residential unit and customize the designs accordingly. In other cases, students focused on the design of a modular framework, customizable by the various people that will occupy the residence over time. Because the final phase prioritized design integration and construction detailing, we permitted both approaches. However, students who used a systemic approach rather than an empathic approach received less enthusiastic critique from jurors at the final review. Critics questioned the rigor, details, and intention in these modular projects on more frequently.

One of the student designers of the Orchestrating Space project continued to research the interactive architectural elements that engage seniors and activate memories. These interactive elements minimize wandering behavior, a common symptom of Alzheimer’s disease and related dementias. Since private residential areas, also serve as contemplative spaces, the emphasis shifted away from an atmosphere that ignites to an ethereal, meditative atmosphere. Research shows that seniors who live in congregate living environments report positive feelings about their living arrangements if they can regulate their sense of privacy and adjust the ambiance of their private space.23 The student intended to create a comforting and meditative space while still activating memories. She designed an interactive partition system that informed the spatial organization for the two-bedroom residence. The ephemeral quality of the finishes and architectural volume allows for a sense of privacy while still providing transparency and access to views. The partition system fills the surrounding spaces with ethereal percussion-like music. This sound producing partition engages and comforts residents suffering from Alzheimer’s disease and related dementias.

Conclusion

By emphasizing empathy and experience, design students more effectively design residential and communal spaces which acknowledge the wide-ranging needs of seniors with Alzheimer’s disease and the related forms of dementia. P.A. Muetzel, a nursing educator, developed a praxis for teaching therapeutic relationships in nursing curricula. Muetzel described therapeutic nursing as the integration of partnership, intimacy, and reciprocity.24 Empathic design also occurs at the intersection of these three related elements. Instead of using Muetzel’s terms, the empathic design categories could be “experience-based research, sensory awareness and design integration”. By encouraging students to take the perspective of an individual with memory loss, they can become better designers. We can simply ask “What does it feel like to have dementia?” “What would you do or think if you lived here?” or “How would you like to be treated if you had dementia?” Design pedagogy with an empathic focus, even with an autobiographical basis, forges a stronger connection between human-centered design and student learning.
Notes


18. “Alzheimer’s News: Women in their 60s twice as likely to develop Alzheimer’s disease over the rest of their lives as they are breast cancer,” Alzheimer’s Association, March 19, 2014, http://www.alz.org/news_and_events_women_in_their_60s.asp


Promoting Occupational Engagement in Design Education: Accounting for Doing, Being, Becoming, and Belonging

James Thompson, University of Washington

Introduction

Conceptualizing education as a meaning-making process serves to reorient teaching, learning, and research activities around notions of personal and professional development in more holistic and humanistic ways than conventional approaches. Instead of “receiving an education,” students get recognized as enacting a form of agency by engaging in self-growth while they weave educational experiences into broader personal narratives. Such a perspective is genuinely student-centered in that it more accurately captures the ways that education gets experienced as a progression of embodied, social, and psychological encounters. By considering how learners experience education as a process of ontological change over time, these significant dimensions—often neglected or considered secondary by conventional pedagogical practices—become foregrounded. Only when, as educators and researchers, we elicit and attend to such narratives, do learners become true protagonists of education. Whereas this understanding of education is supported by decades of research across disciplines and learning contexts, it has so far not been operationalized widely in applied research on design education.

The project reviewed in this paper, a recently completed case study of a graduate architecture program, imported and adapted the notion of “occupational engagement” from the field of occupational therapy as a way to capture the multidimensional nature of education as a holistic meaning-making process. Occupational engagement has been recognized as the interplay of doing, being, becoming, and belonging. Analysis of narrative content from in-depth interviews suggested that meaning-making occurred when all four dimensions of occupational engagement were expressed as an interrelated whole. Additionally, agency, autonomy, and psychological resilience were identified as themes centrally tied to narrative strategies these aspiring architects used to align their personal and occupational identities. Ultimately, reframing design education as falling within each participant’s broader life history elicited a considerably holistic perspective of becoming-an-architect by including human facets rarely considered in scholarship on design education. The expectation is that these insights can begin to inform educators and researchers seeking to reframe and improve delivery modes and outcomes of design education starting at the beginning of the curriculum.

Literature Review

Past studies on architectural education exposed certain integral characteristics that often go unnoticed but are perpetuated nonetheless through its particular cultural and pedagogical practices. Dutton described how architecture’s “hidden curriculum” tacitly plays out through the power-laden social dynamics of the studio, revealing the inescapably political nature of curricular and pedagogical practices.1 Willenbrock’s autoethnographic account of being an architecture student conveyed how student agency is a central aspect of design education despite being overlooked in most scholarship.2 Surveys with architecture students over the years have illuminated the pernicious myths that continue to frame expectations and the experience of studio culture.3 And Bachman and Bachman theorized how architecture students psychologically justify their efforts and unhealthy lifestyles.4 Finally, in her seminal text on architectural practice outlining the “metamorphic transformation of layperson into architect,” Cuff presented the field as a set of dualisms that get manifested by its members who, in their daily performance as practitioners, “tacitly cope” with the “fundamental discrepancy between the stated beliefs of the profession and the everyday work world of architectural practice.”5 This body of literature remains central to our theoretical understanding of architectural education as a complex social process of cultural reproduction. However, very
few empirical studies have examined this theme from the perspective of aspiring architects themselves—and fewer still have done so across the school-to-workplace divide as the study reviewed here did.

In addition to past research on design education, the theoretical basis for this study was drawn from three primary strains of scholarship: the ontological turn, the narrative turn, and an occupational perspective on health. The two “turns” served as theoretical frameworks, whereas the latter strain of scholarship was employed as an analytical lens for interpreting the study’s narrative results. Together, these offered a set of complementary concepts that supported a holistic orientation toward education and suggested particular methodological approaches to the study.

The recent ontological turn proposes that higher education ought to be positioned in such a way as to promote human character development, as opposed to focusing so heavily on cognitive or skill development. The central claim is that focusing on teaching and learning alone or in a limited way blinds educators to the more holistic dimensions and objectives of education that reflect the kind of ontological growth necessary for thriving in the contemporary context. Thus, the ultimate recommendation is to reframe teaching and learning practices in ways that cultivate graduates with the kinds of attributes that prepare them for a world where one’s character is more predictive of success than the acquisition of particular skills or knowledge.

Traditionally, design education has been scaffolded primarily around a certain base of knowledge and skills as foundational learning outcomes. To incorporate an ontological perspective, the task would be to structure formative learning experiences in ways that cultivate dispositions in graduates identified as central to contemporary practice: to become professionals who can sustain their empathy, curiosity, humility, and passion amidst an environment of radical complexity and uncertainty. The fact that such a perspective has yet to gain wide acceptance in design circles is arguably not because of any cultural incompatibility. However, identifying and encouraging meaning-making requires a broader and more holistic scope than typically employed in research in design education. Thus, new methodological and analytical approaches are necessary to apply such an understanding.

This study also borrows from scholarship on narrative that considers the telling of life histories as an identity performance and meaning-making strategy. Narrative is understood as a way that individuals make sense of themselves—as both relatively fixed and relatively mutable—in relation to their day-to-day life and social context by assembling into a coherent whole reflections on themselves, their experiences, their and visions of the future. This performative and sense-making notion of storytelling has a longstanding tradition within the field of architecture, with some scholars even arguing that architecture and narrative are analogous modes. Drawing upon certain perspectives and concepts from the narrative turn became a way to operationalize this disciplinary tradition for the particular aims of this empirical study.

From the field of occupational therapy (OT), the “occupational perspective on health” offered an additional, adaptable framework for conceptualizing architectural education in more holistic terms than conventional approaches. For occupational therapists, the term “occupation” does not refer merely to one’s job title or career path. Rather, it implies how one’s everyday activities and commitments inform one’s holistic sense of self, and vice versa. In the ways that it encapsulates daily educational activity (doing), personal identity (being), a sense of belonging to the design community (belonging), and the perceived potential for personal and professional growth (becoming), professional design education can be understood as functioning as an occupation in this sense. When OT scholars use the term “occupational engagement,” they are referring to the interrelated nature of all four of these dimensions: “Engaging in occupation requires that we perform activities and occupations (doing) that meet the needs of both ourselves (being) and others (belonging), that we can learn from and build upon through time (becoming).” Considering the interdependent dimensions of doing, being, becoming, and belonging therefore becomes a way to structure design education as a holistic pursuit with ontological implications. Likewise, narrative offers a way of foregrounding the ways that individual learners make sense of this process by relating the four dimensions of occupation into their personal life histories. In this study, the following definitions were developed from interview content to suit architecture’s disciplinary and pedagogical context.

**Doing** included active engagement in meaningful educational activities, from the singular to the recurring. In this study, doing most commonly referred to the broad set of mental, social, and physical activities related to design, whether in an academic studio or a professional office environment. It also covered activities associated with the rest of the curriculum—such as researching a topic for a paper—as well as extracurricular or quotidian activities—
such as going to happy hour or commuting to campus. In an office context, *doing* also included tasks not directly contributing to design projects.

**Being** referred to notions of social and occupational identity, or who someone “is” under various roles like student, intern, or licensed architect. It also covered identity traits associated with factors like gender, race, and sexual orientation, as well as statements made like “I’m someone who likes to draw.” Personal interests, insofar as they form part of one’s identity, therefore link *being* and *doing*. And just as *doing* includes “what architects do,” *being* also includes general statements about “what it means to be an architect” or the predominant personality traits, interests, and backgrounds that participants felt were embodied by the architectural community writ large.

The dimension *becoming* denoted aspects of human growth and development, or the more mutable nature of identity. It included reflections on the past (“I became a different person”) as well as aspirational futures (“I want to become self-sufficient”). In either case, *becoming* related at least two points in time and expressed a shift from one state of being to another. *Becoming* was also evoked in provisional, conditional, and unknowable aspects of the future, in statements like “Someday, I think I’ll want to…” or “I can’t predict the next few years…” In such statements, participants expressed a certain orientation toward the future and their place in it (i.e., as optimistic, skeptical, or apathetic). In this sense, the notion of *becoming* was very much tied to agency, as it evoked how individuals felt more or less able to author their growth and determine their future selves.

**Belonging** referred to the relative sense of connectedness one felt at various scales of community. Intimately tied to one’s social and environmental context, *belonging* was not simply a description of that context. Rather, one’s social context was evoked through reference to sensations and relationships that marked entrance into communities (acknowledged or otherwise) and passing from one community to another. Statements of *belonging* frequently evoked feelings of relative acceptance or ostracization. It also took on a more active dimension, when participants described forming sub-communities. In this way, *belonging* can illuminate thresholds, access, and barriers to membership in the communities encountered throughout an individual’s life history.

**Methods**

Adopting transdisciplinary concepts and approaches, the study was designed as an exploration into ways of eliciting, representing, and examining narratives that might evoke the broad range of experiences that constitute an architectural education today. In this case, a single academic program provided a shared context for the twelve participants, who were selected to fall within three cross-sectional cohorts to represent several points along the timeline of professional development—current students, recent graduates, and emerging practitioners. As a site of inquiry, the University of Washington’s Masters of Architecture (M Arch) program was considered representative of the “integrated” model of professional education. Quickly becoming the standard in the Anglophone world, in this model, students complete professional programs having opportunities to develop and experiment with their professional identity, whether through internships or other formalized opportunities. In the case of this program in particular, most students expect to, and ultimately do, gain employment in local design firms soon after graduation, and most eventually obtain professional licensure. In this sense, then, the program is also representative of an educational model wherein academia and the local professional community operate in a cooperative arrangement: the school provides the profession with graduates able to immediately contribute to design production, and the profession supplies the program with a sense of purpose of cultural legitimacy.

Participants were selected using convenient sampling with an effort to achieve a certain level of diversity. Participants in the two alumni cohorts were interviewed using an in-depth, one-on-one format over three sessions, whereas the cohort of current students participated in two focus group sessions. Interview protocols explored the decision to pursue architecture, as well as formative episodes that shaped the experience of architecture school and entry into professional practice. Finally, participants were asked to describe whatever issues they believed to be most pressing currently facing the profession. The underlying objective of these topics was to be able to examine the content of ensuing narratives to elicit how aspiring architects glean personal meaning—and ultimately a sense of occupational identity—from their experience of education.

Following transcription, ensuing analytical steps involved assembling and reducing each participant’s responses into a coherent narrative and then identifying and interpreting evocative passages deemed relevant to themes of meaning-
With interview protocols providing a structural point of departure, narratives tended to be organized around the following themes: entry into architecture; formative experiences; identity transformation; struggles, transitions, and turning points; and investment and membership in the professional architecture community. The framework of occupational engagement then provided an additional lens to interpret narrative content by considering how participants evoked an interrelated conception of what they do, who they are, who they are becoming, and their sense of existing within the community. Passages with content expressing three or four of these dimensions corresponded with those previously marked as “content rich,” substantiating this label. Below is one such passage of dialogue from an interview with Monica, a member of the emerging practitioners cohort, with phrases marked as expressing one or more dimensions of occupational engagement. When Monica entered architecture school, she immediately identified with the marginal and tangential vectors of the discipline. In this passage, she reflects on her place in the architectural community now that she finds herself becoming one. In terms of themes related to meaning-making and occupational identity, this passage is particularly rich in content.

You mentioned [in a previous interview] feeling between communities. What did you mean by that?

I sort of meant that... even once I get my license, I'm not sure I'm gonna feel like “an architect.”

In school here, I felt like I was part of the broader university community and at times felt like I was well-entrenched in the departmental community. But also just felt like I wasn't quite as there as other people. That I either wanted or was looking for ties to other things that weren't just this, in the professional creative sense.

I could just be a hundred percent “Yay, architecture! Yay, architects! I am one!” But it doesn't feel like a natural fit to say that or buy into it to that degree. I guess... I feel like I hit a wall with architecture at a certain point. And I get to that place, and then I need to go elsewhere for creative inspiration or whatever.

But do you tend to view it more in that sense that there's this thing and you're around the edge of it? As opposed to you [saying], "I'm redefining what it means to be an architect?"

Well, I hope it's that! That would be great.... [But] it feels really inflated to say that I'm doing that... I definitely don't think that on a regular basis. I feel like I approach the discipline and the profession in a way that makes sense for me, and I hope that I encounter people that feel similarly or similarly different about it. It's not that we even have to have the same approach, but just finding people out there who are doing something different than the party-line of how you do architecture. And I did find people like that here! Other students or faculty members who had a vein of dissonance in whatever they were doing. So I don't feel like I'm the only one or like a 'trailblazer' or anything like that. But it's something that you're doing, and you don't really know what you're doing, and you're just kind of trying to do it to do what feels right for you, and you hope it gets you somewhere productive and interesting. And if it's productive and interesting for other people then that's even better! But I don't know. Maybe I should have a more conscious understanding of what I'm doing, but I feel like I don't, really...

I keep wondering if I'm gonna have an epiphany moment where I'm like, "I know exactly what I want to do, and how I want to do it!" And sometimes I think that would be really nice, but I don't know if it's gonna get to that point. I mean, even when I took this job, I had applied to so many places. I sent out like thirty applications before I sent this one out. And none of them was really excited about me. I mean, they were all places that would be "good" to work, y'know?... But this was the first one that felt like any sort of match, that felt like something where I knew I could contribute something that wasn't being contributed. And I think I'll stay here as long as I feel that way. But if it stops feeling that way, then it'll be time to do something else. But I have no idea what that would be! And I really wish I did! 'Cause I have no five year plan! Y'know, 'Where do you see yourself in five years?' I'm like, 'I don't know. Employed hopefully. Hopefully.'

But you still mentioned that if and when you get licensed... you wouldn't really feel like you're an architect, in some sense.
Yeaa! I don’t know. ‘Cause there are things about it that I probably still won’t like, y’know? There are things about the job that I think kinda suck! And I know a lot of talented people that have a lot of great ideas that started off in architecture and have gone completely different directions. And part of me wonders like, ‘Did they have the right idea? Why am I force-fitting myself into something that isn’t a perfect fit?’ But maybe they wouldn’t have left if somebody that shared their perspective had stayed. So yea, I guess I do have this broad, vague, somewhere-in-the-future desire to expand what it means to practice in some way. In some very-small-corner-of-the-world way.

But you don’t want to fit into what you think a typical architect is, so that’s perhaps why you’d feel uncomfortable about being titled?

I don’t wanna drink the Kool-Aid, y’know? I don’t wanna wake up one day and be the entity that I was criticizing ten years ago. I do want a paycheck! I do wanna continue to be employed. But yea, I don’t know. I think it’s just gonna be largely about finding avenues on which I can actively be that and challenge it at the same time.

And I feel like I’m working for someone now that is doing that, in some ways. And I feel like there’s something to learn from that, and that I can sort of take what she has done and learn from that and figure out what that might mean for how I could do something similar.

**Discussion**

The passage illustrates the kind of meaning-making that study participants evoked in their narratives. As participants navigated the different social and pedagogical contexts of their education, they encountered architecture in its various forms—as the physical built environment (prior to becoming an architecture student), as a mode of doing/making/learning and as a social/disciplinary community (as architecture students), and then as a professional field (as practitioners). As these various forms get encountered in progression, they accumulate into a sense of architecture as a multivalent occupation, necessitating meaning-making strategies in order to calibrate one’s sense of self against disciplinary norms and expectations. This means revising one’s personal narrative to justify a sustained passion for professional design practice that can overcome the inevitable periods of cynicism, apathy, and malaise.

Reasons for pursuing architecture largely centered on wanting to contribute to the creation of meaningful places. The noble quality of the architect as a social figure remained a powerful motif, though the professional title itself was not necessarily a significant draw. Like so many aspiring architects of this and past generations, participants referenced the desire to “make a difference” in terms of contributing to projects of social and environmental justice. Indeed, recruitment strategies for architecture programs have elevated “making an impact” to one of the chief selling points of an architectural education regardless of whether or not graduates choose to become licensed design professionals. The foregrounding of “why questions” as a motivator for entering the discipline, which run parallel to discourse marketed by architectural education, raised certain points of tension throughout participant narratives. As students, participants faced instructors who they felt hampered their ability to explore such questions, typically by restricting design projects to primarily formal or technical considerations. Participants generally believed that school was an opportunity for aspiring architects to orient their internal compass and find their “voice” as a designer, by exploring how their personal interests might inform an approach to the design process. Once in professional contexts, they found themselves looking for opportunities and outlets to enact their agency as a designer. Oftentimes, this meant shifting their perspective towards design to identify meaning in quotidian tasks or engaging in projects beyond the realm of design familiar to them a students. A central thread running through participant narratives, therefore, was grappling with how the desire to “make an impact” plays out in the various pedagogical and social contexts of architectural education.

Generally, the experience of architecture school was expressed as an ebb and flow of self-doubt and empowerment. Participants would periodically question their commitment to architecture only to find themselves regaining a sense of occupational purpose. Unsurprisingly, the emotional attachment developed in relation to studio projects lay at the forefront of this oscillating rhythm. Navigating such a rollercoaster-like experience required a certain level of psychological resilience, social support from peers and mentors, and/or inspiration from role models. Alternative pedagogies like collaborative design projects, research and thesis studios, and studying abroad were identified as the most formative in terms of finding one’s “voice” or orienting oneself in relation to professional norms and values. When participants recalled questioning the investment they had made in their career path, these were oftentimes periods when school activities felt disconnected from ethical concerns and their personal values.
Consistently, participants attributed opportunities to grapple with “why questions” through studio and research projects as critical to sustaining their sense of architecture as consequential and personal fulfillment. In these moments, they were not simply making sense of their education by acknowledging the merit of its content or methods; rather, they were relating their activities (doing) to their sense of themselves (being) and an imagined future role (becoming) within the professional community (belonging).

The dualistic and oscillating challenges of architecture school also came in more conventional forms, such as: the demand that aspiring architects disconnect from the outside world and public life even as they design for it; that they develop time management skills even as projects demand their complete, round-the-clock immersion; and that they dedicate themselves to fostering the social community of studio even though sustained productivity often entailed finding working environments outside the physical confines of the studio. In each of these cases, participants recalled that their reaction made them feel either more or less like a stereotypical architecture student—or more less a part of the dominant architectural community. What was somewhat surprising, though, was that participants acknowledged rarely discussing these sentiments with their peers. The psychological challenges of becoming a professional designer—which indeed may be the greatest challenges of design education—went largely unspoken, as inner reflective monologue.

The transition into professional practice spurred additional moments of self-reflection. Interns and graduates sought to get the lay of the land in terms of how particular professional contexts and modes of practice may or may not align with their architectural values and burgeoning design sensibility. Internship opportunities during school generally served to demystify aspects of professional life in the minds of participants. Having spent time working in local firms, they ostensibly would enter the profession after graduation with a narrower gap between their perceptions/ideals and the realities of practice. As students, participants already considered the kind of projects, firms, and professional roles that might best suit their interests and personal values. Some had placed certain limits on their future positions, like a firm’s size, predominant project type, or philosophy. But others seemed to prefer letting their futures unfold more organically. What was consistently expressed was a “fear of specialization” and the complementary desire to engage in all aspects of the design process. When describing entry into the professional workforce, narratives evoked a sense of humility—that an aspiring architect must “put in their dues” and learn certain skills unattainable in academic contexts before they can enact any genuine agency as a practitioner. Still, as students, participants had become so attuned to receiving positive reinforcement (from themselves, mainly whenever they were able to glean a sense of fulfillment and hold back latent feelings of anxiety and self-doubt) that they began their positions as emerging practitioners searching for opportunities to continue doing so. This often meant daydreaming of alternative futures or shifting one’s perspective towards their day-to-day work in order to justify it as meaningful—either for them personally or for future users of the designed environment.

**Conclusion**

The study outlined in this paper broadens our notions of design education by illustrating the ways that it can be considered an ongoing process of meaning-making that individuals engage in over the course of their lives to construct and maintain their occupational identities. The content of participant narratives from this study suggests that navigating becoming-an-architect requires meaning-making that incorporates all four dimensions of doing, being, becoming, and belonging in ways that form a holistic framework of occupational engagement.

No one enters a career path with a complete or accurate understanding of what it means to be the kind of practitioner they are seeking to become. Navigating a pathway of professional education, and ultimately investing in that career, means grasping the problematic nature of this transformative process and recognizing one’s agency in it. This includes acknowledging that one’s identity is shaped by doing certain discipline-related activities, adopting and/or challenging certain discipline-related ideologies, and belonging to various scales of the disciplinary community. Reflecting on one’s architectural education becomes a way of writing a personal narrative that can incorporate significant learning experiences, thereby gleaning meaning in ways that can help construct an occupational identity. Ultimately, laypeople do not become architects by simply graduating from architecture school, logging hours of work at a firm, and passing an exam that tests their competencies in disciplinary skills and knowledge. Rather, they join the architectural community by engaging with architecture across temporal scales and social/pedagogical contexts, encountering it as an “occupation” through various modes of engagement until they are able to construct an occupational identity coherent to themselves and others. Even once they have achieved this much, they must continue developing strategies to maintain their identity by revising their
narrative and continually recalibrating their identities in relation to their social context and developmental trajectory.

How might this holistic understanding of education help structure curricula and student support initiatives? If the goal is for students to develop a sense of occupational engagement that supports positive growth and is personally meaningful, as it should be, learning objectives must be structured to not only include the four dimensions of doing, being, becoming, and belonging—but to do so in ways that suggest the interdependent nature of all four dimensions. For instance, aspiring architects might be tasked with considering the following: How do the activities in which I am involved inform who I am and what I want to become in relation to the architectural community in which I find myself? Assuming that doing design activities alongside experts and peers will result in becoming a “good” designer or lead to a sense of belonging to a supportive or empowering design community is not necessarily a fallacy—but it overlooks the substantial psychological effort involved in the meaning-making process. Any understanding of student agency must account for the broad set of factors that constitute education, as they are central to how meaning and occupational identity get constructed and sustained.

One of the difficulties of addressing such a holistic framework of education, of course, is that no single educator can be reasonably held responsible for supporting students across all these dimensions over long stretches of time. Practically speaking, this returns us to notions of autonomy and agency, to ways of supporting aspiring designers in their meaning-making and the writing of personal narratives. Design portfolios, as a reflection of one’s occupational identity, offer an existing point of departure. The conventional application of a portfolio could be expanded to include more reflective/narrative opportunities beyond design projects themselves in ways that can express the holistic nature of occupational identity and growth over time. Extracurricular opportunities like mentorship programs and student advising could also be better integrated with one another so that aspiring designers are supported throughout and beyond professional curricula.

The dearth of research in this area—or studies that take into account the authentic and holistic experience of students as agents in disciplinary reproduction—calls for further exploration, both to increase our understanding and to continue exploring methods appropriate for doing so. Because most studies on design education tend to focus on specific courses or pedagogical formats, we continue to lack a more comprehensive model from which to base teaching practice that can integrate extracurricular and psychosocial experience. Yet the desire to become more student-centered remains limited until educators form a more complete picture of design education and consider the perspectives of those presumably at its center.

Notes

10 Hitch, Pépin, & Stagnitti, “In the Footsteps of Wilcock Part Two,” 258.


12 The cohort of current students, all in the three-year track of the program, were interviewed twice in a focus group format between their first and second year—before and after their summer internship. The recent graduates had completed their degree requirements within two months of their participation in the study. The emerging professionals graduated six to eighteen months prior to participating in the study, and each was employed in a local design firm at the time of being interviewed. Interviews with four full-time faculty members provided additional perspectives on the program’s features and cultural character.

13 Each participant cohort consisted of two males and two females. Other identifying factors that seemed to contribute to narrative content included: age, ethnicity, cultural background, and living situation. But, rather than foregrounding these factors myself, I was determined to allow each participant to define the contours of their story.

14 Participant profiles were shared with respective participants for feedback.

15 This phrasing can be found at www.studyarchitecture.com, a website run by the Association of Collegiate Schools of Architecture, which goes on to state: “Regardless of how you choose to study architecture, your path will certainly lead you toward a fulfilling place. You’ll make an impact. Whether you’re designing greener urban center, building smarter classrooms, helping to solve environmental challenges, creating art in three dimensions, or helping the next generation explore the wonder of the built environment, you’ll make a difference in the world around you.”

16 This could be attributed to the fact that, traditionally, architecture programs do not promote specialization.
New Frontiers in Teaching Parametric Design and Digital Fabrication

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1. Introduction

One of the fastest developments in design disciplines, particularly architecture, is the continuous introduction of a wide range of digital tools and techniques. Consequently, especially within the past three decades, teaching digital design capabilities has gained growing emphasis in architecture schools’ curricula. Teaching digital design capabilities traditionally focuses on skill building, with a focus on software learning. This process primarily takes a tutorial approach to teach digital design capabilities: students learn how to execute a series of commands with a given software package, and then utilize this new skill towards production of drawings, renderings and alike for their design projects (Senske, 2013). This is primarily due to the fact that up until early 2000s, the notion of digital design has primarily covered using digital media as another tool towards production of technical drawing or representation.

Since early 2000s, however, two developments in the design realm have introduced significant changes and capabilities to the design process: parametric design and digital fabrication. Both developments have helped move the focus of digital design from production to the design process. At this point it will be helpful to clarify the terms parametric design and digital fabrication.

1.1. Parametric Design

Conventionally, both in analog and computer aided architectural design, parts of design are added, subtracted or edited in drawings. The changing of a part of a design does not automatically affect other parts of the design. In parametric design software, however, parts of the design relate to one another, and affect one another in a synchronized manner (Woodbury, 2010). As the designer edits parts of the design, they can observe the impact of those changes on other parts of the design simultaneously. Thus, parametric design brings in a new mode of thinking where the software becomes more than a production tool, but a digital thinking medium.

1.2. Digital Fabrication

Digital fabrication tools operate on four main principles: cutting, subtraction, addition and formation. Cutting tools (i.e. laser cutter) use digital data to move a cutting mechanism, cutting out the required shapes out of a flat material. Subtracting tools (i.e. computer numeric-controlled, or CNC routers) use digital data to move a milling mechanism, subtracting material from an existing solid material. Adding tools (i.e. 3d printers) use digital data to move an adding mechanism to build up material in layers. Forming tools (i.e. vacuum form) use mechanical force to help deform an existing material into a desired shape (Dunn, 2012). While providing rapid production capabilities through a variety of tools, digital fabrication also contributes new ways of thinking in the design process in two ways: (i) the designer can now build fast physical study models which can impact the design development immensely, (ii) the interaction between design software and digital fabrication hardware, as well as the digital fabrication principle (i.e. additive vs. subtractive) requires new modes of thinking, where the designer needs to keep production in mind while designing.

1.3. Teaching Digital Design Today

Both parametric design and digital fabrication contribute to the development of more accurate as well as complex design propositions. However, to what extent students gain capabilities to fully utilize the capabilities of digital design is another question. A quick review of student work in many architecture
schools today reveals cases where the student is not in control of the software and hardware. In such cases, the projects may present interesting and complex forms, but do not perform well in conventional terms, such as programmatic relationships, environmental control systems and structure.

To maintain and increase the design quality and expand students’ learning, new approaches to teaching digital capabilities are required, in which software and hardware are not perceived as “production tools” but “design media”. Wing (2006) refers to this capability as computational thinking. Computational thinking enables the designer to understand the fundamental working principles of the software and hardware (Senske, 2014), thus utilizing parametric design and digital fabrication as integral parts of design development. It introduces a departure from approaching the use of digital media as “tools” in a linear fashion where design is more or less completed before digital software and hardware gets in the picture.

1.4. Current Approaches to Teaching Digital Design

How can we teach digital design capabilities so that students understand the fundamental working principles of the software and hardware available to them? This question is crucial especially for teaching parametric design and digital fabrication. In an attempt to answer this question, Senske (2013) proposes a number of techniques in content delivery and exercise design. Although not widely tested, it will be useful to briefly review these proposals at this point. These techniques can be categorized under content delivery and exercise design.

1.4.1. Content Delivery

Inquiry based learning, as opposed to linear skill building proposes that a problem is introduced, and students are encouraged to seek information to solve this problem. This technique differs from linear skill building in the sense that, students are not directly exposed to knowledge, but are encouraged to search for, and integrate knowledge (Senske, 2013).

Inverted curriculum, as opposed to in-class skill building proposes that students study the material online before class time, and class time is used for problem solving. An example of this technique is to assign students to watch online tutorials prior to class, and working on problem solving and inquiry during class time. This technique differs from in-class skill building in the sense that delivery is “inverted” to before class time (Senske, 2013).

1.4.2. Exercise Design

Pair programming, as opposed to individual exercises proposes that students work on problems in pairs, instead of individually. While one student operates the equipment (i.e. the computer), the other student provides guidance and feedback. Students exchange roles in certain intervals (Senske, 2013).

Scaffolded exercises as opposed to linear process exercises (Also referred to as “reverse engineering”) proposes that instead of starting from scratch and moving towards a described product, students are given a product and propose a workflow to reach that product (Senske, 2013).

1.4.3. Integration of Rapid “Making”

Although these new techniques of content delivery and exercise design are worth considering, they have not been widely tested in teaching digital design. In addition, these techniques do not explicitly attempt to integrate the capability to rapidly “make” things using digital fabrication methods. This may be due to the fact that in many architecture schools there are central digital fabrication facilities, and students usually “submit” a digital fabrication job after finalizing the software stage. However, learning computational thinking can be significantly advanced by integrating “making” into these delivery and exercise design techniques. By being able to digitally fabricate incrementally, and through a back and forth process between software and hardware will expose students to immediate problem identification, thus further emphasizing search for information and learning by doing.

2. Research Objectives, Methodology and Methods

The proposed techniques of content delivery and exercise design in current literature, as well as the integration of rapid digital fabrication into these techniques have not been widely tested. Existing literature does not provide substantial evidence in the sense of evaluating the advantages and disadvantages of these methods. We are in early stages of development in parametric design and digital fabrication arenas. Given the current educational context discussed above, it is important for architecture schools’ curricula to respond to these developments by teaching parametric design and digital fabrication so that students gain an understanding of the fundamentals of software and hardware. In the given context, the current research asks three fundamental research questions to enhance architecture students’ learning in parametric design and digital fabrication arenas.
1. What are the teaching techniques used in today’s architecture schools (content delivery, exercise design, integration of making) for parametric design and digital fabrication? In the existing literature, problems are identified and some proposals for change are provided. However, there is no current “map” of the existing conditions for teaching parametric design and digital fabrication across architecture schools. An inventory of current teaching practices is needed, if we are to continue developing and testing new techniques.

2. Which in-class teaching techniques are most efficient in teaching computational thinking towards parametric design and digital fabrication? So far reviewing the existing literature, we have seen conventional, linear delivery techniques as well as proposed ones. However testing of these techniques is limited in existing literature. It is important that we have a clear understanding of the advantages of these techniques, as well as others that may surface when an inventory of current teaching practices is developed.

3. What are the information horizons of students when it comes to finding information towards developing parametric design and digital fabrication capabilities? Not all learning happens in class. Given today’s advanced information technologies and our exponentially growing access to information, students can gain information from many online resources. Further, research indicates that individuals’ information horizons are far beyond books and online resources. Face-to-face interactions with friends, peers, social events can all act as information sources for students, expanding individuals’ information horizons (Sonnenwald, 1999). In this context, students can also learn incrementally from the internet, interactions with peers, peer social events such as workshops. If we are to make informed decisions about teaching parametric design and digital fabrication, we need to know about the breadth of students’ information horizons, and how much knowledge they get from each information resource available to them.

2.1. Methodology and Methods

The current study utilizes a multi-method strategy to seek answers to the research questions introduced.

To address research question one, the author has started conducting in-depth interviews with faculty teaching parametric design and digital fabrication in NAAB-accredited architecture schools in California. The in-depth interviews address the techniques each faculty uses for (i) content delivery, (ii) exercise design, and (iii) integration of making in their parametric design and digital fabrication classes.

To address research question two, in-depth interviews on student perceptions have been conducted with the author’s parametric design and digital fabrication students. The author teaches a 400-level elective in a NAAB accredited architecture school, titled Advanced Computer-Aided Digital Fabrication. As a part of the current research project, the author has started to systematically introduce new teaching techniques in (i) content delivery, (ii) exercise design, and (iii) integration of making into this parametric design and digital fabrication class. At the time this paper was written, in-depth interviews were conducted with a group of students who took this class.

The interviews addressed students’ perceptions of: (i) the advantages / disadvantages of each technique, (ii) aspects of the introduced techniques that contributed to their learning, (iii) the advantages and disadvantages of integrating “making” into their exercises (i.e. making 3d printers immediately available as they work on their exercises), and (iv) their access to various information resources while they are taking the author’s parametric design and digital fabrication class.

In the upcoming phases of the research, faculty in-depth interviews as well as the student in-depth interviews will be expanded to a larger number of respondents. In addition, alternative methods will be utilized to expand the breadth of data.

3. Preliminary Findings

This paper presents preliminary findings from the ongoing study described in sections 1 and 2. Although data collection is not complete, preliminary findings were gathered from in-depth interviews with faculty who teach parametric design and digital fabrication, and from in-depth interviews with students who took the author’s parametric design and digital fabrication elective.

3.1. Teaching Techniques Used in Today’s Architecture Schools for Parametric Design and Digital Fabrication

Architecture faculty who teach parametric design and digital fabrication from three California NAAB-accredited schools were interviewed. They were asked to describe their teaching in terms of (i) content delivery, (ii) exercise design, and (iii) integration of making in their parametric design and digital fabrication classes.

When asked about content delivery techniques, faculty mainly described techniques identified by Senske – they did not identify any teaching techniques not described in his 2013 paper.
(Senske, 2013). While some faculty preferred in-class, linear skill building, others did make use of inverted curriculum (i.e. students watching video tutorials of the skills introduced in the class before attending the class). The faculty who preferred inverted curriculum techniques identified the advantage of this technique as better problem solving inside the classroom. Since students come to class having watched a video tutorial of the skills of the day, more time can be allocated to answering questions and solving problems. Other faculty identify the advantage of in-class skill building as the capability of answering questions on the spot, as they arise. Some faculty also reported that they use a combination of the two.

All interviewed faculty noted that they encourage their students to use out of class resources, such as websites that provide online tutorials. Both free websites as well as websites that charge for watching software tutorials were mentioned in this list.

When asked about exercises used, faculty mainly reported that they start with smaller scale skill building exercises, followed by projects with a larger design scope. They all emphasized that all these exercises have a making component that intend to integrate digital fabrication and parametric design. “Actually making things” seem to be a key part of exercises introduced by faculty in these classes.

When talking about the integration of making into exercises through the use of available digital fabrication tools, faculty noted some logistical problems. They usually referred to the fabrication portion of their exercises as a “partial problem”. This is primarily due to the fact that their institutions have central digital fabrication facilities (i.e. 3d printers, laser cutters and CNC routers in one or two locations). Following the design / problem solving stage, students need to “submit” a fabrication job to a facility. Faculty report that this creates financial and scheduling challenges. Since the equipment is not widely accessible, and due to the nature of materials used, making can put stress on students’ budgets. Another problem is that students need to wait for their fabricated product because of queues that form due to limited resources (i.e. limited number of laser cutters, etc.). This also limits the interaction of students with fabrication equipment, which is a key factor in learning the logic of the connections between parametric design and digital fabrication techniques. In some institutions, limited space for digital fabrication equipment was also reported as a problem. A certain amount of resistance from faculty not affiliated with these teaching areas seem to trigger concerns about space allocation to digital fabrication equipment and activities. One faculty did report having 3D printers in the class while teaching was very advantageous, since students were able to overcome the aforementioned logistical problems.

3.2. Content Delivery and Exercise Design for parametric design and digital fabrication teaching

In an attempt to understand students’ perceptions of (i) the advantages / disadvantages of each technique, (ii) aspects of the introduced techniques that contributed to their learning, in-depth interviews were conducted with the author’s students who took his parametric design and digital fabrication class.

Prior to these interviews, the author systematically introduced inquiry based learning, linear skill building, pair programming, team programming and individual exercises, as well as scaffolded process exercises in his class. Students interviewed were therefore capable of comparing and contrasting these techniques in terms of their advantages / disadvantages and their contributions to learning.

Inquiry-based learning vs. Linear skill building: Students report that inquiry based learning is very helpful in the beginning stages of the class. It introduces them to the worlds of parametric design and digital fabrication through information search in the library, online and more. However, when it comes to understanding the specifics and capabilities of software and hardware, students strongly favored linear skill building. Step-by-step instructions on parametric design software was particularly favored against what students described as a “sink or swim” approach. Students especially like the capability of asking on the spot questions in class, when linear skill building is employed. Nevertheless, students also note that once they gain some proficiency in the software, linear skill building may start to get redundant, causing them to “rely too much on the professor”.

Pair Programming, Team programming vs. Individual Exercises: Students reported that in the beginning stages of learning, individual exercises contribute more to their learning. Combined with a linear skill building approach, individual exercises seem to be very efficient in students’ skill building with parametric design software. In later stages, however, students did find pair programming and team programming very helpful. When assigned a large scale parametric design and fabrication task that comprised of four weeks, students heavily relied on teamwork – from research to design development to fabrication. Students also reported that pair programming is very helpful with scaffolded exercises (i.e. reverse engineering and existing project). Overall, students’ preferences for pair
programming and team programming were high when tasks involved large projects and reverse engineering.

Another condition students reported was that, even when they receive individual exercises, sometimes they do end up working with a peer outside the class. The primary rationale behind this is the ease and productivity of rapid idea exchange during problem solving, and their advantages for learning.

Overall, pair programming and team programming were highly regarded by students, especially in later stages of the class, for large scale projects of reverse engineering assignments.

Scaffolded Exercises vs. Linear process exercises: Students heavily favor scaffolded exercises (i.e. reverse engineering an existing project), but in the later stages of the class. All students reported that linear skill building was needed to learn at least the basics of the parametric software. Nevertheless, when assigned a reverse engineering task prior to beginning a large project, students were very enthusiastic. They all reported that this process, albeit being more challenging, was very helpful towards learning the rationale of parametric thinking. They also underlined that while helping them better conceptualize their project, reverse engineering could not be as effective in the early stages of the class for skill building.

Inverted Curriculum vs. In-class skill building: The only technique that was not employed by the author prior to this paper was inverted curriculum (i.e. students learning skills from an off-class source, such as a video tutorial) before coming to class. Although this technique was not employed in the author’s class, students’ opinions about the use of this technique was requested during the interviews. Students seem to think that later stages of the class would be more appropriate for inverted curriculum techniques. Once again, in early stages of skill building having the professor as the main information resource in class was highly preferred. Nevertheless, in later stages of the class the students were much more open to this idea. They thought that this would enable them to ask deeper questions and further their learning if they were exposed to this technique about midway through the class, after learning the basics.

3.3. Integration of Making in Parametric Design and Digital Fabrication Classes

In the author’s parametric design and digital fabrication classes, three 3D printers are available for the students to use while taking the class. The other option for 3D printing is to use the central school facility, which operates based on a queue of incoming jobs and charges a fee for printing. Students leave their file(s) to the operators, and pick up the 3d print(s) after the job is complete.

When asked about the advantages / disadvantages of having 3D printers available for the class, the students reported that it was very helpful to their learning. Besides the obvious cost factor, students actually underlined the importance of being able to try different approaches to 3d modeling and printing, utilizing a “trial / error” method. Since they did not have to wait for a queue, and the printers were available, all students reported that they had a good understanding of the connections between the equipment and software. They reported that they not only got a better understanding of 3d printing processes, but also learned 3D modeling tips such as creating closed polysurfaces, precision etc.

3.4. Parametric Design and Digital Fabrication Students’ Information Horizons

In an attempt to understand students’ information horizons while taking the author’s parametric design and digital fabrication class, students were asked to identify and prioritize the information resources they used during the class. All students interviewed indicated that when they have a problem or question on the topic, they first ask a peer that may provide a solution. They reported that this is the easiest resource, especially if they can find a person who took the class previously, or is currently a student in the class. If this did not work, their second preference was online search. This could be in the form of scanning blogs, discussion forums, or software tutorial videos. Students also reported that they often searched for information online with a peer. If the first two information resources do not work, students reported that their third information resource preference would be the professor. All students reported that they wait for the first two searches to happen and fail before they contact the professor. Other information resources such as the library, emails, etc. were not mentioned in students’ answers. This may be partly due to the fast changing / developing nature of parametric design and digital fabrication, thus making actual physical publishing redundant. By the time the book or paper is published, it is old information.

4. Conclusions

Interviews conducted so far with faculty indicate that in-class skill building and inverted curriculum are commonly employed. Making, fabrication of objects is an integral part of exercises, while logistical concerns were reported regarding using centrally located fabrication equipment – such as queues and lack of
direct interaction with fabrication equipment. Faculty interviewed did not report techniques or exercises not listed in Senske’s (2013) classification. They did not seem to favor a particular content delivery technique, but reported advantages and disadvantages of each. Usually a combination of techniques is preferred.

Students’ perceptions of advantages and disadvantages of content delivery techniques and exercises were informing. Students reported that in-class linear skill building was efficient for their learning, especially in early stages of learning parametric design software. Inquiry-based techniques as well as scaffolded exercises were reported to be very efficient in learning, but scaffolded exercises were preferred in later stages of their learning, once basic skills were acquired. Students also highly favored pair programming and team exercises, since they can rely on each other’s knowledge. This, however, was also reported as an advantage in later stages of learning parametric design software. For earlier skill building stages individual exercises were favored. Findings indicate that a combination of techniques can be most effective for learning – individual, linear skill building in early stages of learning, while increasing pair and teamwork supported with scaffolded exercises and inverted curriculum in more advanced stages.

Students reported that having digital fabrication equipment readily available to use strongly supports their learning. Not only this helps them avoid queues and logistical problems, but it also enhances their learning through direct interacting with fabrication equipment – such as running a 3D printer, or setting up a laser cutter.

Finally, students report that while learning parametric design and digital fabrication, talking to peers is their first choice of out-of-class information sources. In case they have a question or a problem to be solved, they seem to first look for a peer who is taking the same class, or one who has taken the same class before. The peer as an information source is followed by the internet. The next information resource that students report to look for is the professor.

These preliminary findings indicate that multiple content delivery techniques, supported by a variety of individual and team exercises seem to be favored by both faculty and students. There are similar views from both faculty and students on which techniques and exercises are most helpful in which stages of learning. Expanding data collection through additional methods will provide further detailed understanding of teaching and learning processes in parametric design and digital fabrication.

Notes


Introduction

One of the most essential learning outcomes of a beginning architecture studio is for students to define, debate, and defend the theoretical premises of a project. He or she must answer to the question: Why...? Nevertheless, in the context of a beginning architecture studio, the amount and intensity of hands-on instruction often overwhelms the degree to which ideas can be articulated, and when ideas become accessory to the fact — literally, accessories to architectural facture — there are serious consequences to a student’s understanding of our discipline. My initial question is simple: What is the best beginning architecture project to compel a student to take responsibility for cultivating both technical and theoretical knowledge? This question, however, is somewhat deceptive, because it masks a larger opportunity for students to take responsibility for the definition of the project itself.

The recent focus on learning outcomes in studio pedagogy has given considerable freedom to the kind and quality of projects that students undertake, but for the most part this freedom is enjoyed by the instructor who invents the project from his or her best idea. Is this necessary? Is it ethical? By being given a project that is well-defined in advance, aren’t students missing the greatest opportunity to cultivate their theoretical knowledge? If we want students to be responsible for the fundamental premises of a project, shouldn’t we simply give them the responsibility to create these premises themselves? And shouldn’t we do so at the very beginning of their education?

In the narration of two exemplary studios from the School of Architecture (SARC) at Mississippi State University (MSU), this paper proposes a model of architectural education in which the definition of the project is shared between the instructor and the student. While increased student agency is considered an important outcome of higher education, this does not exhaust the significance of this proposal. Sharing the responsibility of project definition is also an opportunity for students to engage the basic premises of our discipline. To do this in an effective way depends on the careful division of the tasks undertaken in the planning of a course. In this paper, these tasks are described as the articulation of virtues, values, outcomes, and vehicles. It is proposed that the articulation of learning vehicles is the responsibility of students, while the articulation of learning outcomes is the responsibility of the instructor. In the movement between the definition of learning outcomes and the indefinition of learning vehicles—between the instructor and the student—the broader virtues and values of the project are engaged and brought into focus.

Example one

The first studio at the MSU School of Architecture to explore the concept of student participation in project definition occurred in
the second semester of the 2016 summer studio program. The summer program offers advanced placement for students with previous university experience. It consists of two compressed semesters of roughly five weeks each, with class meetings scheduled for eight hours a day, five days a week. Given these circumstances, it is rare that a learning experience equal to a full thirty weeks is plausible without some additional invention on the part of the instructor. This invention is anticipated by the school’s administration and faculty, and so the summer program lends itself to more experimental approaches. Nevertheless, instructors of the summer program assume that students enter the second semester with a set of basic abilities and experiences, including some experience with the range of learning environments typical in an architecture studio, such as desk crits, lectures, seminars, and reviews. One might also assume a certain level of anticipation and curiosity in the students. In this proposal, student anticipation and curiosity are resources for the instructor.

Prior to the close of the first semester, but after the final review, a roundtable meeting was convened with the students during which I asked what they wanted to work on and why. I introduced myself and described those portions of my past that might affect their future. Along with this came an introduction to those books that held a central importance to my own foundations education, including Itten’s *Elements of Color* (1970), Hejduk’s *Education of an Architect* (1988), and Raimund Abraham’s *Unbuilt* (1996). I explained that, while I would define the learning outcomes and maintain the qualitative and quantitative standards of the School of Architecture, it would be their collective responsibility to invent a project to deliver these outcomes.

Our second roundtable discussion was held on the first day of the semester. We reviewed the policies of the school and the university and then resumed our discussion of possible projects. The students had enjoyed a short break between semesters, but had also been unable to resist pondering what was possible. It was apparent that they shared an interest in making things, which reflected a common moral orientation grounded in the virtue of labor. Regardless of the origin of this orientation, it was evident that whatever project was to come, it must involve full-size manufacture with actual materials and assemblies. This limited the project to things that could be accomplished within the available technical and temporal resources. For homework, students were challenged to identify types of projects that could satisfy the moral orientation they shared.

It is important to note that, concurrent with this discussion, there were also two parallel activities outside the boundaries of student participation. The first was a series of small painting assignments intended to maintain the habits of studio work. These were focused on the practice and theory of color, with an emphasis on chroma and the formal balance of color strength. The second was the planning of a field trip to Dallas and Fort Worth, Texas, which was mostly intended as a visit to the Kimball Art Museum. These items were presented as opportunities for enrichment and were not the core of the curriculum.

At our third roundtable discussion we reviewed the color work and the progress to the field trip planning, and then continued our discussion of their project. One student suggested that creating furniture was consistent with our discussion, and several others nodded in agreement. The students voted and unanimously approved the idea to create furniture. But while they agreed to the virtue of this proposal, they were unable to discuss it beyond the most cursory intentions. It was clear that more elaborate vocabulary was required, and so I asked them to read a few short essays: Adolf Loos’s “Furniture for Sitting” and “The Poor Little Rich Man”; as well as Le Corbusier’s “Type-Needs, Type-Furniture” and “The Undertaking of Furniture.”

Our fourth roundtable discussion was concerned with the definitions of furniture put forward in the essays by Loos and Le Corbusier. According to Loos, furniture is a matter of decorum in the context of traditional dwelling practices. His most cunning pronouncement is that when Americans sit with their feet resting upon a nearby table they are in fact sitting appropriately because in the context of Fordism decorum dictates that one sit as efficiently as possible. Le Corbusier, on the other hand, ever the Modernist, views furniture as an orthopedic instrument for overcoming the inadequacies of human nature—for him furniture is “equipment” for dwelling.

In the course of this discussion, students sought a common ground and began a misleading argument for the naturalism of the concept of comfort. In response to this I assigned Joseph Rykwert’s “The Sitting Position,” in which the various concepts of comfort are freed from any apprehension of universality and thereafter returned to their historical circumstances. Rykwert’s essay became the basis of a counterpoint and an inquiry regarding the usefulness of theoretical readings. The students were receptive. Their answers were guided by their common interest in making. To the students, the readings gave “some basic principles” and “vocabulary,” “access to the symbolic problem of furniture” and “tradition,” as well as a basis for
expressing “respect for the richness and quietness of prosaic, everyday experience.” Curiously, they also hinted at the reflection of human virtue in manufactured objects, for example, how furniture “suggests the personification of objects, especially in its invitation to use” and how it can be “dignified by use.”

It was clear that the students were dangerously close to being swept away by literature and that a return to the work of furniture was necessary. In response, a list of architects who are also known for their furniture was provided (Walter Pichler, Josef Frank, Eileen Gray, Lina Bo Bardi, Gerrit Rietveld, Charles and Ray Eames, Richard Neutra, Alvar Aalto, Ludwig Mies van der Rohe, Marcel Breuer, Vernon Panton, and Eero Saarinen). Each student selected an architect and set about to understand his or her work in preparation for our fifth roundtable. It was at this point that the need for a theme first arose. We agreed that, as students of architecture, our hope for the project was to understand something about the relationship between furnishing and dwelling, and so the purpose of looking at the work of others was to determine the ways they dealt with this relationship.

In my experience as an instructor, I have often been flummoxed by the lack of interest students show in assignments that contend with historical precedents, but in this instance the opposite occurred. I like to think that this is because the task arose largely from their own interests and was grounded in their shared moral sense. At this point, the project remained undefined, but it was presumed that an understanding of historical precedents might elaborate our framework.

At our fifth roundtable students came in possession of three things: a presentation of an historical architect who considered furniture to be an integral part of his or her work; a collection of theoretical musings on the art of furnishing; and most fundamentally, a shared orientation toward a particular virtue. A grasp of these things was necessary for participating in the definition of what would be done, in other words, what the project would entail. Historical, theoretical, and moral components are all necessary components of any project. Instructors are more or less cognizant of these during the invention of a project, but asking students to speak to these ideas after they have been defined a priori does not compel their debate so much as their explanation. On the other hand, allowing a learning environment in which there is a demand for students to articulate these ideas at the very least propels students into debate.

This debate took place in front of the blank slate of a chalkboard. Students volunteered to act as secretary and recorded the discussion on the board. I performed as the moderator and sometimes as the translator. The first question posed was “Why do this project?” Even before it was clear what the project would be, it was clear that the students—given the ideas they were debating—would have to come to some agreement about “why?” or “for what reason should this project be undertaken?” The only stipulation was that this reason could not be for the sake of education itself. The first pass at this question created seven more-or-less incoherent responses. (For example, the students proposed: “comprehending furniture to room relationships”; “furnishing defines space”; “human interaction with space”; “satisfying the ideas of the designer and the user”; “creation of spatial harmony”; “object communicates with the space that it exists in”; and “creating versatility with objects and its space.”)

Nevertheless, these became the fodder of four well-articulated statements of values. The project, the students concluded, would result in a work that values: 1. “the harmony of architecture and furniture”; 2. “the physical definition of typical human needs and desires”; 3. “the flexibility of functions”; and 4. “the assembly of materials.” These values were the conclusion of our fifth roundtable, which was the end of the first week. For homework, each student was to explain these values in their own words. It was convenient that this was also the weekend we traveled to Texas.

Our sixth meeting, and our second week, began with the presentation and collection of each student’s explanation of the values. We debated and clarified these in discussion, which led rather naturally to the question of what kinds of learning vehicles were appropriate to each.

To create a harmony of architecture and furniture, students proposed that there would need to exist some learning vehicle in which a space, perhaps a pre-existing space, would need to be represented in a scale at which the human figure might negotiate between architecture and furniture. On the side, it was briefly considered to replace the human figure with a study of light as the mediating link, although this was never pursued. To create a physical definition of typical human needs and desires, it was proposed that there might only be so many typical human actions which require furniture, among these were eating, sleeping, sitting, and working. The idea that a study of a typical human action might be required caused contentious debate. Close observation of a specific activity, the students concluded, could never lead toward the definition of truly typical human action. To allow for a flexibility of functions,
it was proposed that one thing should contain two, which meant that a single work might be created that supports two typical human actions. Finally, to demonstrate the assembly of material techniques, it was proposed that there should be a narrow range of materials, perhaps only two from a list of four that included wood, metal, fabric, and concrete, and furthermore, that these should conform to an additive approach.

Thus, in addition to their collection of historical, theoretical, and moral components, the students articulated four primary values as well as the character of the learning vehicles that might be suitable. This was the conclusion of the sixth day, on the basis of which a project for the creation of a work could now be defined. Together, the students generated a project brief, including a calendar and the requirements for deliverables, which I revised for clarity and consistency and then approved for execution.

It is important to note that during the very first roundtable meeting the students were presented with a course syllabus that outlined the important policies of the school and the university as well as listed the typical learning outcomes of the second semester of architecture studio. What was absent from this document was an expression of the more general virtues and values as well as the more specific learning vehicles. The intention of this omission was to employ the latter as a way to engage the former; in other words, to use student participation in the definition of the particular learning vehicles to instigate greater responsibility for the general virtues and values. The risk of retreating from the definition of the project was calculated on the basis that the fundamental premises of a project are rarely shared between instructors and students. Suspending my own agency in the authorship of the project lent to the possibility of greater agency in the students, but it also lent to their greater ability to define, defend, and debate the basic premises of a project. Although this is something that is difficult to empirically demonstrate, there was a resounding chorus of well-articulated premises at the final review, for which the students were asked to give their “idea of dwelling equipment” as a prologue to their presentation. Among the various student proposals, dwelling equipment was defined as: “an instrument that alters the interaction between dwellers by challenging conventional concepts of comfort”; “a representation of the relationship between dwelling and dweller”; “a representation of the earth upon which we rest”; “something that promotes stability and adaptability”; “something that promotes the definition of space”; “not a challenge to—but an extension of human nature”; as well as “an invitation to let dwell—to be at home.”

### Example two

The second studio to explore the concept of student participation in project definition occurred in the spring semester of the fourth year. For the sake of brevity, I will limit the description of this studio to a more cursory narrative.

In this studio, which occurred over the course of a typical fifteen week semester, the model of daily roundtable discussions was maintained, again beginning from the question: “What do you want to work on, and why?” The spring semester of the fourth year is historically identified as the “comprehensive studio.” This fact quickly derailed the discussion into a debate of how to demonstrate “comprehensive knowledge.” We were concerned that, while this might describe the virtues and values of a good student, it would likely fall short of prompting a work of architecture. We determined, therefore, that the subject-matter of the studio ought to be a “comprehensive work of architecture.” To aid in the definition of this concept, we turned to Gottfried Semper’s *Four Elements of Architecture*, which was transformed into the theme of the *Four System-Families of Architecture* in order to accommodate contemporary project delivery. The four “system-families” were identified as levels/foundations, structures/frames, enclosures/walls, and comforts/hearths.

Assuming that the project would represent buildings as a gathering of systems, we was raised the question of what building type, and why? The students expressed interest in museums and libraries, and in a debate over the suitability of each, the virtues of community were articulated and the typology of a library chosen.

At this point we introduced the concept of programming along with seminal texts from this discipline, including William Peña’s *Problem Seeking* (2012). Peña introduced the importance of establishing values—statements that allow specific problems to be defined and assessed. With the major virtues and values of the project in hand, there was finally a demand to organize the basic premises of the project. It was a rather natural extension of this discussion to require a program document, which would articulate the curriculum in the context of the elaboration of a building program and the selection of a site. Two groups of twelve students created two building program documents, each approximately thirty pages long.

At the time, it was unclear how the virtues and values collected in these program documents would lead to the definition of specific learning vehicles. This lack of clarity encouraged
invention. We proposed that the program documents be dismembered and remembered into four chapters representative of the four system-families. Each chapter would describe how one of the system-families was responsible for accomplishing a portion of the program. For example, a student may determine that the collection of books was the metaphorical foundation of the library, and so the space planning and programmatic requirements associated with the collection would be assigned to the levels/foundations. Two further possibilities emerged: first, the order of the system-families could indicate a sequence of progressive learning modules; and second, the task of assigning the various responsibilities of the building program to the four system-families could be an effective demonstration of an individual student’s appropriation of the group document.

This proposal was challenging and not immediately accepted, but once it was, the consequences were quickly apparent. The most dramatic of these was the circumvention of the sketch plan. The development of each system-family was undertaken from PD to SD to DD independent of the others, which meant that each system-family represented the program document independently. In other words, there was no primary sketch plan to which building components must conform. The absence of the plan, perhaps a future foreshadowed by Building Information Modeling (BIM), was a small cost for the possibility of an integrity of a learning vehicle for each building component and a direct relationship of these vehicles to the major virtues and values of the project.

**Authoring suitable learning outcomes**

Despite the differences in the attitude and maturity of students, the sequence of development in each studio was identical. In each, the demand to define the specific learning vehicles prompted the debate of the general virtues and values, all the while keeping in mind the learning outcomes that had been established in advance. In this model, considerable pressure is placed on the concept of learning outcomes. The clearer these outcomes are written, the more instructors can allow students to define the appropriate vehicles, and the more students engaged will be in the general virtues and values of our discipline.

Recent scholarship on teaching and learning proposes that student-centered learning, the growing culture of self-assessment, and the focus on learning outcomes are linked by an increasing pressure to demonstrate “continuous improvement” in higher education (Bachman and Bachman).

This pressure is executed by the National Architectural Accrediting Board (NAAB) and by the various higher education regional accrediting commissions (SACS, HLC, etc.), but also by fundamental shifts in educational trends. The model of education proposed herein is complicit with these trends. Learning outcomes play a central role in demonstrating continuous improvement insofar as they denote the specific conditions under which student behavior is measured or assessed. This has created a serious demand for well-articulated learning outcomes in the education of all disciplines, including architecture.

Given this demand, is it possible to simply adopt the NAAB Student Performance Criteria (SPC) as specific learning outcomes? No. The reason for this rejection is simple. NAAB SPC are not written as effective learning outcomes. While the definition of the concept of learning outcomes is debatable—indeed, it often changes based on the scale of its application in courses or programs—it is nonetheless generally agreed that effective learning outcomes contain specific language that describes how student behavior may be performed and assessed. An effective learning outcome will have an action verb that identifies what students should be able to perform; language that denotes the conditions under which students can demonstrate mastery, as well as language that indicates to some degree how this mastery may be evaluated (Hartel and Foegeding). These clarifications are the responsibility of the faculty as a school or as an individual.

Scholars of teaching and learning who advocate learning outcomes as the lodestone of student accomplishment within a curriculum often recommend a return to the descriptive language and action verbs of Benjamin Bloom’s taxonomy of learning. The intellectual tradition of Bloom’s taxonomy specifically rejects the use of broad descriptors, such as the terms “understanding” or “ability” that begin all of the NAAB SPC. Despite the persistent representation of the SPC as “educational outcomes,” they are closer to what are called “competencies”—general statements that describe the desired knowledge and skills of students who graduate from the course or program. Competencies may be conceived as containing several learning outcomes, but this does not make them equivalent to the articulation of virtues, values, or vehicles. While there is some consternation regarding the contemporary relevance of Bloom’s taxonomy, or even the application of its cognitive objectives to works of architecture, it is nonetheless a fair staring point for writing effective learning outcomes.
Andrew R. Tripp

Conclusions

The articulation of virtues prioritizes the ethical orientation of students above all else, but this is something that instructors likely have little control over. This is as it should be. Likewise, the less general values that guide a student’s interests and affections remain thankfully beyond our reach. More likely, it is in the movement from the indefiniteness to the definition of learning vehicles, promoted by suitable learning outcomes as well as patient guidance instruction, that the virtues and values of our students can be let into the work in a sincere way.
The Ethics of Color
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Introduction
Goethe’s *Theory of Colours* marks a beginning in my own education. Fifteen years ago I found a reproduction of Charles Eastlake’s translation in St. Marks Bookshop in the East Village. At the time I was exploring the possibility of stained glass in a studio project. The book was expensive, but I was confident in the purchase for two reasons: For several years I had closely observed friends in the painting program clipping images and collaging Color-Aid in the vein of Joseph Albers. I had also spent a good number of days in the previous semester observing Giovanni Bellini’s painting of *St. Francis in the Desert*, which hangs in the Living Hall of the Frick Museum across from El Greco’s *St. Jerome*. Both of these paintings left me with indelible memories of their color interactions, and I grew ever more interested in the possibility that color could support meaning in ways that were independent of the historical, material, or metaphysical frameworks that I had been learning as an architecture student. At the time, I didn’t find any particular clarity in my reading of Goethe, but I was receptive to his critique of Newton and his proposition that “man himself is the best and most exact scientific instrument possible,” which I...
It was Goethe, therefore, who first introduced me to something like phenomenology. Despite my initial misapprehensions of this mode of inquiry, the introduction proved productive. As much as I was attracted to color as a formal element, this attraction ran alongside a growing unease with the Enlightenment theories of the aesthetic. I became deeply appreciative of the possibility that the interaction of color lends itself simultaneously to the disciplining of artifice and the weakening of the modern project. In other words, color lent itself to enjoying the creation of things without a basis in unbending intellectual frameworks. This affection continued into my architectural practice where color sustained my interest in projects that were otherwise mundane, and then into graduate school where a pair of papers on Schopenhauer’s youthful appropriation of Goethe and Kant in his On Vision and Colors sparked an altogether different line of flight.

When I arrived at the School of Architecture (SARC) at Mississippi State University (MSU) color theory was among the topics assigned to be taught in the first year architecture studio. On the occasion that it was taught, the topic was delivered through water color assignments largely aligned with the description of color temperature in Johannes Itten’s Elements of Color. The work was of a high quality but almost exclusively cast in a formalist theories of the work of art; but, more than this, it failed to offer substantial opportunities for students to form the kind of inquiry that was central to my own experience. When I eventually assumed the role of coordinator of the foundations program, one of my tasks was to renovate the instruction of color. The proposal was simple enough—expand the hermeneutic possibility of the interaction of color by focusing the task at hand. In other word, focus the vehicles to broaden the values of the work.

Description

The color project now delivered in the first year curriculum is the result of four years of development, and owes a good deal to an ongoing conversation with Finas Townsend III. It would be fruitless to describe the history of this development, and so I will contain my description to only its most recent delivery. Most recently, the project on color was moved into the introductory module of the first year architecture curriculum—meaning that it is the first project that freshman architecture students encounter. This implies that working with the interaction of color presents foundational values to architecture students, and, as in my education, might serve as a productive beginning. The concluding section of this paper attempts to clarify these values.

Whereas the previous color project was focused on Itten’s contrast of color temperature, the new color project was focused on the concept of saturation or chroma. In the proper science of color vision, these terms have significant differences, but in the education of an architect such synonyms are healthy for inventive description and discussion. Other terms often associated with saturation include intensity or purity, of which the latter suggests an interesting moralism perhaps best illustrated by Simone Martini’s Annunciation hanging in the Uffizi.

Other than its constellation of concepts, the attraction to a focus on saturation was the complexity of the associated techniques of observation and manipulation. Sensitivity to changes in saturation—as oppose to sensitivity to hue or lightness—requires more advanced experience with the observation of color. It also more directly relates to the quality of interactions in which architects most often find themselves. Hence, the specific learning outcome of this project is for students to demonstrate and document the ability to intentionally manipulate the saturation of color using the given materials, means, and methods.

Whereas the previous color project established water color as its primary media, the new color project sought a faster means, first through dry pastel on paper, then through acrylic on prepared chipboard. Golden Acrylic paints were ultimately selected for their relative consistency, availability, and economy. For a fair gamut, the pallet included Cyan Phthalo Blue (GS), Quinacridone Magenta, Hansa Yellow Medium, Naphthol Red Light, Permanent Green Light, Dioxazine Purple, Zinc White, and Carbon Black. The supporting material for acrylic painting was thin chipboard, prepared with a ground of sandable gesso on both sides to avoid bowing.

Between the procurement of these materials and the final documentation of a student’s abilities, the project calls for six phases or assignments: 1. supports; 2. hues; 3. harmonies; 4. saturations; 5. color strength; and 6. color and design. The outcomes of these assignments are progressive, accumulative, and more-or-less predictable for someone with an intermediate understanding of color theory.

In the consideration of material supports, students prepare the grounds of their first paintings. Considerable attention is given
to the creativity of this action. In the consideration of hues, students use acrylic on the prepared supports to articulate their palette into a graduated spectrum of twelve hues that all share the same degree of lightness. This leads to an assignment on color harmony in which students demonstrate a basic understanding of the conventional harmonies of hue, including split-complimentary and tetraddic relationships. At this point they are also introduced to a simple vocabulary of design, including terminology related to the concepts of figure and field. The careful observation of color harmony leads to a discussion of the “dimensions” of color, which is an opportunity to introduce Albert Munsell’s theoretical model of color space and the chromatic definition of saturation. But theoretical discussion of color is a poor substitute for practical observation, and so students are required to create a single, large graduation of chroma based on the tetraddic harmonies established in the previous assignment. This leads to the final two challenges of the project—color strength, and color and design.

In the color strength assignment, students are challenged to create two compositions that demonstrate the balance of color strength using colors chosen from their graduation of chroma. The first composition consists of a field of nine high chroma figures on nine low chroma background panels. The second is the inverse—a field of nine low chroma figures on nine high chroma backgrounds. Each of the background panels is four by five inches, which, when assembled, create a painting that twelve by fifteen inches. In theory, any colors can be chosen for this assignment, but using colors defined in the previous assignment means that they are already structured within an equivalence of value and a tetraddic harmony of hue.

It should be noted that each assignment is paired with a more- or-less extensive lecture on the topic. The assignment that considers color strength is paired with a thorough discussion of Itten’s seven color contrasts, with emphasis given to the contrast of intensity. This emphasis is operationalized through Thomas Maitland Cleland’s explanation of the balance of color strength in *A Grammar of Color* (1921): “If, as in general practice, we wish to produce a balanced or harmonious color design, we would employ a larger area of the weaker color than of the stronger. If we do this in correct proportions, relative to the strength of chroma in each of the colors, we will attain balance. We may prove that we have attained balance by the fact that everything in our design, thus apportioned as to area and strength of chroma, if mixed together, would produce a perfect gray” (21).

Up until the references to Munsell and Cleland, the interaction of color was presented entirely as a domain in which the judgment of vision was predominant. This predominance is never questioned, but the introduction of the twentieth century science of color is viewed as an opportunity to enforce skills that students often de-emphasize in their studio work, including the centrality of mathematics as a form of theoretical knowledge. In this context, students are introduced to the possibility that qualitative judgments of the eye can be supported—but not substituted—by quantitative determinations, such as those collected in Munsell’s Color System.

The Munsell Color System is primarily a notational system in which hue, value, and chroma are described as independent dimensions. The Munsell Color Tree is a useful representation of this system. The appeal of this system is its approximation to perceptual uniformity within an extreme simple format that is both coherent and operative. In other words, its notations can also be used as the quantitative variables in a calculus of color. On this basis, Cleland’s explanation presents a rule of thumb for balance in which the strengths of two different colors are to related inverse-proportionally.

If in our assignment  \( A_1 \) and \( A_2 \) represent the respective areas of the figure and the background, and \( V_1 \) and \( V_2 \) describe the respective Munsell Values of these areas, and \( C_1 \) and \( C_2 \) their respective Munsell Chromas, then, according to Munsell and Cleland:

\[
\begin{align*}
A_1 & = V_2 C_2 \\
A_2 & = V_1 C_1
\end{align*}
\]

Furthermore, if the areas of the figures plus the background panels are given as a whole, and indeed each panel under consideration amounts to precisely four by five inches, then:

\[
A_1 + A_2 = 20
\]

Given these two propositions, we may substitute and solve the equation for the area of the smaller figure:

\[
\frac{1}{20} + \frac{V_1 C_1}{20V_2 C_2} = \frac{1}{A_1}
\]
On the basis of Munsell’s system and Cleland’s rule of thumb it is plausible to propose supporting the observation of color strength with its calculation, provided that students understand the necessity for adjustment according to the judgment of the eye. This proposition compels precision in several domains of creative endeavor as well as supports the interests and affections of several different kinds of student.

Visitation

A substantive project about color can cultivate the estrangement of something as ubiquitous as chroma in order to promote values that are consistent with an introduction of architectural education. With any luck, this can also support a memorable experience in the beginning student.

Admittedly, it is uncharacteristic for me to leave such things to fortune. Indeed, with the conclusion of the final assignment students typically accompany faculty on a weekend trip to Dallas and Fort Worth, Texas, which is mostly an excuse to visit the gossamer skins masquerading as vaults in Louis Kahn’s Kimball Art Museum. With the accomplishment of the color project, students are well-prepared to enter into a design project, but they are also well-prepared to encounter a serious experience of the visual arts. Students who enter a professional program in architecture in the State of Mississippi are more often-than-not unfamiliar with the conventions of observing works of art. Without experience in the conventional forms and formats of the visual arts, visiting a collection of paintings is a frustrating endeavor—for both students and instructors. This frustration is effectively prevented by the color project. Insofar as the field trip relates directly to what students most recently learned, it supports the relevance of the content and enables their enjoyment of newly learned behaviors. More than anything else, it is the enjoyment of abstract and concrete learning that is the proper outcome of a substantive color project.

Valuation

Color is rarely considered a rudiment of architecture. On the other hand, working with color engages a number of values that are fundamental to the education of an architect. Do these values warrant an introduction to architecture that is noticeably non-architectural in its vehicle? Can such an introduction orient students to the larger virtues of the discipline? These questions are part of a larger inquiry into the survival of virtue ethics. What follows is not an explication of this larger point, but rather—somewhat less elevated—a description of ten values articulated from my experience teaching color in the beginning architecture studio over the last four years.
1. creating

A project about color will value the priority of creating over the dictums of artistic license. All too often, students conflate the simple art of making things appear with the wistful diversion from conventions. Activities that include cutting edges, preparing supports, laying masks, and scraping surfaces are all matters of creativity. Ideas, in their most ancient and general form, are general because they are shared, not because they are unique.

2. observing

A project about color will value the role of observation. Observation, however, ought to be understood in the broadest sense of what it means to observe a holiday, a format, or decorum. In front of a painting, it is often important to observe the conventions of the visual arts. As a student, it is important to observe the guidelines of an assignment and to follow instruction, as well as to observe the direction given by sensation. A project about color will value the many levels of observation.

3. judging

A project about color will value the exercise of judgment. Michelangelo was said to have the “judgment of the eye,” which is to say that he found measure in visual determination. This kind of judgment is essential to working with color, for example, in the division of hue into equal gradations around a color wheel or the qualitative adjustment of qualitative color strengths.

4. describing

A project about color will value the craft of describing, in words and gestures, the appearance of things. There is a language to looking, and facility with this language is integral to a critical and creative working process.

5. organizing

A project about color will value the thoroughness of organization. Mixing, storing, and labeling paints, denoting the dimensions of colors and their combinations, calculating the range of possibilities, and annotating readings and lectures are essential to the consistency of the work and to the basic premises of continuous improvement in a project and a program.

6. working

A project about color will value the habits of working. The interaction of color is largely dependent on environmental circumstances, and for there to be a consistent degree of predictability between creating and assessing, most assignments will need to be accomplished in the same environment in which they are evaluated. This leads to one of the more satisfying outcomes of a substantive color project—students are compelled to spend a considerable amount of time working directly in the studio.

7. flowing

A project about color will value the flow of student motivation. Mihaly Csikszentmihalyi’s psychological concept of flow links satisfaction to appropriately progressive increases in challenges and achievements. More so than most, projects about color absorbs students into a flow. This is likely because of the intrinsic and revelatory nature of its visual feedback in concert with the challenging complexity and depth of its structure. Students regularly report that they spend more time on color projects than other kinds of projects.

8. analyzing

A project about color will value the focused analysis of relevant practices and theories, including subtractive and additive approaches to the observation and manipulation of color interactions.

9. delineating

A project about color will value the integrity of the formal structure of color alongside—and in addition to—the integrity of the formal structure of delineation. For better or worse, elevating the consideration of color can serve as a model for the diminution of design in general.

10. remembering

A project about color will value the meanings, memories and morals that individuals and groups possess in their associations of color and color interactions.
CNC Mediated Representation
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Abstract

“The reality of our century is technology: the invention, construction, and maintenance of machines. To be a user of machines is to be of the spirit of this century.”

-Laszlo Moholy-Nagy, 1922

At the beginning of the 21st century—not unlike the previous century that Moholy-Nagy was writing about—design education is continually enhanced, disrupted, and questioned by technology. Arguably, these changes in our design tools and work flows are happening at a quickening pace, and this speed of technological innovation suggests a focus on the role of design education to develop and sharpen the ability to sort, integrate, and disseminate information effectively. In a sense, this underscores the importance of communicating within teams, outside of teams, and to various machines for drawing and other forms of fabrication. This paper will describe a set of projects and exercises within a foundation-level, interdisciplinary design studio that are geared toward thinking about these design/representation/production and processes, mediated by CNC robotic machinery. This parametric-scaffolding requires an understanding about the most optimal and natural workflow.

Introduction

Given recent shifts in practice and education due to the integration of digital technologies (geometric and parametric modeling, digital fabrication, etc.), educators need to question and perhaps expand the roles of representation in the design process. While students are more easily trained to draw that which they can see or imagine, the authors are more interested in design communication that shifts from passive or generative representation techniques to instrumental and operative instructions for machine production. Learning how to draw is very important, but we suggest that students also need to carefully consider emerging forms of visualization for computational analysis and digital fabrication that communicate, not on the perceptual/representational, but on the performative and the operative. In some ways, this kind of visual communication is intended as much for the machine as for its human counterpart. We have embarked on experiments and exercises to empower our students with tools and workflows for the instrumentality of directly communicating to computer-mediated machines and the agency to manage such complexities. The categories of explorations in these exercises are a series of narratives on mediated representation:

- Hand Drawing – drawing exercises that explore the mind-hand-eye relationship. The uses of hand drawing techniques were conducted in previous semesters of studio, and will not be directly addressed in this paper.
- Digital Drawing – drawings that lack tactile construction but are mediated to represent three-dimensional objects in flat, printed representations through traditional compositional methods (the introduction of peripherals like mouse, screen, printer).
- Robotic Drawing – drawings that are produced by machines. The students’ roles include making the drawing machines and coding the instructions for crafting drawings (mind-instructions-robot relationship).
- Robotic Fabrication – the output of digital information to computer-automated machines, such as laser cutters, routers, 3D printers for the production of physical and material prototypes (mind-instructions-machines-assembly relationship). This part of the project is currently in process with students and will be addressed later in the paper as a future pedagogical trajectory.

While specific skill sets are useful for the immediate task(s) at hand, these exercises were aimed to instill longer-lasting design values and ethos—the designers of our next generation need to be information orchestrators, working with multiple feeds of data that merge and bifurcate, inputting and outputting with multiple devices and machines, and utilizing meaningful processes and methods of interaction, engagement, and critical thinking (see fig. 1). These responsibilities for combining and outputting information into multiple devices is not uncommon, however, more importantly is what are the bigger set of rules that govern the design decision and how one instills a culture of thinking around the core values at the beginning of the design education—more specifically, values that relate to design thinking and design making.
Methodology

These exercises are being carried out in our School of Architecture’s Fundamentals of Design studio sequence with an interdisciplinary mix of architecture and landscape architecture sophomore-level students. In order to address design thinking and design making, active learning methods were used, as appropriate for beginning design studios. These methods have shown to provide students with discipline-specific skills, but also life-long learning skills. As digital technologies have become mostly ubiquitous, they are also constantly changing and evolving and the authors feel that the ability to “learn how to learn” is paramount to sustaining a computational fluency for students throughout their academic and professional careers.

The studio was conducted using a problem-based learning model. Problem-based learning involves immersing students in an open-ended problem, within which, they can learn and apply discipline-specific skills while also learning and developing strategies and skills for the problem-solving process itself. This is a form of active learning in that students take responsibility for their own learning and obtaining or constructing new knowledge, usually in small teams. As learning is primarily self-directed, instruction is limited to scaffolding the design problem(s) to allow for students to cumulatively grow more self-reliant and instructors serve as guides and mentors to question or challenge the learning process.

Overlapped with the problem-based learning model, the authors have further embraced a “tinkering” mentality to encourage students to fearlessly ask questions, experiment, and invent without the pressure of succeeding the very first time. Most are probably familiar with the traditional dictionary meanings of tinkering, but defined with more rigor, tinkering can be combined with engaged or constructivist learning frameworks. In fact, this combination is currently being applied in many schools in the United States to foster STEM (Science, Technology, Engineering, and Math) learning through applied projects. These frameworks are also helpful when introducing students to design thinking and design making. The sophistication of results changes with timeline, scope, scale, and complexity, yet the following points are adaptable in application.

Experimentation

Experimentation and play are important parts of learning, particularly when confronted with new concepts or new tools to explore concepts. Along with academe, many corporations and companies involved with innovating new ideas have also embraced the idea of allowing for open-ended play or experimentation. Students should be prompted to take risks, ask questions during structured “play” and these questions lead to more experiments. Indeed, after assembling the drawing machines, students couldn’t help but immediately “play” with the sorts of graphic inputs that the machines can receive and learn from the varying degrees of success and satisfaction of the resulting “robotic” drawings.

Iterative Prototyping

Iterative prototyping and testing create feedback loops for incremental improvements. When performed rigorously, they yield successes and surprises as well as failures (a natural and necessary part of learning). The nature of prototyping in architecture has changed dramatically over the last twenty years with the integration of digital design and fabrication technologies within academic curriculums and the profession itself. Ideally, the “continuum” that digital information creates between design processes and output/fabrication processes allows for a prolific prototyping process that is genuinely helpful to students when testing ideas. This is particularly important when students have to reconcile and compensate for drawing sizes versus drawing machine sizes, how to produce varying line weights and tones, and even the optimal media (graphite, ink, papers, etc.) to use with the drawing machines. These problems were best addressed with direct testing and experimenting with the machines, and even modifying the machines themselves.

Repurposing

Repurposing involves taking an idea, method, or widget out of its situational context and applying it elsewhere or in a new way. Often, disparate concepts or techniques can be repurposed and combined to create
something novel. In his popular book, *Where Good Ideas Come From*, Steven Johnson uses a biological metaphor, exaptation, to describe the misappropriation and re-combination of technologies, concepts or ideas. Misuse of technologies are nothing new to the design disciplines; for example, Greg Lynn repurposing animation software like Maya to produce architectural propositions, or Gramazio and Kohler adapting flying quad-copter drones to stack masonry in precisely patterned configurations. In our case, CNC machines or robots are being re-purposed and fitted with drawing media to produce representation in a different way than simply printing or plotting from the computer screen. Later in the semester, these same workflows and robotic machines will be repurposed and retrofitted to produce other tangible outputs.

**Platform**

The hardware and software platform(s) provided to students should be robust enough for experimentation yet accessible to novices or beginners. Key questions about a specific platform include: Is it open-source? Is there an active community of users? How useful or limiting are the system’s constraints? What are the platform’s biases? The students used mostly Makeblock XY-plotter CNC machines with aluminium frames and an Arduino-based control system. This hardware platform was robust enough for production, yet modular and easily adaptable to particular tasks.

**Scale**

Scale, and not only size and weight, but also complexity, is an important consideration as students are asked to start simple and layer complexity as they iterate. The project, as given to the students, built on itself and added layers of complexity through time. As a result, the emphasis of the project shifted at each milestone—first it was about composition principles, then about drawing legibility and conventions, then about compositing multiple drawings, then about drawing with the robotic machines, etc. These processes and workflows, particularly at first, present a steep learning curve in implementing the cognitive and technical aspects necessary to think and make, and therefore, started reductive but became cumulatively integrative as layers of complexity and constraints were added.

**Studio Exercises:**

The studio exercises discussed in this paper utilize many of these frameworks and can be broken into three main parts for discussion: Digital Drawing, Robotic Drawing, and Robotic Fabrication.

**Digital Drawings**

The Digital Drawing exercises for this project are similar to some exercises presented at a previous NCBDS Conference, in that students were asked to watch the Netflix series, “Chef’s Table,” to study humans occupying space while performing certain tasks (preparing food, serving food, and consuming food). Each student selected a scene from the series to analyze, specifically focusing on the start, end, and duration of the clip and how it introduces or reinforces its small, micro-narrative. Further studies involved frame-by-frame analysis of foreground, midground, background, object, subject, depth-of-field, and point-of-view. Each student drew their unique scene, frame-by-frame, breaking each into its constituent parts of background, foreground, object, and subject using layers in their drawing software. Most students used Adobe Illustrator for drawing, while others used popular CAD softwares such as AutoCad and Rhino 3D. As the frames were drawn, the students were tasked to provide each frame composition with visual legibility, hierarchy, and emphasis using lineweights, tone, and transparency.

![Fig. 2. Human Locomotion Chrono-photography Composite, c. 1886. Étienne-Jules Marey.](image-url)
While there are other good examples of design studios drawing with CNC machines, as well as many fun, novel examples, it is important to be clear about the project intentions. Students are charged with developing useful workflows for translating their design intentions into instructions for a robotic machine to perform. At the writing of this paper, the Robotic Drawings exercise is currently in the early stages of execution, and so the processes and workflows have yet to be completely discovered and interrogated. What is clear are the parameters that the students have to negotiate in order to successfully navigate the project with a legible “chrono” drawing at the end.

The machines that the students are using—the Make Block XY plotter (shown in fig. 6)—are rectangle aluminum frame gantry CNC machines providing two axes of movement (X and Y). These machines use a control software called mDraw that reads SVG vector files, and the allowable drawing area is 38 cm wide and 31 cm long. By default, drawing media can be manually clamped into a moving cartridge that runs the length of the gantry. The software allows the user to control the Z depth of the drawing media along with the speed of movement while drawing. These parameters directly affect the accuracy of the drawing as well as the pressure the machine applies to the drawing tool. Students are also experimenting with different media (graphite pencil and various ink pens, thus far). The exercise has quickly become a complex parametric thinking exercise, as each decision is interrelated and sometimes competing with other decisions—for instance, what drawing utensil to use? How fast can it draw with accuracy? How long will it take to draw the entire composition? Students are also grappling with the best techniques for making drawings that are larger than the machine—whether the machines can be tiled to work on different parts of the drawing at once, or whether the paper media can be moved with enough accuracy to maintain a fluid drawing without seams. Drawing with line weights becomes another complex issue. The students are testing a variety of ideas, such as altering the drawing geometry or overlapping redundant curves (a parameter in the drawing information), changing the pen pressure and speed (a parameter in the software), or simply changing the pen that the machine is drawing with (a machine parameter).

Indeed, it is this careful thinking while making with digital information, facilitated by testing and experiments (and sometime happy accidents), that we wish to instill in our students. Our hope is that these skills, workflows, and lessons scale up for large and more complex projects such as the next exercise—Robotic Fabrication.
From our perspective, the procurement of these drawings is assumed to be simplistic, yet, a series of discussions begin to frame the background and add manifold levels of re-understanding design processes. First, they are processed signaling the potentials inherent in learning how to deploy standardized computer-controlled equipment. Second, they are digital-analog explorations that are not to be confused with learning to customize robotic tools or with learning to script codes. Additionally, noting these distinctions is important because our efforts seek to embed tools with the possibilities to produce infinitely flexible and dynamic outcomes; even when the instructions stem from a single G-code file.

In part, this body of work attempts to introduce designers to re-engage with drawings and making of ideas using workflows that allow for a cyclical feedback loop approach to help attune one’s ability to see the benefits of tinkering, experimentation and failure as integral to the design process. It is through this experimentation and use of conventional tools that a matrix of constraints and opportunities established by explorative drawing methods that designers might consider as a suggestive workflow towards new processes that re-explore the opportunities of conventional fabrications. Ultimately, these innovative and rational lessons allow us the possibilities to reexamine the role of technology in design education especially that of the beginning design.

Conclusion:

The design process typically ends in the digital environment, where our outputs — read in pixels — are known prior to giving control to a machine (printer and/or projector) to render our final intentions. Whereas, using the CNC mediated drawing within the design process, extends our control to interface with a dynamic representation that reveals itself only through constant feedback, direct manipulation and individual authorship. The process is an open system, reliant on the relationship between human and machine. The idea that solely the machine has authority over the result is renegotiated through intangible inputs (computation), tangible inputs (media) and the creative intentions of the user.

The final exercises for this project will reutilize the information workflows from the previous robotic drawings exercise in the production of installation-scaled spatial interventions. The drawing robots will be retrofitted to become CNC weaving machines that are controlled from drawing information. Interestingly, these new drawings will be the exact instructions for the machine to perform it’s complex weaving choreography, rather than a literal, visual representation, which gets to the essence of understanding communication between humans and machines. Often there is a difference in the complexity and information between what an object will look like, versus how the object is made, and it’s important for students to understand this in order to think through and communicate those differences so they can be effective at design thinking and making.

Notes

Vermillion, Yeshayahu, Solano


Introducing Empathy into the Classroom: Becoming my Brother’s Keeper
Roger Vitello, Northern Arizona University

Introduction

How does one go beyond a momentary sympathy to understanding another’s experience? Generation Y is the most socially conscious generation since the 1960s. They are known for being altruistic and concerned with environmental, socio-economic and community problems. Between 65 and 85 percent of teens have participated in volunteer activities by the time they enter college.

Serow (1989) notes that college students are “the single segment of the youth population most likely to engage in pro bono projects”, and there is growing popularity for community service programs among university students.

The National Institutes of Health has stated that narcissistic personality disorder occurs three times as much for persons in their 20’s as for those in their sixties. Increases on the narcissism scale in 2009 were 58 percent higher than in the 1980’s for college students. Barrow (1975) called the single most interesting and difficult question in education - “Can we teach students to care?”

Boyer stated that “the Academy must become a more vigorous partner in the search for answers to our most pressing social, civic, economic, and moral problems and must reaffirm its historic commitment to what I call the scholarship of engagement.”

These are the students we have been tasked to educate. How can we address these strengths and weaknesses in an effective way? The interior design studio presents a unique setting in which to explore this challenge.

Objective

There are two inseparably linked reasons for education: to develop critical intelligence and to nurture the human capability to care. Although the second reason listed above occurs primarily in the home, it is not to be ignored by educators. Creating environments and experiences that allow students to discover and build knowledge for themselves is a primary purpose of higher education. Through this experience students can become part of learning communities making discoveries and solving problems.
Context of Family Homeless Shelter Project

The story of this project began when I was introduced to the director of a local homeless shelter who shared with me the need for a family shelter. The director had formerly been homeless himself and was passionate in expressing this need. There were men’s and women’s shelters but none for families who were increasingly becoming homeless. Hope Cottage required materials that showcased planning and presented a vision to assist them in raising funds from the local community.

The opportunity to integrate this need with our program arose when I revamped third-year studio projects with a colleague. In such a studio classroom setting, student learning is in a formative stage of development. Students had become familiar with a rhythm of project requirements. There was a need to move beyond the intellectual and to involve student emotions in the design process. Most projects include client descriptions and programs but keep a comfortable distance from real life personal challenges. Designing for homeless persons introduces discomfort into the learning equation and necessitates a response from the student. Will they embrace the challenge and immerse themselves in the design experience as though they belonged to a homeless family, or will they retreat and design at a comfortable distance?

Connecting students with homeless persons was difficult to achieve. The homeless in this situation are our “real” clients. Frequently they are embarrassed about their life situation in comparison to others and are reluctant to share their experience. Living at the edge of survival, the homeless may turn their focus inward as a protective mechanism against the outside world. This makes it difficult to relate to students and others. As a result, it was not possible to invite homeless persons into our classroom to share their experiences with us. We had to rely on what the director shared with us and research on the homeless condition. Students absorbed this information and placed themselves in the homeless client’s place to undertake design development.

Most students were able to immerse themselves in the design experience. A few accepted the invitation to visit Hope Cottage and met homeless residents for the first time.

Project goals included the following:

- Going deeper than aesthetic beauty in design
- Injecting meaningful purpose into design and design thinking
- Developing intellectual and emotional aspects of student awareness
- Finding and engaging in personal experiences of space, place and human social needs
- Applying these experiences to influence their design solutions
- Creating a safe place for discussion and asking questions inside of the studio setting
- Allowing the design process and real lived experiences to act as catalysts for design interventions

Literature Review

The population


In the mid-1980s the Torrance Tests of Creative Thinking stopped increasing and began decreasing, falling sharply in 1998. Beginning in 2000 scores on empathy tests fell sharply. Possible causes were a lack of face-to-face time and higher degrees of narcissism.11

The National Institutes of Health has stated that narcissistic personality disorder occurs three times as much for persons in their 20’s as for those in their sixties. Increases on the narcissism scale in 2009 were 58 percent higher than in the 1980’s for college students.12

It appears that narcissism and empathy are inversely related. “Impaired empathic processing has been considered a hallmark of pathological narcissism and NPD.” There is a motivational aspect to their relationship: “Inability to recognize how others feel has been changed to unwillingness to recognize or identify with the feelings and needs of others”.14

Dolby shares examples from student service learning projects. In one example, the perspectives of the people being helped did not matter to the students, because it did not fit the inner narrative the students believed. In the second example, there was resistance to the reality that there are cities in Africa.

She goes on to say that “the ‘facts’ did not matter to them (students): they clearly and boldly stated they wanted to cling to their romanticized (and racist) images
of Africa, for themselves”.

Millennials have trouble understanding others’ points of view. Dolby said “they were so confident in their own perspectives and opinions that they had no interest in learning anything else about the community”.37

Why is there less empathy today than in previous generations? Konrath and others suggest possible explanations such as the distancing of social networking technologies and the rise in violence in video games and other electronic media.18

“Turkle (2011) notes that millennials shy away from the forced human intimacy of face-to-face communication and even the phone. They strongly prefer the disembodied text message to the embodied person. Levine and Dean (2012) confirm this, asserting that today’s students are “tribal, self-centered and low in interpersonal skills”.”

Other research has shown that millennials are interested in service oriented projects and practice in increasing numbers compared to previous generations. Serow (1989) notes that college students of all populations are most likely to volunteer for projects, and there is growing popularity for community service programs among university students (Serow & Dreyden, 1990). 20

Howe and Strauss (2000) describe millennials as “mature responsible young people who value authenticity and community service; they go on to describe millennials as exhibiting seven core traits: team oriented, special, sheltered, confident, pressured, conventional, and achievement.”.21 “Howard, Schiraldi, Pineda, and Campanella (2006) commended millennials for their commitments to communities, respect and teamwork.”.22

How does one reconcile the conclusions of various studies which claim that millennials are both more narcissistic than previous generations and yet are community minded and service oriented? One possibility is that the mindset which causes a student to care about racism and poverty is a global one. It is possible to care about great problems and want to help. At the same time, students may be less likely to give up a free afternoon and go work at a food kitchen. A personal sacrifice is required for empathy in close proximity, but only intellectual agreement is required for a more distant cause. Clearly, this is an area where more research is needed.

Research on millennials is included in this study as they are the primary generational group for our students. However not all students have the broad characteristics cited for the millennial generation. This is a limitation of this study.

Introducing Empathy into the Classroom

Empathy

Whether empathy can be taught has been debated for a long time. Is it possible to teach someone to feel for another person?

Empathy can be defined as “the ability to walk in another’s shoes, to escape one’s own responses and reactions so as to grasp another’s”.23 Although intuitive in nature, empathy can be understood intellectually and as a skill can be developed.

Wiggins and McTighe (2005) identified six types of understanding that aid the transfer of new knowledge. The last three, perspective, empathy and self-knowledge are outside of Bloom’s taxonomy and less often considered crucial to learning.24

Guzzetta (1976) characterized empathy as important to interpersonal relationships and necessary in all occupations requiring interpersonal communication. Changes in perspectives, emotional connections and self-awareness often occur when empathy is present.25 Empathy is a consistent correlate to pro-social behavior (Eisenberg & Miller, 1987; Shelton & McAdams, 1990; Unger, 1991). Galinsky and Moskowitz (2000) identify empathy as a powerful pathway to come to new understandings. Emotional connections occurred when students connected with people in need. This created new understandings of people and their current place in life.26 Not simply sympathy, but also feelings of compassion created the emotional connection to desire to reach out and help. Preconceived ideas and ill-considered judgements decreased when this occurred.28 A study of physicians who remain open to being moved by the stories they hear from their patients demonstrated that listening can create empathy.29

Homelessness

Increasing numbers of women, minorities, children and whole families are without adequate housing (Children’s Defense Fund, 1990; Gulati, 1992). Many argue that eliminating homelessness will require long-term shifts in social attitudes and action (Giamo, 1992). Morgan et al cites a study where 80 percent of students expressed willingness to help establish a soup kitchen, but only 54 percent indicated they would work as volunteers in a soup kitchen. Helping establish a shelter may not require personal face-to-face contact with homeless persons. Working in a homeless shelter would bring volunteers into close, interactive proximity. Perhaps
many students are uncomfortable with the idea of such proximity and hence are less willing to give time.\textsuperscript{31}

Being homeless usually means having few personal possessions. This makes it more difficult for a ‘home-like’ experience apart from possessions. Findings indicate that an effective response to family homelessness should include housing that keeps families together.

\textit{Ana Ganza in quoting Mother Teresa said, “we will be judged by ‘I was hungry, and you gave me something to eat, I was naked and you clothed me. I was homeless, and you took me in.’ Hungry not only for bread - but hungry for love. Naked not only for clothing - but naked of human dignity and respect. Homeless not only for want of a home of bricks - but homeless because of rejection.”}\textsuperscript{32}

\textbf{Concealed Complexity of Interior Design}

The most basic shelter can be improved upon to create a humane interior environment with minimal means. If to be human and to treat others humanely requires possessions or furnishings, we must consider that the smallest item can represent those things. All of us to a greater or lesser extent arrange our belongings and furnishings in ways that are pleasing or functional to us. Design in non-westernized cultural settings is further proof of this.

Within interior design education the aesthetic is emphasized. Studio design projects are frequently targeted at ‘mainstream’ topics, because potential employers will want to see portfolio work similar to that which they produce. The needs and desires of vulnerable populations including the homeless are frequently ignored.\textsuperscript{33}

In much of beginning design learning the social and emotional aspects of design are neglected. The outcome involves consideration of immediate physical parameters rather than deeper personal considerations such as aging or arthritis. Survival is often given in other areas of design, not so when considering homelessness.\textsuperscript{34}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig2.png}
\caption{Schematic section of loft family homeless shelter room with features noted.\textsuperscript{35}}
\end{figure}

The preoccupation with form and aesthetics in design also distracts from the idea that design has a purpose and contribution for every person. It is as if the designer’s artistic bent is sending a message of cultural superiority that excludes the modest and humble. Patricio del Real refers to the unease with which the furniture of “the poor” inhabits homes designed by the Rural Studio in Alabama. The architectural style of the home falls short, no matter how aesthetically beautiful, because there is a disconnect with the people who will reside there. There is an attitude of superiority that excludes the occupant’s needs.

We now realize that individual choice is a hallmark of our society, and that there are a variety of valuable experiences that each person has to share. If we do not begin to understand the experiences of others it will be impossible to “walk in their shoes” and relate to them. Community is created when a group of persons decide to walk through life together. Learning occurs when we do life together. The truth is that knowledge comes only through community and occurs at the start of connected knowing.\textsuperscript{36}

When we are confronted by the unexpected we can choose to learn or to ignore the experience. It is my hope that students choose to self-reflect as a means of learning. The homeless family shelter project was intended to encourage self-reflection among students, causing them to adjust their world view and ultimately make a difference. It can be argued that interior design education should encompass the full range of human
Introducing Empathy into the Classroom

experience including appropriate and socially responsible design, solving problems in and through design interventions. ³⁷

Design Studio Teaching Rethought

Design experiences are anchored in the doing. The act of coming alongside the homeless for a project confirms that design is not merely an examination of aesthetic form. A more far reaching social understanding of design is possible with integration of the user-designer perspective. This is a crucial component of design interventions and improves problem solving in the field of human experience. ³⁸

Communication through conversations is a meaningful avenue to knowledge within the studio. This includes teacher to student conversations and student to student conversations. Projects that look into human concerns require conversation to understand issues of a personal and intimate nature. ³⁹

Is it possible for instructors to make design real for students and to encourage exploration of vital questions? Yes, this can begin to occur when students notice parallels between themselves and their clients, helping them to embrace the viewpoint of those clients. ⁴⁰ When students see through other’s eyes, they start to understand that there are multiple answers to complicated issues. Once this occurs empathy begins to develop through an emotional connection. ⁴¹

While students start the homeless shelter project experience thinking that they understand the causes of homelessness, they begin relationships with persons that could be life changing. Often these interactions are surprising. This experience of conflicting beliefs causes tension but is necessary for students to challenge predetermined assumptions and consider causes of complex problems from new points of view. ⁴²

“Empathy is the bridge between perspective and the motivation to help”. ⁴³

Greene (1995) said “it may well be the imaginative capacity that allows us to experience empathy with different points of view, even with interests apparently at odds with ours. Imagination may be a new way of decentering ourselves, of breaking out of the confinements of privatism and self-regard into a space where we can come face to face with others and call out, “Here we are”.” ⁴⁴

Telling the Story of the Homeless Shelter Project

I return now to the story of the homeless shelter project. While it is difficult for an individual to be homeless, problems multiply greatly when an entire family is affected. I noticed many students appeared self-involved, and this seemed to be an opportunity to introduce the idea of compassion for others.

The more the project developed the greater the possibilities became. Due to a limited time period, it was decided to focus on a solution that could be easily implemented in a variety of settings. Communal support amenities such as lounges, kitchens, dining, and bathrooms were excluded. It was decided to concentrate on a ten-foot by twelve-foot room to accommodate four persons.

![Perspective of family homeless shelter room with privacy curtains and accessories.](image)

Fig. 3 Perspective of family homeless shelter room with privacy curtains and accessories. ⁴⁵

Research determined that the space needed to be basic and not appear luxurious. Generosity of financial contributors to the shelter diminished if facilities became too nice. Accommodating a family of four within such a small space required students to develop ingenuity as they designed places to store possessions and sleeping and living spaces that were not claustrophobic. Inspiration came from transportation, such as cruise ship berths.

Multiple uses within a limited space were explored. To limit cost, furnishings were designed to be simple, resistant to transmission of disease and parasites, and capable of being fabricated by volunteers. Students were encouraged to also go beyond utility and turn a basic shelter into a personalized space that would feel like a ‘home’.

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Although short in duration, this project became popular and was effective because it touched students and introduced them to the challenge of making a significant difference in the lives of others.

The Project

The family homeless shelter project presents an ideal platform for the exploration and introduction of empathy into the classroom. Shelters and other services can offer support for the homeless but often fall short of being optimal. “Lack of understanding of how meaning is constructed in the daily lives of homeless families” is where the largest gap occurs.

One of the reasons why interior design is often considered a luxury rather than a necessity is the association with wealth and possessions. Yet design at its core is income neutral and seeks the betterment of all human beings. This project was counter-cultural in that it taught students that the benefits of design apply to the poorest of the poor, not just the wealthy.

Students are encouraged to imagine themselves in a state of homelessness. Forced to confront functional design on a negligible budget, students innovate to design simple furnishings that can be built by volunteer labor.

Methods to introduce empathy and similar characteristics into the design studio process were examined. The question of “why do this project” was answered as we addressed a real local need for a family shelter. Having established relevance, we explored beyond the veneer of decorative to what is basic. Additionally, we introduced the servant aspect, a crucial motivation in understanding the suffering of others. These were some of the areas of reflection elicited by the project.

Results

Student creativity was reflected in the following solutions:

- Accommodating up to 4 persons - single beds. Students stacked beds in inventive ways ranging from bunk beds to beds that folded flat against the wall to other stepped arrangements.
- Providing security for possessions. The entry door had variations including use of a Dutch door to allow casual conversation to occur without allowing full entry.
- Providing a place to hang clothes, a laundry receptacle, and a waste basket. Various left over space, nooks and crannies were used to hang and store clothes and accommodate other features.
- Providing personal lighting and a feeling of intimacy. Table lamps provided a secondary, more intimate form of lighting within the room.
- Providing security and privacy from other residents. In this case the front door and walls provide security. Retractable privacy curtains were used in some instances.
- Providing ventilation and warmth. This was from building systems primarily. Some rooms included operable windows and others used ceiling fans to aid circulation and cooling.
- Building an end table with drawer for personal valuables. Some students included tables, pull out shelves, and other variations on a theme.
- Working with a limited space footprint: 120 s.f. and a ceiling height of at least 10 feet. Ceiling height was used to good advantage allowing vertical access to beds and other items through inventive use of ladders and steps, sometimes with storage underneath.
- Using common materials and methods of construction that could be implemented by volunteer labor. In most cases the designs were simple enough that they could be fabricated using readily available materials. In some cases, students provided assembly drawings illustrating how their designs fit together.

Empathetic Impact

A recent project for an assisted living facility provided indicators that learning about empathy had indeed occurred.

- Students were able to more easily understand about caring for elders, and began to understand some of the challenges that seniors experience, evidencing empathy.
- Students incorporated research from colleagues in another location with minimal complaints, a sign that they were invested in the project outcome.
- Most students were able to develop an ambitious imagination, an empathetic trait.
- Afterwards several students expressed an interest in pursuing a career path that could include assisted living, a specialty requiring empathy. This was in contrast to responses from previous classes.
One semester later, post-project, there is less empathetic impact than I would have imagined in a different project setting. This discovery came about through an upper studio class where students undertook a project to design a training center for ‘Save the Amazon’ volunteers located in Miami. Some students had difficulty associating with the cause of saving the Amazon basin for that area’s natives and South Americans. They could not understand why Americans would want to train to volunteer to help others in South America. For some students, the empathy learned in the Family Homeless Shelter project did not continue through to the Amazon project. How could this be the case?

Possible explanations include the notion that today’s students simply have less capacity for empathy. That alone would not explain how the homeless project could elicit empathy in students, and the ‘Save the Amazon’ project did not elicit empathy in some students.

Another explanation may be that students in the ‘Save the Amazon’ project had too much distance from the volunteer experience being advocated. Situations that produce separation reduce the need for human interaction and curtail the possibilities for development of empathy.47

How do we understand the responses to the impact of projects designed to elicit empathy? Students did learn about empathy and were able to put it into practice in some projects they undertook. Often their first response was one of sympathy, and for some empathy followed.

Transfer of empathy occurred from homelessness to the aging population served by the assisted living project, but not to Amazon volunteers. Transferability of learning (including learning to empathize) may be limited by subject. If the subject does not resonate with the student, educating the student on the need may take too long. Hence, the students had difficulty seeing the need in the population of Amazon volunteers. When the students had difficulty imagining the need, they had more difficulty feeling and evidencing empathy.

Discussion

Koth (2003) makes the connection between service learning (a step beyond doing a classroom studio homeless shelter project) and spiritual growth; defined as “that which provides purpose, meaning and inspiration plus action to develop constructive relationships; sacred to an individual-not religious”.48 It is when the caring and empathy reaches this level that it approaches the notion of going beyond self-centered actions to “becoming my brother’s keeper”.

In higher education, it has become common to see mission statements that speak of ‘sustainability’, ‘social justice’, or ‘global citizenship’ amongst other themes. Less common is examination of what these themes mean in consequences for the world in which we live. Development of fundamental human qualities and behaviors such as empathy matters. David Orr (2011), Richard Heinberg (2011) and Paul Gidling (2011) suggest that unless we focus on the education of human beings in this area, the future of the planet may be in jeopardy.49

Education reform has emphasized intellectual processes, leaving the question - how can education for instruction and education for life be reconciled?50 It neglects the person and context of education resulting in outcomes that are potentially disastrous for students and our world. Students need to learn how their lives and reality intersect with others and how to begin to respect and empathize with others.

Future ways to improve this project include introducing physical visits to homeless shelters and interviews with current or former homeless persons to hear their stories firsthand. Expanding the scope of this project to include service learning may contribute to a deeper empathetic sense.

Conclusion

Empathy is, at its simplest, awareness of the feelings and emotions of other people. The link between self and others, it is how we understand what others are experiencing as if we were living it ourselves.

In the biblical book of Genesis, Cain responds to God’s question of where his brother is after he has slain him by saying “…am I my brother’s keeper?” The same lack of caring expressed in that verse from the Bible characterizes many of our students and their lack of empathy. It is imperative that students understand their responsibility to others (their brothers) globally and learn to feel empathy. Without empathy student designers will be impaired in their personal and professional lives.

Through the family homeless shelter project students were able to identify with homelessness and design a temporary family home within a room. In most instances students moved from sympathy to empathy...
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producing change in those who give and those who receive. Sympathy can be done at a distance, empathy cannot. Without genuine empathy, compassion and selflessness are impossible.

Students learned how their lives and reality converge with others and how to begin to respect and empathize with others. This experience can then lead to becoming better designers and learning effective ways of working with people to improve the world for all of us.
Introducing Empathy into the Classroom

Notes


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7 Ibid. p.11

8 Wilson, Judy C. "Service learning and the Development of Empathy in U.S. College Students." Education Training: Bingley UK. 2011 p.208


11 Stein and Sanburn, "Why millenials...save" p.27

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19 Ibid.

20 Morgan, “Factors that Influence Willingness” January 1997 p. 47


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23 Wilson, Judy C. "Service learning ... Development .. Empathy..." p.9

24 Wilson, Judy C. "Service learning ... Development .. Empathy..."p.8


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35 O'Hara, Kim Sunshine Ministries ID 362 Studio-2, Spring 2014 Northern Arizona University, Flagstaff, AZ Instructor Record..

36 Stout, Candace Jesse. "The art of empathy." p.33

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51 (Gen. 4: 8-10 ESV n.d.)

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Digging Deeper: Creating Meaning While Discovering Internal Resolve in a Capstone Project

Roger Vitello, Northern Arizona University

Introduction

“Between stimulus and response there is a space. In that space is our power to choose our response. In our response lies our growth and our freedom”.¹

(Victor Frankl)

There is a lack of persistence among young American children and a tendency to give up when doing tasks. This demonstrates itself in the almost 30% of high school students who drop out before completion in the United States.² This leaves a large number of students ill prepared to contribute in the modern work world.

This trend can easily continue through to the college years and be exposed in their last semester when students undertake the challenge of their senior capstone project. A time sensitive endeavor, success in the capstone project is associated with significant student effort and application. Project focus is selected by the student.

What if our students could be trained to respond to the challenge by persevering, to perform to the extent of their abilities while keeping their eyes on the goal, staying engaged, belonging and excelling?³ Could educational preferences be realigned to encourage psychological education alongside academic training?

Objective

Each student is unique in their experience and skills; motivating them to invest in the capstone project is a challenge as they search for their special topic and solution. This search can prove daunting, resulting in the loss of valuable time.

There is an assumption that students will have prepared themselves for this culminating process after years of study, but many exhibit a lack of awareness of what is required to succeed. Further, when they struggle to find a compelling project, they also struggle with self-doubt.

Intellectual talent is well established as a prerequisite for achievement. Less is known about other qualities necessary for success. Research findings suggest that achievement of difficult goals requires not just talent but also the uninterrupted and concentrated application of talent over time.⁴

Fig. 1 Whispering Gardens-Alzheimer’s Community⁵
This paper explores key factors that make a difference in motivating students to create meaningful capstone projects.

Duckworth et al suggests that ‘grit’ is the personal quality common to most prominent leaders in every field.\(^6\)

Grit is defined as

\textit{“perseverance and passion for long-term goals. Grit entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress. The gritty individual approaches achievement as a marathon; his or her advantage is stamina. Whereas disappointment or boredom signals to others that it is time to change trajectory and cut losses, the gritty individual stays the course”.}\(^7\)

It is intrinsic motivation that can transform the capstone effort from the routine to the extraordinary.

**Context of Capstone project**

Student learning culminates in the capstone project in which original research and a fully developed design solution are typical outcomes.

The context for this study was a senior design course which is made up of a classroom component as well as a capstone project experience.\(^8\)

The initial goal was to encourage all students to adopt project topics they were passionate about. They were then encouraged to discover an emotional connection that would strengthen them throughout the process. Not all students were able to do this. The students who did it were able to excel.

Research shows that students who assign meaning to their capstone project tend to work harder, more creatively, and with more tenacity.\(^7\) The ability to create meaning is enhanced by challenge, emotional safety, autonomy, and learning from experienced meaning-makers.

\textit{Challenge} is the test of a student’s abilities accumulated over the past four years to produce a culminating project that showcases all of these abilities and brings them together into a whole.

\textit{Emotional Safety} is a second factor leading to meaningful learning. “Optimal learning is driven by curiosity, which leads to exploration, discovery, practice, and mastery. In turn, mastery leads to pleasure, satisfaction, and confidence to once again explore”.\(^10\) This cycle can be stopped by fear. When students feel safe curiosity thrives.

\textit{Autonomy} is necessary for students to have the courage to take the next step and develop their own path through the capstone project. This correlates with many positive outcomes, including greater engagement, more positive emotionality, greater conceptual learning, preference for optimal challenge, greater school retention (vs. drop out) and higher academic achievement.\(^11\)

Learning occurs when the experience comes together, and the student makes the knowledge their own.

The capstone project purpose is to provide a culminating and combined educational experience. A rite of passage, the capstone initiates students into the practices of the profession by “legitimate peripheral participation”.\(^13\) Professional attitudes and competencies are perfected.

By the end of this experience, the instructor asks: Can the student demonstrate sufficient learning and personal growth to consider them a graduate of the University?

Students can fail to fully deliver on their capstone project’s potential yet grow from the experience and be prepared to graduate.\(^14\) However, producing an extraordinary capstone project can add measurably to a student’s confidence and provide a crowning achievement for their portfolio.
Literature Review

Anxiety

Millennials are arriving on campus with increasing severity of psychological issues.15

Twenge’s analysis of anxiety assessments from over 40,000 students between the 1950s and 2000 brought concerning results. The typical 1990s college student handled more anxiety than 85% of students from the 1950s and more than 71% of students in the 1970s. The American College Health Association surveyed 34,208 college students from 57 universities about their stress levels in 2009.16 84% of respondents reported feeling overwhelmed by all they had to accomplish at some point. Almost 50% affirmed feeling overwhelming anxiety at times and 40% rated their stress levels as above average. 28% said that their stress had disrupted their academic performance and 46% said they had felt as though their situation was hopeless.17 Just over 5% indicated that they had intentionally injured themselves. 6% said they felt so depressed they seriously considered suicide in the last year.18

Resilience

Digging deeper and internal resolve connect to the word ‘resilience’. The term “resilient” is drawn from the physical sciences and describes materials and substances that return to their original form after being exposed to external pressures that change their shape.19 Terms commonly associated with resilience include: hardness, endurance, invulnerability, adaption and persistence.20

Student responses to pressure vary. Some students exhibit resilience by managing stress productively, while other students do not have the knowledge, skills or incentive to deal with existing pressure and as a result, choose self-defeating behaviors to deal with stressful situations.21

This underscores the need for increased understanding of resilience, prevention of self-defeating behaviors and intervention methods to cultivate resilience in students.

Masten, Best and Gramercy (1990) referred to resilience as not only a process and outcome but also as a “human capacity of successful adaption despite challenging or threatening circumstances”.22 Bernard (2004) and Reivich and Shatte (2002) spoke to educators saying that resilience is an innate capacity that can be developed and not specific to individuals.

They described this competence as a “basic strength underpinning positive characteristics within a person’s emotional and psychological make up.”23 They stressed how critical resilience is to healthy functioning and that negative functioning often results from a lack of resilience. Research on resilience has focused primarily on primary and secondary school students and adults, leaving a gap when it comes to higher education.

The capstone project is no ordinary experience; it requires dedication to overcome many obstacles.

Psychological Preparation

Recently educational interest in exploring non-cognitive and psychological factors has been growing. This is in contrast to the emphasis on cognitive and academic factors that continues to exist in higher education.

Psychological preparation prior to tasks that test competencies and staying in touch with one’s own psychological state (remaining present) during the task have been shown to be critical to success in many settings. Two excellent examples are in competitive athletics and in the military.24

When done correctly, psychological preparation frequently leads to increased resilience and the capacity to remain motivated in the midst of uncertainty or self-doubt. In theory, equipping interior design students with such capacities leads to increases in motivation, tenacity, and retention.25

Grit

A critical psychological construct for this effort is the term “grit”. Described in the Objective section of this paper, grit is a non-cognitive trait including perseverance with passion to pursue goals with sustained effort over time.26 Grit results in consistent achievement through stamina even when feedback is missing or explicit rewards are absent. It is rare to hear mention of grit-related psychological interventions in interior design. Yet the incidence of post-graduate burnout is high in interior design.27

What are the habits of an interior design student with grit? Typically, this is a student who exemplifies self-discipline, who believes in their ability to succeed in interior design (self-efficacy), who can manage personal anxiety, is comfortable socially and can manage social conflict. Unafraid of failure, possessing the self-control to inhibit impulses and delay gratification, this prototypical student with grit is flexible and adaptable.
to new learning environments. They feel a sense of being connected to others within the program. Their professional identity increases over time as they move towards graduation. In a way, grit can come to exhibit many other psychological skills and qualities.  

Howe (1999) refuted the belief that high achievement is a bi-product of extraordinary mental ability. After reviewing biographies of Darwin, Einstein, and other geniuses he concluded that “Perseverance is at least as crucial as intelligence. . . . The most crucial inherent differences may be ones of temperament rather than of intellect as such”.  

Grit emphasizes long term stamina over years rather than short term intensity; consistent goals and interests are also a byproduct.

The population

Howe and Strauss (2000) described millennials as “mature, responsible, young people who value authenticity and community service. They go on to portray millennials as exhibiting seven core traits: team oriented, special, sheltered, confident, pressured, conventional, and achievers”.  

These descriptions were later criticized as being overly generous and optimistic. Other researchers and educators have added further descriptions such as: achievers, responsible, pressured, and special.

- “Wanting immediate gratification and lacking in understanding as to why they are not able to get what they want – now.
- Children who have grown up overly protected, coached, pampered, and heavily grounded in messages of specialness.
- Holding high – at times unrealistic – expectations of their own abilities, of others, and the world around them.”

Researchers have added further characteristics:

Bent on high achievement, millennials are acutely sensitive to internal and external pressures to succeed. These expectations come from within, from parents and from others. Other sources of pressure can include personal transitions (including going to college), adaptation, financial concerns, interpersonal relationships, and social justice.

Fig. 3 Motion-Family fitness center for Pediatric Obesity Education.  

Higher Education

Resilience studies are not new to higher education, however few focused on psychological and personal resilience, areas of particular concern to this research and the capstone classroom.

An early finding was that academic performance and resilience are highly influenced by a student’s personal and psychological beliefs about themselves, others and the world around them. A result of this finding was that college mental health practitioners embraced the importance of personal and psychological resilience (Banyard & Cantor, 2004; Emmons, 2007; Li, 2008; Parr, Montgomery, & DeBell, 1998).

Rickinson (1997) demonstrated that increased levels of anxiety decreased academic performance and that using various techniques could reduce levels of anxiety. Using resilience interventions allows students to self-regulate their stress. Steinhardt and Dolbier (2008) also explored student endurance skills.

These studies imply that students who were taught resilience strategies had better handling of stressful life situations, had better academic results and increased graduation prospects. With increasingly severe mental health issues accompanying students to campus, learning resilience strategies is becoming more important.

A research study by Masten & Obradovic (2006) confirms a clear interrelationship between resilience
and competence. Students who ranked highly in resilience also ranked highly in competence.36

**Situated Theory for Design Education**

Educational theory from luminaries such as Erikson, Piaget, Kohlberg, Gilligan, Chickering and Perry extend the development of student resilience through the college stage.

The goal of this paper is to examine student resilience in the specific area of the interior design capstone classroom.

Some of the most relevant psychological theories guiding us in designing environments to promote psychological preparedness are listed in *(Table 1)*.

Educational strategies have focused on preparing students academically, with few seeking to prepare students mentally and psychologically for success. Pierrakos in examining engineering students noted that “an inability to cope with the psychological demands of engineering contributes significantly to demotivation and attrition” today in the classroom and carrying over potentially into the workplace.37 A similar inability to cope with psychological demands applies to interior design students.

Psychological and educational research suggests that a proactive approach, where all students are assumed to have this need, is better. The more common reactive approach of targeting “at risk” students is less successful. The extra attention “at risk” students can receive may also backfire and cause increased alienation. A proactive approach can increase student motivation and engagement, leading to more grit and persistence as well as improved academic performance.38

**Capstone Teaching Rethought**

Tell me, and I will forget. Show me, and I may remember. Involve me and I will understand.
*(Confucius, 450 BC)*

An understanding of what works in a capstone class to ensure maximum success is important. Which types of motivations work, and why do they work? Students gain invaluable experience by developing their own topic and learning to persist in bringing it to life. They learn to view topic challenges armed with a unique perspective and expanded knowledge base.

<table>
<thead>
<tr>
<th>Achievement Goal Theory (AGT)</th>
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<tr>
<td>A motivational Theory, AGT theorizes that achievement goals may be pursued for reasons that are either intrinsic (mastery-oriented) or extrinsic (performance-oriented).</td>
</tr>
</tbody>
</table>

| Mastery vs. Performance Goal Orientation – Mastery oriented goals tend to promote long-term, high-quality learning and college students with a mastery orientation are typically more engaged in class and receive higher grades compared to students with performance goals. |

| Approach vs. Avoidance Goal Orientation - Approach goals tend to contribute positively to intrinsic motivation whereas avoidance goals do not. |

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<thead>
<tr>
<th>Self-Determination Theory (SDT)</th>
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<tr>
<td>SDT is a theory of motivation concerned with supporting individuals’ natural tendencies to behave in effective and healthy ways. Fulfillment of the three fundamental elements of SDT has been empirically linked to personal and academic success.</td>
</tr>
</tbody>
</table>

| Competence | is the belief that one can influence important outcomes. |
|------------|
| Relatedness | is the experience of having satisfying and supportive social relationships. |
| Autonomy | is the experience of acting with a sense of choice, volition, and self-determination. |

<table>
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<tr>
<th>Social Identity Theory (SIT)</th>
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<tbody>
<tr>
<td>Groups give people a sense of social identity: a sense of belonging in the social world. Level of commitment determines how group characteristics, norms and outcomes influence the perceptual, affective and behavioral responses of individuals belonging to that group.</td>
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</tbody>
</table>

| In Group Cooperation – In-group cooperation speaks to collective action and goal pursuit. Willingness to work and bond with others for a common purpose is important to identifying with, and benefiting from, a social group. |

| Sense of Belonging | refers to a need to feel closeness to, and acceptance by, other people both in dyadic and group contexts. When choosing to leave a group, people often report feelings of improper “fit” or a lack of belonging. |

*Table-1. Relevant Psychological Theories* 39
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encourages perseverance is essential when the inclination to give up appears. Dedicating the capstone project to others as a gift or a tribute is one approach, and setting realistic expectations provides a framework for success. Self-confidence is fostered through each task completed, and inviting guests to share in the final presentation reinforces the intrinsic motivation.

Design experiences are anchored in the doing. Design as social practice extends further than examination of aesthetic form. Integration of the user-designer perspective is critical to design interventions and improves the place of design problem solving within human experience studies. Conversations in a studio are an important contributor to making knowledge through communication. Teacher to student conversations and student to student conversations then create meaning. Issues of a personal and intimate nature use conversations to create social human understanding.

Instructors can make design authentic for students and engage them in interior design practice. In this setting, essential questions can be encouraged and explored.

Connection can begin to occur when students become aware of similarities between their experience and that of their clients. They can then choose to adopt the viewpoint of those they advocate for. Understanding the viewpoint of others allows students to cognitively realize that there are numerous potential answers to perplexing issues. Emotional connection then leads to the development of meaning.

Descriptions of Capstone project examples and the motivations of their student authors with related illustrations follow:

Example 1 (Fig. 1)

A student who recently had lost his grandfather to a misdiagnosis of Alzheimer’s disease decided to design a facility that could have accommodated both of his grandparents through the period of his grandfather’s decline. In considering living options for people with the disease, his grandparents were confronted with difficult choices, such as having to give up their home to pay for the care and his grandmother having to live apart from her husband. Emotionally fresh in the student’s life, he dedicated the project to his grandfather’s memory, and this gave him the impetus to produce an extraordinary result.

Example 2 (Fig. 2)

A second student had emigrated from the Dominican Republic as a child. The student had a strong desire to give something back to her homeland. After some discussion, we determined that her project could make an immediate and perceivable difference in the area of primary healthcare. There are very few physicians and healthcare clinics outside of the Dominican Republic’s capital of Santo Domingo. The student determined that a small van-sized vehicle could bring basic healthcare to a variety of locations and address this access problem in a cost-effective way. The van’s flexibility allowed conversion of virtually any site (interior and exterior) into an interior design setting in which to dispense healthcare. In a tangible way, this student was able to give back to her native country through her project. No doubt the emotional bond she had for the Dominican

Fig. 4 Urban Expressions- Art Therapy facility

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Digging Deeper

Republic allowed her to produce an exceptional solution.

Example 3 (Fig.3)

This student had a young half-brother from her father’s second marriage. He came to visit her, and she was astonished to see how much weight he had gained since she had seen him last. Concerned for his health, she determined to focus on designing a facility to educate parents about and treat pediatric obesity. She found an existing building and adaptively reused it including adding additional upper floors. The upper floor façade acted as an advertising billboard for the facility. Her research showed that pediatric obesity is a family issue, and the family must receive treatment by addressing the entire family’s needs.

Example 4. (Fig.4)

Art Therapy was this student’s concern. Her family had benefitted from being exposed to Art Therapy and she wanted to make it available to others in inner city areas. She chose the Bronx, NY as her site and converted two Brownstone row houses into a center for Art Therapy. Each floor had a different purpose with modern integrated amenities. Extensive evidence based design annotation was added, explaining the subtleties of her design solution.

What do these examples all have in common? The students were passionate about their subject matter and had an emotional connection and purpose to it that transcended typical interest. The personal connection served as a motivating factor even when they were tempted to quit.

Methods

Undertaking a capstone project is a very personal venture. The project topic initially comes from the student. Often students have been thinking about what their topic might be for a year or more.

Encouraging students to discover the right balance between the topic and the scope of the project must be done with considerable tact. Often students’ ambitions exceed their ability or the available timeframe. Introducing the topic of perseverance, grit or resilience must also be done carefully, striking a balance between genuine concern and integrating the emotional purpose into a capstone topic that might have been long in development.

If students are able to assign meaning to their capstone project many of the necessary remaining pieces will fall into place.

Results

Many students during this capstone project and subsequent students have benefitted from viewing the assignment through a personal lens. They began to see a solution as more than just an exercise, but as an expression of caring that came about as a result of the student’s own concerns. This led to increased self-discipline and motivation. Learning how to make this kind of investment is not specific to capstone projects alone. It may be learned and exercised earlier in student development, but due to the buildup and prominence of the capstone experience student anxiety typically increases and is demonstrated at this time.

There are of course other potential roadblocks to success in a capstone project. Among them are:

- Difficulty in discovering and developing a topic
- Lack of motivation
- Poor time management
- Too ambitious a scope for the time given.

Often the scope grows alongside the student’s enthusiasm until it exceeds what is possible. Reducing the student’s dream to a manageable reality becomes difficult at this stage.

Every student who has mastered and applied these principles has done very well. The effort and focus expended has been evident in their projects.

Fig. 6 Student Dedication inscribed: “This is for you ‘Poppy’ with love always”.
Conclusion

The capstone project is an opportunity to demonstrate mastery of skills learned throughout a four-year education. Students need to discover their own topic, design and execute the project. Typically, much anxiety is felt before and throughout the capstone process. How students manage this anxiety is crucial to capstone project success.

Various words are used to describe proactive responses to anxiety and the desire to ‘give up’. These include: persistence, perseverance, motivation, grit, personal discipline, and resilience. Research describes each one and advocates their benefits in education and life.

Intellectual or cognitive responses fall short in motivating students when they feel that their situation is difficult. Psychological and emotional responses while less researched offer better solutions. Motivation is deeper and more resilient when it is visceral.

Discovering a topic that carries unusual significance for the student, dedicating the project to a relative and their need, or to a deceased loved one, all can help to inhibit the desire to ‘give up’ and allow the student to persevere and reach the goal of capstone completion.

The meaning created by a student when they choose a capstone project of emotional significance bolsters the internal resolve needed to finish and excel.

A successful capstone project acts as a springboard for a student’s future achievement, and it can become the crown jewel of a student’s graduation work portfolio. It represents the next step, infused with potential for a new employer and can act as a catalyst to a professional career.
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Architectural Analog: Find, Make, Move
Lance Charles Walters, University of Hawaii Manoa

This paper reflects on a project which introduced concepts of pre-digital motion control to early design students. It is the first of two projects in a course that was created to broaden young architecture students design horizons by bringing them closer to the tools used in the design process, and to the mechanical elements found in modern buildings systems.

Introduction

Many of the mechanisms and hardware that make contemporary design and fabrication tools possible are the same as those that make modern building systems possible; the majority of the principles that go into and have impacted the design of these machines have also profoundly shaped the systems and equipment in the buildings we design. With the increasing complexity of tools and systems today it is increasingly important for students to have an opportunity to unpack and learn not only about how they work- and how buildings themselves go together- but why they work the way they do. The mechanisms produced through this project are more than captivating mechanical systems from a seemingly-past era, they are demonstrations of a student’s ability to think critically about the many complex layers of technology that modern building design emerges from.

Despite the universality and ubiquity of mechanical technology embedded in architecture over the last 80 years, knowledge of these systems still remains in the hands and minds of consultants and other designers. And while many beginning design students today do readily adopt technology used in the design process, they are increasingly distanced from the mechanics that make them work and from the history and evolution of mechanisms and motion control that profoundly impact the way these machines work. An important thesis of this course is that our understanding of the way something works has an enormous impact on our ability to work with those same things. With this in mind, the ultimate goal of the course is to make sure students not only gain new conceptual understanding of mechanical principles, but a deeper connection to the tools and systems they will be designing both for and with.

Fig. 1 Inter-orbital gear prototype. Student: Elim Ng

Analog: Functional, Structural and Technological

In the project and paper title as well as throughout the course, the term analog is used in several capacities in order to facilitate a range of discussions with the students.

In working this project students are asked to consider the composition of a design process and what is functionally analogous vs. structurally analogous. Is the structure of the design process that is similar? Or is the structure of individual procedures that comprise the design process that are structurally similar? Or, are they functionally similar- in that they look or are conducted differently but produce outcomes similar in effect or result to other process.

The first is in the sense that the process the students will be undertaking with this project is in many ways analogous to architecture. There are literal connections such as the motors and controls that are physically in our building infrastructure, which
Lance Charles Walters

are the very same used in this project. There are also similarities found in the design process itself and it is in this sense that the term architectural analog is intended to provoke students into finding and considering analogies between design processes. The project itself is intended to be a tool for reflection on our own ways of designing, encouraging students continue exploring, learning and reflecting during their beginning design years.

Through the introduction, exploration and design of something other than architecture (mechanical design), the project itself is a showcase of the structure of a design process and highlights the fact that all design processes are merely the combination of many smaller functions (site design, research, etc). So although this project explores some aspects of mechanical design rather than architectural (spatial) design, many design parts they learn about in this project have relationships to the architecture design process ‘functions’ that these architecture students are already learning about.

In a contemporary design and especially in technologically related design projects the term analog also invokes the idea of the ‘digital’, often along with the notion that these are opposites or independent. This is discussed more in the Form section, but in this course we look at technologically analog systems and technologically digital systems not as polar opposites but as behaviors which drive how a design comes together.

In this context the class is encouraged to consider analog as interacting relationships, and the digital as fixed states. Analog as two entities interacting and flowing to create a single continuous system, while digital is used to refer to a system that operates in one of two fixed states (on/off). Both digital and analog can be the drivers of a mechanism or part of the mechanism itself, however the design techniques employed to utilize one or the other in a design are quite different.

**Project Overview**

Each student produces a total of three working mechanisms of his or her own design. The project is carefully controlled so that the design sequence is repeated three times and only one mechanism is produced at a time by each student. The design sequence itself is divided into three stages for which the project is named: Find, Make and Move. In line with the idea that the design process is being studied, repeating the process of these three areas gives students more opportunity to reflect on it, including analogous relationships to components in architectural design.

![Fig. 3 Three finished mechanisms. Student: Austin Chun](image)

**Mechanisms and Machines**

As a course that shaped for young design students that also as well as incorporates many new and unfamiliar ideas and components, students are continually introduced and encouraged to use specific vocabulary during the course to promote better communication and to help dissect the work they will be investigating. In the beginning students are asked to define a list of word pairings. Some are complex, such as functional analog and structural analog as discussed earlier, while others are less obviously distinct. One of the most revealing pairings is prototype and model, often described and used interchangeably by students at the start of the course.

Another important pairing is mechanism and machine. It is also important for students to differentiate these early on, as they are used to introduce the project. The concept of a mechanism is introduced as something closely aligned with both the engineering and biological definitions and is the principal term used to describe the project overall. Mechanisms, for this course, describe a system of simply interacting parts; a device or system that is transforms or translates one set of inputs into another. We consider a machine an assemblage of mechanisms which use energy to operate and which also introduces the idea of a driver or energy into the assemblage.
Find

Students first develop ideas of what they might be producing by finding descriptions (both graphic and written) in engineering books and patent descriptions. The majority of these tend to be very simple diagrams with a wide range of terms used to describe them, so the students are also tasked with researching and sharing preliminary vocabulary and mechanical principles they have found. In class these are separated into those which are representative (symbolic) and those which can not or are more difficult to learn or define by visual study.

After developing a preliminary understanding of what the deliverable of the project may be students are given an overview of the design of some of the components they found, such as gear design. And though at all stages we discuss more about these complex components, the nuances and details of them become more important as the project’s progress. Students then devise and design variations of their selected mechanical principles. This is done graphically, intended to visually highlight the principles of the mechanism itself while downplaying the shapes, forms and structures required to keep them together. Architecture students seem to gravitate to re-drawing and sketching the devices for themselves in their own ways before fully grasping the techniques used in many of the materials they are studying. A particularly interesting aspect of this stage is how the students reconstruct the original material. This early material, seemingly drawn to make the mechanism more understandable, is more often than not just as incomprehensible as the original drawings to anyone else in the class. Ultimately though these are not entirely correct either - a discovery they soon make in the next stage of the project.

Make

During the Make phase, typically the longest state of the project (especially during their development of the first mechanism) students are introduced to prototyping which is very different than primarily representational and scaled models they are beginning to make in architecture studio. The expectation of this stage is that prototypes are built and rectified with their diagrams and drawings until fully functioning and operational. These prototypes are also intended to become the final products of this project, even in none of the original parts are included in the final.

Though the first prototypes are often very rudimentary they immediately reveal the mechanical principles, a crucial part of the process that must happen before design refinement can begin. As the parts and components are replaced and refined students begin encountering more and more problems to resolve, often finding the need to learn more details aspects of mechanical design. This primarily involves finding and incorporating new and unfamiliar components to them, such as bearings and bushings and bolts. It also involves addressing new constraints that go along with these physical components, which were not part of the original diagrams and drawings.

Lessons

Throughout this stage more lessons are provided on mechanical principles and design. Some of these apply directly to the students work while others are intended only to support the ideas of the course and reinforce the evolution of design thinking. An introduction to gear design supports the students work as it progresses from simple, smooth circles which rotate against each other with friction. The complexity of gear design is an eye opening experience for most students, in that the complexities of the design of even a single gear tooth and the associated math and nomenclature is very complex. Though we do a very
high level overview of gear design concepts and terminology they are ultimately introduced to digital tools which they are allowed to use in order to derive the gears themselves. Again, the idea of the functional analog is represented here with a wide range of ‘black box’ elements (tools) which can be used to or plugged into the design process to get what you need. What is emphasized is that at least a preliminary knowledge of what that “function” is about is critical to its incorporation into a design process. With absolutely no knowledge of gear design or operation the automated gear design tools would just provide an additional challenge in the project, rather than supporting or simplifying it.

**Materials and fabrication**

Though students often begin with cardboard or even paper, they are prototyping and soon discover the properties of the materials they use impact their work. What seems like a poorly rotating gear could be the result of friction in one of several locations produced by the material rather than the design of the gear itself. Most of the designs utilize fairly straightforward, simply extruded (flat) geometry and students confront material issues related to smoothness, hardness and anisotropy. They also begin to deal with conditions caused by fabrication methods, such as finding that the thickness of the laser cut, though minute, does have an impact on the operation of the prototype.

![Fig. 5 Reversing rack. Student: Kris Jugueta](image1)

![Fig. 5 Reciprocating drive prototype. Student: Aira Iglesias](image2)

**Move**

The move stage brings the mechanisms closest to the definition of a machine. The final model is the most refined prototype and should seamlessly incorporate all of the knowledge gained along the way. Students finalize their design and incorporate technology and motors to ‘illustrate’ their design project. Though this does introduce some final challenges like friction and alignment, by now the students are equipped to quickly deal with them. Though some students do choose to construct a final model that is fabricated and built independent of the single prototype, the required deliverable of the project is the prototype that has been built upon during the entire project. It is not about a cohesively crafted or perfectly refined mechanism, rather it is a demonstration of a principle and the embodiment of a process through which they have learned and problem solved. It is a working physical demonstration of their invented mechanical principle.

They are introduced to arduino and other electronics only enough to drive the project. A motor is incorporated to drive the mechanism though certain limitations are placed on its use in order to make sure that the underlying ideas of simple mechanisms are maintained. In most cases stepper motors are used, however the mechanisms must do the work- the motors can not reverse, change speed or otherwise engage with ‘digitally’ managed operations. In the next project they explore more of the electronic and digital mechanisms.

**Project Considerations**

Students are required to build three mechanisms, however they are only allowed to work on one at a time, which reinforces the lessons and reflections embedded in the findmakemove process. As they build each they can choose more or less complex
mechanisms while going through the same discovery process and refining the techniques. By separating the project into three components students are able to focus on the individual and unique aspects which are part of a single mechanical design at a time. While they learn new ‘hows’ of each stage, they are only allowed to explore a limited set of new material. Simple is better, and each mechanism must be discussed and approved; the project is tightly controlled and limited in scope so that students have the opportunity to reflect on why things are done, rather than focus their attention on what the machine does or on complex new aspects to be incorporated into their work.

**Conclusion**

This project allows beginning design students to momentarily step away from the ways they are currently working only in order to look back at it and consider the whys which drive the inception of design. It is an additional benefit that engaging students with these tools, techniques and representational conventions give students a tactile understanding of elementary systems, forces and conditions that can be directly applied to their growth as architectural designers. So while new skills are developed, it is primarily intended to be an exploration of ideas and questions, and provide an opportunity to reflect on the highly controlled design lessons that go along with teaching beginning design architecture. New and electronic design tools are increasingly available and more easily and readily than ever being incorporated into even the earliest of beginning design projects. At the same time they are increasingly considered as functions or ‘black boxes’ which can be plugged into the design process where useful, however their own operation and design have direct implications which are reflected on the greater design process they become a part of. A few new tools, used in an unfamiliar but analogous design environment, can help students reflect on and reconsider information in their own architectural design work.
Introduction

In Dostoyevsky’s The Idiot, protagonist Prince Myshkin optimistically declares that “Beauty will save the world.” This sentiment has been adopted as the driving ethos of a new course for freshmen entitled “Stalking Beauty.” This seminar-cum-design studio is made up of 150 students from a variety of majors who are asked to investigate the topic of Beauty through a series of design-oriented projects. Beauty has historically been a much-discussed topic. People often discuss whether or not something (whether it be art, a person, a piece of music, etc.) is beautiful, but we rarely talk about why beauty matters to the human condition. Why is beauty so important to humanity? What purpose does it serve? These questions are asked consistently through the various readings, lectures, videos and projects that are presented throughout the course. Stalking Beauty seeks to reveal the multiple scales and aspects of beauty and, in the process, further develop a student’s awareness of how it affects them on a daily basis. It also asks them to go a step further, from simple awareness to activism, considering and conspiring to make their community more beautiful.

We begin by building students’ awareness of their surrounding environment through a semester-long exercise called a “Passport.” Students are required to keep a journal, making weekly entries about new places they visit and writing about them in relation to various topics discussed in class. In addition to the journals, students also participate in several projects which become increasingly collaborative as the course unfolds. Through installations inspired by the ephemeral work of artist Andy Goldsworthy, we explore how even small temporary projects can create a big impact and change the passerby’s experience of a place. Through participation in the planning and execution of a Better Block, we seek to inspire a new generation of designers and design allies to use concepts of beauty to improve their communities, and thus their world. This year’s Better Block is slated for a historically rich but currently underutilized area adjacent to campus, making it an area of particular importance to these students. By the course’s end, these beginning designers will have participated in a large scale public design event, seeing their visions come to life in a real and transformative way. Our hope is that through this engagement, they will have the confidence and pride to seek opportunities for involvement in future community projects.

Moreover, by stalking beauty, we seek to reveal all the ways in which design thinking can be championed as the method of choice when solving problems. While only 10% of our students in this course are design majors, through the dynamic course content, students from other majors are exposed to the design process. Through this course, we seek to reveal to these beginning design students that, by looking outside of ourselves, we can realize the significance of beauty and the beauty in our insignificance.

Fig. 1 Creating public art through found object installations.
enlightening in terms of beauty’s connection to goals of teaching as he stated that, “the object of education is to teach us to love what is beautiful.”

Confucius said that “everything has beauty, but not everyone sees it.” To counter this reality, we spend a semester discussing the differences in individual and cultural perceptions of it as a means of demystifying and enhancing an appreciation for beauty in students of diverse majors and backgrounds.

**Beauty and Design Thinking**

The notion that the acquisition of knowledge can be achieved most readily when one actively seeks out beauty with the intention of understanding is incredibly relevant today in the design professions. Design is becoming a primary mode of understanding existing problems, both physical and psychological, and devising solutions to them. Contemporary research on mental health and the built environment suggests that the ability of a space to regularly facilitate social gathering and interaction amongst can be linked to design elements which define spaces. If conditions found in the built environment directly influence mental processes affecting behavior, social engagement and relationships, then Design Thinking is the most poetic methodology for achieving a sense of beauty in our everyday experiences. This is why for the beginning design student beauty must be sought aggressively. If beauty is the ethos of knowledge, which diminishes fear and anxiety, then the beginning designer must stalk beauty to achieve understanding. This is the sentiment surrounding a new course for freshmen entitled Stalking Beauty. In the course Stalking Beauty, we seek to reveal the multiple scales and aspects of beauty and, in the process, further develop a student’s awareness of how it affects them on a daily basis. Furthermore, the course seeks to not only raise awareness of socio-cultural problems, but to also inspire a new generation of designers to apply their design skill-sets towards community activism and guide them in conspiring to make their community more beautiful. These goals are achieved through lectures, discussions, debates, and projects centralized around both tangible and abstract ideas of beauty. Questions of why is beauty so important to humanity and the purpose of beauty are asked consistently throughout the course to incite reflection and even criticism of existing physical conditions in young designers. Since beauty also occurs on multiple scales, course projects will follow suit, requesting that the beginning design student evaluate ideas of beauty as they relate to them personally, tribally and ecologically. While only 10% of our students in this course are design majors, through the dynamic course content, students from other majors are exposed to the

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Kwana McClung and Sarah Young

**Why Stalk Beauty?**

Recognition of beauty in any form is a source of deep enrichment to human life. Writing, art, music and architecture demonstrated the profound connection that humankind have to ideas of beauty and the creation of beautiful things. The ability to recognize beauty is deep in all of our minds. Philosopher Denis Dutton explored the connection between ability to recognize beauty is deep in all of our minds. have to ideas of beauty and the creation of beautiful things. The standards.

Plato’s reflections on beauty were particularly confined to nature or the arts, it can be recognized in mathematics, science, relationships, and jobs done to high standards. Plato’s reflections on beauty were particularly

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**Fig. 2 Brainstorming collage produced in preparation for Better Block.**
design process. This exposure of design principles to non-design majors could potentially lead to the use of Design Thinking in solving problems in all disciplines.

**Course Structure**

This freshman seminar course is made up of 150 students representing a wide range of majors; the course is subdivided into 6 sections of 25 students, each with its own instructor. The course is set up for 3 sections to meet in the same space to see the same lectures, videos, and announcements for the first 15-20 minutes of class, and then for each section to split from the large group in order to discuss the course material separately. This structure ensures that each student is given plenty of opportunity to discuss the course material in smaller groups, while also capitalizing on its large numbers by joining each student’s work into large collaborative public installations.

**Building Awareness: Passports, Lectures, and Debates**

A large component of the class deals with raising awareness of beauty, or the lack thereof, in the context of the conditions that surround us every day. We do this both with the activities we do in class, and with the assignments we require of our students outside of class.

Each class, we begin with a lecture or video which presents a perspective on beauty. We then split into our sections of 25 and discuss and/or initiate debates which examine the different perspectives and the ways beauty is manifested in our world. Towards the beginning of the semester, these activities focus on beauty in a more general sense and beauty as it relates to art, but as the semester continues, we begin to focus more on the need for beauty in public space and the built environment.

![Fig. 3 Painting signage for Better Block event](image)

The semester begins with the introduction of a weekly reflective writing assignment called the Passport. For this assignment, students are required to visit a new destination each week, and write about their surroundings in relation to a series of given prompts. A list of suggested destinations is provided, however, they may visit destinations which are not on the given list. This assignment has several goals. Primarily, it requires the freshmen, most of whom are new to the city, to explore and get to know the things their new home has to offer them. Secondly, it aims to build the students’ awareness of their surrounding environment. Reflective writing can enhance awareness and be instrumental in the transformation of one’s perspective, as Jack Mezirow noted in an examination of how to foster critical reflection in adulthood: “Perspective transformation is the process of becoming critically aware of how we perceive, understand, and feel about our world; of reformulating these assumptions to permit a more inclusive, discriminating, permeable, and integrative perspective; and of making decisions or otherwise acting upon these new understandings.”

By strengthening their ability to observe, an understanding of how surroundings may affect them subconsciously can be fostered. Finally, rather than simply listening to their instructor lecture about existing conditions, they will be prompted to apply lessons from class to their experiences and begin to envision how they can be improved. The Passport is also where all other assignments are entered and recorded. A record of engagement with the course themes and assignments, this document is the primary means of assessment in the course.

**Awareness in Action: Projects**

Over the course of the semester, we assign three projects designed to push students beyond simple awareness and into activism. These projects can be read and experienced at multiple scales, with individual projects coming together to make a larger impact. The projects require various degrees of collaboration and, at times, compromise in order to get the job done.

The first project is a found object self-portrait inspired by the ephemeral work of artist Andy Goldsworthy. After watching the documentary, “Rivers and Tides,” students are tasked with creating shoebox-sized installations assembled from found objects. To begin the project students are asked to come up with a word that described their personality, i.e. loud, messy, calm, introverted, thoughtful, etc. The students then arrange these found objects together in an effort to evoke the word they had chosen. There are two restrictions on what objects could be chosen; these objects could not be valuable, to minimize the risk of them being stolen, and they must be no bigger than the palm of
their hands in order to encourage the assembly of small pieces into a larger whole. Many students used natural objects found in the landscape around campus. Someone who chose the word “loud” to describe themselves might try to find materials that are brightly colored such as red leaves or yellow flowers. Someone who describes themselves as “messy” might look for materials that lack structure, like floppy flowers or string, as opposed to straight sticks. Someone who chooses the word “detail-oriented” to describe themselves may look for a lot of very tiny materials, like grains of rice or flower petals, and arrange them meticulously. Like a Goldsworthy piece, these projects aim to transform ordinary objects into extraordinary works of art. After discussing and critiquing the installations over a few class periods, all 150-plus projects are installed in a continuous line along a highly-trafficked walkway on campus. (Fig. 1) This transforms the projects from subtle individual pieces into a large and visible statement. During the process, students are also asked to research and debate the merits of different forms of public art, whether temporary or permanent, large or small, etc. In doing this project, students came to the realization that even small temporary projects can make a big impact on the experience of passersby.

The second project, an experiment undertaken for the first time this year, was for students to plan and execute a Better Block in conjunction with several community stakeholders and organizations. Students were introduced to the idea with the TED talk by Better Block originator, Jason Roberts, and then led through a series of steps to design our Better Block event. The project began with a walk to the site, a neglected strip of defunct college bars and unused parking lots adjacent to campus. Students were asked to look at the space critically and photograph things about the site which they thought were beautiful and things that they thought could be improved. These pictures were used to prompt a debate about what beauty can be in the context of the urban environment. Beauty in this case was not confined to aesthetics; beauty can be powerfully felt in experiences that go beyond looks and engage all of the senses. For the next phase of the project, students brainstormed about the activities/amenities/improvements they wanted to see on the site, creating collages to illustrate their visions. Each section created a list of potential activators which they thought would have the most positive impact on the event and the future development of the block. These lists and collages were presented to the Better Block organizers, who then sought to find vendors, artists, and non-profits to participate in the event. Though not all of the students’ ideas were able to be realized, many of them were implemented. As the list of participants solidified and the event drew nearer, our students proposed site plans of the activities which they felt would produce the most appropriate interactions, i.e. a food court next to the children’s activities, and an enclosed dog park next to the pop-up coffee shop. In the week leading up to the event, each section designed and painted signage to advertise the various activities. The morning of the event, students prepared the site, cleaning up trash, sweeping sidewalks, posting signs, landscaping, sidewalk-chalking, etc. so that by the time the event started, the entire area was transformed.

After being involved in such a large scale, collaborative event, we decided that the final project should be more individual. We
had each student identify a site which they felt was not currently living up to its potential as an asset to the community and asked them to re-envision a way to capitalize on this potential. This brief project required students to define a problem they saw in their environment, brainstorm solutions, research precedents, and make a proposal illustrating their vision for how to improve it.

Results

Student reflections showed that many of them began with a narrow definition of beauty at the beginning of the course, but that definition expanded greatly by the end. A student wrote, “Its cliche, but this class teaches that beauty is in the eye of the beholder and how true that really is. Everyone has their own opinions and views when it comes to what’s art and what’s beautiful and it’s amazing to observe. There are so many different ideas of beauty. I loved the video we watched where you taught us to find beauty in what we do. Art is beautiful, yes, but there is beauty outside of art. Outside of nature and music and other similar subjects... we can, if we are open minded, find beauty in what we love and in our profession.”

Other students reported a heightened awareness of the beauty in their everyday lives and surroundings, and also the potential for beauty to have a positive impact. Design major Isabella Laroque was highly intrigued by our lectures on street art, particularly by a video highlighting Parisian street artist Invader. Her delight was magnified when she visited Houston for a weekend trip after the lecture and found a replica (or original) street art piece of Invader’s work. In her reflection, Isabella cited the course as the reason she was more observant of things around her and says the experience cemented her decision to major in design. Students also reported in their passports about a generally heightened capacity to notice their surroundings: “I learned that beauty can be found in everything. You just have to really take time to view and appreciate everything around you. I could use this during and after college because before this class, I just didn’t take time to appreciate the beauty in everything around me. Now I can go through life and find things and places that are just beautiful that nobody else would view as that. I can maybe embrace it and share it with friends to teach them that there is beauty in everyday life.”

The Better Block project in particular seemed to catalyze a change in perception of a student’s view of their own ability to create something of beauty and value in their communities. One student wrote: “I learned that beauty isn’t always something that you can see or touch. The Better Block project taught me this by showing me a side of beauty that came from people: the love, compassion, and interaction of people as they were out there supporting a cause that they all believed in. I think that seeing our imaginations turn into a reality was definitely something incredible that few of us will ever forget.” Another wrote: “Something that I learned that can apply to my future as a college student is that I am not too young to make a difference and want to create beauty. With the Better Block, we transformed McKinley Street into something very fun and beautiful. This street was mainly transformed by college students. This helped me learn and will help me in the future by knowing that I am not too young to make a change... Something that I learned that can apply to my future life after college is just that this world is beautiful, and beauty can be found in everything, sometimes it just takes time to look for it.” This change in perspective is something that we hope will follow our students as they continue through their education and professional and social lives outside the academic setting.

There are a couple of examples of students who’s final projects actually reached beyond just envisioning change to actually create real change. Education major Brooklyn Derise from Avery Island, Louisiana decided to create a proposal to improve the local park in her small community. The park had deteriorated over the years due to neglect, despite being heavily used by community members for Easter celebrations and summer camps. Brooklyn recognized that this problem could easily be solved by relocating the existing, unused playground equipment from the recently closed elementary school to the park. Creating this proposal inspired Brooklyn to present the solution to community leaders in her hometown and now they are in the process of implementing her proposal. Another example of lasting change initiated by student projects is the identification of unsafe...
conditions in a campus parking garage. These students reported unsafe and non-sanitary conditions in the parking garage and expressed their discomfort with being within the structure. The inquiries made by these students to Facility Services, as a part of their research on the project, prompted the University to clean up the garage and assure there is adequate lighting for users. Interestingly, many students made a correlation between beauty and safety. Another permanent change which creates more beauty and better safety is the installation of permanent string lights over the site of the Better Block.

While to the uninitiated, beauty can seem surface-level, it is a true enrichment for life. Based on the response to the class, we have high hopes that our students will be strong and vocal advocates of beauty in the future.

Notes

Second year is a critical time for architecture students at the University of Louisiana at Lafayette. It is their first introduction to architectural thought, to architectural processes, and to architectural expression. In their multi-disciplinary first year studios, students are encouraged to explore form generation as the product of tectonic systems. Their work is concerned with craft and with creating reasonable systems of discreet elements that can be combined in order to express tectonic form; form that expresses its constructive nature. In concentrating on form, there is very little conversation about the implications of space; any understanding of architecture is limited by the objectification of form. Students are not exposed to the relationships of form and space that are necessary for human dwelling. They are not exposed to the idea that architecture is a form of place making. In this sense, our first year program in architecture exists in the abstract. The third year of our program demands that students address the complexity of multi-story, multi-use buildings in an urban context. This level of engagement requires a pragmatic knowledge of site, of context, of spatial awareness, and of basic material and structural systems. At this level, place is marginalized in favor of pragmatics. The second year studio must begin to mediate between the abstract and the pragmatic; it must negotiate the how, the what, and the why of the discipline of architecture. When how is a question of skill, and what is a question of disciplinarity, the why becomes a question of accountability. Why do we do what we do and how do we know that it is the right thing?

In second year we begin to address the why of architecture as the embodied expression of a phenomenological being-in-the-world. Without introducing the heady theory of Heidegger, we begin to encourage our students to explore an individual awareness of place, of movement, of threshold, and of transition. The why of architecture is distilled to a study of human experience of place and the means with which that experience can be shaped. Our primary challenge in raising awareness of the role of place in architecture is in slowing the students down; slowing their experiential awareness to the point of seeing and slowing their desires to be professionals prior to knowing the why of architecture. While our second year has been in a period of transition—several changes in faculty and several competing curricular iterations—we have begun to slowly develop a program that responds to the limitations of the first year and to the demands of the third.

Why Slow?

It seems that our students have a desire for speed—they have been conditioned toward immediacy. They want to do things once and to be assured that that doing once was correctly done. They do not have time for exploration, for experimentation, or for contemplation. Living a fast life has become the default form of being in our culture. While there are many examples—psychological, physiological, and practical—of why a fast life has not served us well, there has been very little incentive to slow that life down. Resultantly, the fast life has begun to impact our educational practices. Berg and Seeber have pointed out that the fast life has led to the corporatization of higher education. In architectural education we see this manifest in the professions desire to train our students in the production skills necessary to practice rather than educating them to be capable and competent designers. Our program, particularly the second year, has been structured to counter the demands of a fast life. We have joined the Slow movement.

The Slow movement has been around for many years. It began with Slow Food in 1986. It was then that Carlo Petrini suggested that we should only buy fresh, local produce from sustainable sources, that we should cook based upon time-honored recipes handed down generationally, that dining should be leisurely and familial, and that above all, we should take pleasure in our eating. Petrini saw Slow Food as a prototype for dealing with fastness in all of its manifestations. Slow Food has, as Petrini hoped, influences many other slow movements in a range of...
Thomas Cline and Sarah Young

applications; in medicine, in urbanism, in work, in raising children, and in many other fields that have suffered as a result of being too fast. The discipline of education has also begun to embrace slowness. Slow teaching has been implemented across diverse fields, from poetry to medicine.

Craig Nelson describes the impulse to slow down education as a reaction to the kind of learning created by society’s worship of speed; a form of educational practice that he calls “bulimic learning”. In this model of learning, students “memorize the material, ‘regurgitate’ it on the exams, and forget it so promptly and completely that no mental nourishment remains”. In a study on the amount of new content given in lectures in medical school, Russell, et al., found that lowering the level of new content in a lecture increases students’ retention of the material. When content is delivered slowly and is consistently reinforced, students can develop deeper knowledge and utilize higher level thinking skills such as analysis, synthesis, and evaluation. As Michael Randall noted in 2001, “We might do well to remember that knowledge consists of more than information; rather knowledge is the ability to understand and to appreciate the difficult and complex products of the human imagination... It is important to remember that some forms of knowledge are best served by slowness and by an awareness of the transience of the present.”

Slowing down does not mean teaching less. For Cole, Shaw, and Russell, Slow Education means teaching deeper—focusing on “balance, reflection, and deliberation,” in order to “occupy time more attentively.” Riyad Shahjahan has suggested that Slow Education is about “building relationships, not about being fixed on products, but accepting and allowing for uncertainty and being at peace without knowing outcomes.”

Attentiveness, reflection, and uncertainty are antithetical to the speed that contemporary students demand. The fast life requires certainty and cannot make time for reflection. Donald Schön, prior to the Slow movement, suggested that architectural practice and education needed to slow down—to move away from prescriptive models of thought—and rely upon improvisation and reflective problem solving. By slowing down our architecture studio and taking a phenomenological approach, we acknowledge Schön’s need for reflectivity and Shahjahan’s claim that, “amid product-oriented learning tied to future outcomes, sensory ways of knowing are relegated to the sidelines.”

**Slow Architecture**

One can argue that the practice of architecture has always been slow; the Slow movement only acts as a reminder of our past and a caution against a present that has, unfortunately, embraced the fast life. Architecture has traditionally been slow by nature; it takes time to build. Our buildings, our spaces, and our places last, or should last, for a very long time. Further, these works influence the daily lives of countless people over multiple generations; architecture represents our cultural beliefs and practices. The slowness of architecture seems appropriate considering its cultural importance and the amount of resources put into it. As a result of this cultural and resource intensity, it is important that our works be carefully considered before they are built. Joshua Prince-Ramus, principle of REX and a proponent of the slow architecture movement, describes the need for the process of architecture to “slow down and let the ideas gestate.” He notes that the real crisis facing architectural practice and architectural education is not one of form versus function, but “about doing both and doing them a lot and doing them well.”

The time necessary to carefully consider the ideas, program, and context of any particular project takes more time than is usually spent in studio or in practice. In a fast world, we do not have time to think carefully, to reflect, or to contemplate our sensory awareness when considering the needs of a project.

![Fig. 1 Teandra Gathen, pond reflection study](image-url)
In our second year studio, we believe that the need for slow reflection, slow contemplation, and slow awareness could not be more keenly felt. We live in an era where both culture and material resources are being stretched to their critical limits. In an effort to do more, to be more, and to have more, we have forgotten to take pleasure in life. Milan Kundera, in his 1996 novel Slowness, sums up our beliefs about fast living and fast design well: “when things happen too fast, nobody can be certain about anything, about anything at all, not even about himself [sic].” In this sense, we have come to the conclusion that speed breeds uncertainty; an uncertainty that is at odds with the needs of a fast life. It is this conundrum, coupled with our desire for a reflective time between abstraction and pragmatism, that has challenged us to create a pedagogy of slowness.

**Slow Methodology**

In the second year pedagogy that we have begun to implement, slowing down occurs on many scales. At the broadest scale possible, slowing down means slowly introducing the idea of architecture. In their first year, our students learn the elements and principles of design not through definitions, representations, and examples but through a process of discovery. In the creation of tectonic systems, they discover hierarchy, rhythm, balance, and other ordering systems that define the basic vocabulary of architecture—a vocabulary that they can freely embrace or contest. The primary goal of their making is to create systems that are both reasonable and inspire awe. Additionally, they are encouraged to re-contextualize materials that might otherwise be taken for granted. After this year of tectonic explorations that produce only formal abstractions, our students have not been able to reconcile their preconceptions with our pedagogical practices; they are, to paraphrase many of them, “not learning about architecture.” Their “fast life” need for certainty troubles their ability to learn.

In order to remedy our students’ confusions, we begin the second year by exploring the why of architecture. For us, architecture is a visible manifestation of our human relationships with and in the world. It provides us shelter, comfort, and the ability to thrive in environments that can be thought of as both amazingly beautiful and terrifyingly hostile. Architecture also allows us to celebrate our triumphs, to express our beliefs, and to represent our aspirations. Further, in doing these things, architecture represents our cultural and personal identities. For us, these beliefs about architecture imply a phenomenological approach to design—an exploration of our being-in-the-world. Obviously, in regard to the “fast education” that our students expect, it is difficult to talk about phenomenological theory. Our students, at this point, don’t even believe that architecture could or should have a theoretical stance. In order to begin a conversation about the why of architecture, we begin with a walk in the park—a long, slow walk that takes about three weeks.

We promote slowness—acts of awareness, contemplation and reflection—through a phenomenological approach to second year studio; an approach that prioritizes a re-embodiment of knowledge that begins with an awareness of our individual bodies and their relationships to a particular site. We are fortunate to have a very large public park immediately adjacent to our studio; a large portion of that park is visible from the windows that make up the south wall of our studio. At the beginning of the Fall Semester, we take our students for a walk in the park. We talk about how we experience the park—the things we see, hear, smell, and feel—how our senses are enlivened by the variety of experiences. We then challenge our students to explore and map this park over an extended period of time; they spend three weeks finding expressions of phenomenal awareness and carefully and critically documenting those phenomena. Journaling and drawing are used as methods of documenting their observations and as tools for communicate their experiences of place. This exploratory phase begins to allow for what Pretorius and Ford have theorized as the benefits of reflective learning. Our students begin to demonstrate that they “are capable of making meaningful and profound discoveries... through exposure to the experience without explicit prior instruction, and many come to value the practice because of the benefits they discover.” Joseph Sanacore suggests that this methodology of exploration and reflection “requires doing hard work; thinking deeply, analytically, and critically about experience; responding personally to learning; verifying personal responses to learning;
being curious and inquisitive; having patience with ambiguity; and connecting these reflective practices so that they are working in concert. In other words, our walk in the park is a means of slowing down the architectural education that all of our students are eager to engage.

After three weeks of reflection, a few more spent mapping phenomenal experience, and building on the systems-thinking of the first year, students begin to prototype phenomenological modulators that respond to their site observations. In describing phenomenological modulators to our students—students still itching to do “real” architecture—we suggest that these modulators are extensions of our embodied senses; appliances that allow us to more fully experience particular phenomena that have become apparent through our contemplative observations. In this description, we emphasize that the site has shifted from the park to their individual bodies—they must reconcile their bodies with their observations in the park and with their understanding of tectonic systems. After two weeks of prototyping on the site of the body, we return to the park to test these embodied extensions in an experiential world. This allows the students to think about how their appliances affect the site of their bodies and how those appliances enhance their experiences in the world—essentially, we allow them to discover, at least partially, the why of architecture.

Finally, and over several more weeks, the embodied prototypes are translated to the scale of architecture—to a scale that our students think of as architectural. Their task is to reflect upon what they have learned through observation, reflection, and the experience of their modulating appliances to create a pavilion that expresses a phenomenological awareness of the condition in the park that they have been exploring. They are given a simple program—to assist others in becoming reflective observers of the world. Their particular sites are the points of interest that they first engaged as expressing their own awareness of a particular phenomenon. They are further encouraged to employ their earlier understandings of tectonic systems in order to amplify the role of their pavilions. Through drawings and models, our students create and explore a multi-faceted sensory experience and negotiate a set of programmatic requirements. It is our intention that over the course of the studio, students are slowly introduced to the why of architecture; that they are taken from a formal understanding of systems of expression to an understanding of how and why those systems can be manipulated to serve a clear purpose.

**Our Reflections**

In our efforts to continually develop the second year studio—to mediate between the abstraction of first year and the pragmatics of third year—we have begun to reflect upon our successes and failures. We continually attempt to take account of and develop our assets and to identify and limit liabilities that are antithetical to creating the possibility for Slow Architecture. Foremost, we have been very pleased with slowing the pace of the class in order to develop reflective habits in our students. Traditionally, each semester of second year was filled with multiple short projects that didn’t leave time for reflection or with longer projects that didn’t emphasize reflective
learning; projects that didn’t develop critical thinking skills because the students were not given enough direction to engage those skills. We have found that one sustained project with multiple waypoints for reflective thought is more beneficial. As Chip Wood noted in Changing the Pace of School, “When students have more time in longer blocks to explore content in depth, they can learn research skills, write about content, and revise and improve their work over time.” We have found that in allowing students adequate time to work on a project, and then allowing time for them to reflect upon that working, they are able to devise solutions that begin to counter the speed of a fast life and that, therefore, begin to introduce them to methodologies of design that cohere to the tenets of slowness.

A second decision that we found to be beneficial was in establishing a very early due date. This project is due two weeks before the end of the semester. At that time, we have formal critiques that engender discussions of phenomena, of place, and of construction—discussions of the why of architecture and how that why is critical to their educations. In doing this, we give students time to reflect upon the discussions generated by their work and time to incorporate those reflections into their work. This decision arose from our interpretation of the work of Goldschmidt et al. when she noted that “I realized that I did not give students enough time to process what the question was asking and to compose their response before requiring them to volunteer that information aloud. I found that when I gave students time to generate their own responses they became more likely to contribute and were more confident when they did so.” In allowing students time to consider and respond to feedback, we have found that their understanding of architecture and, therefore, their work, improves in following semesters. This built-in time for reflection also mirrors Woods assertion that “During the last six weeks of school, students should reflect on their learning for the year in order to see all that they have accomplished.” Our students are empowered when they realize all that they have accomplished during the semester. Learning becomes real and, as such, begins to have meaning that both sustains further comfort with our curriculum and further advances student confidence.

We have also found that presenting the semester-long project as a series of steps is beneficial to our Slow methodology. In the past, our discreet projects were very clearly articulated as to our expected outcomes and to the expected range of work to be presented by students. This clarity left no ambiguity; it was too fast for a slow curriculum. In presenting the project step-by-step, we are able to generate curiosity, to make each step critical to the whole, and to generate trust in our students. Exploring the park is not a step to be taken in order to get to a future solution, but rather an end in itself. Observing, contemplating, and mapping produces a product; a product necessary to further explorations. Creating appendages in order to experience phenomena produces products that expresses an understanding of the world, but also prepares students to move toward larger scale solutions. Each step in the process thereby gains meaning. Realization of this allows students to trust our methodology, to embrace architecture as something beyond certainty—as a form of practice that requires personal, reflective, and critical engagement. We hold that this step-by-step engagement is equivalent to Sanacore’s observation that when his literature students’ “personal responses are encouraged, respected, and sensitively refined with teacher support, the stage is set for moving to deeper reflections that consider critical responses to texts.”

In our reflection upon second year studio we have also realized our missteps; those projects that we have found to be liabilities to our Slow methodology. In a previous iteration of
the class, students were tasked with producing architectural place without a clear goal. At first, this seemed appropriate to teaching a contemplative and reflective methodology of design—of teaching our students to be slow in their assumptions and in their decisions. Unfortunately, our means of slowing them down did not translate well. Our attempt at slowness required students to construct architectural space by first creating continuous surfaces, then populating those surfaces with post and beam framing and, finally, in skinning that framing with panels. This process required no program; students were making space employing the tectonic skills that they had learned in the first year. This was an attempt to build on their previously learned methods of construction and to illustrate that a tectonic vocabulary could be spatial as well as formal. Without a clear context—without reasons for their making—students became confused. They did not understand how space could result from their attempts at surfaces, frames, and skins. This confusion was intensified when the curriculum shifted and a concurrent materials and methods course was eliminated. Without guidance and without a context, students did not have the ability to reflect. Their “fast life” need for certainty outweighed the uncertainty of building without a clearly articulated reason.

Further challenges to our development of a Slow methodology have been the result of our own need for action and reflection. Without engaging a class, our ideas seem reasonable. It is only after we have failed to achieve our goals that we can reflect upon and, ultimately, modify our educational practices. The first time that we taught this class—and in response to the confusion of surfaces, frames, and skins—we began the phenomenological mapping/appendage/pavilion project described above. In its first iteration, we found that we were too vague in our description of what a pavilion might be. Most students seem to have thought of them as objects—much like follies—rather than as inhabitable spaces that would allow people to engage the park from a contemplative position. Some of this vagueness may have resulted from the perceived absurdity of the appendages that preceded the pavilions. Some may have been a result of the form-making of their first year studios. Either way, we felt that while the students had gained some skills, they had not attained the critical thinking skills that we had hoped for.

This year, in an effort to compensate for the misstep of being overly vague, we introduced a clear program instead of an ambiguous sensory pavilion. The time spent on phenomenological modulators was cut shorter than before, and students were asked to develop them into public bathrooms sited in the park. We feel that many of the problems arose because the modulators were not given enough time to develop tectonically before Fig. 6. Connor Fritch, light/shadow modulating bathroom.

Fig. 6 Connor Fritch, light/shadow modulating bathroom.

the bathroom program was introduced. The specific bathroom requirements were also introduced too early in the process of translation; this had the effect of students latching onto the absolutes they had been waiting for, causing them to become resistant to an exploration of tectonic and spatial possibilities and instead focusing on what they perceived to be “the making of architecture.” In anticipation of the final part of the project, they sped past the third of our reflective pauses. It also appears that their pavilions were reverting to formal expressions rather than engaging physical bodies in creating phenomenal awareness. Upon reflecting upon these outcomes and discussing them with the students, we have realized that we need to slow it down again. We need to insure that each step in the process is completed independently of the next. The conclusion of each step gives our students the ability to reflect upon what they have done. The beginning of each new step allows further reflection—reflection upon how this new beginning relates to the previous ending. In doing and reflecting, we encourage students to embrace a methodology that mirrors human engagement with the world.

Conclusion

As educators, it is necessary to realize that our students are impatient. They have been conditioned to live a fast life. They are, generally, the products of a fast education. They want everything now, they want it clearly, and they want a high level of certainty in their knowledge and in the outcomes that result from that knowledge. Our task, as design educators, is to slow them down, to help them reflect upon their observations, and to embrace uncertainty as a means of innovation. Slowness, however, is a challenge to our students’ beliefs and assumptions about
the world. It is bewildering to them in that it is antithetical to their preconceptions about life, about education, and about architecture. As impatient as our students can be, we must remain patient. It takes time to develop new ways of seeing, of thinking, and of knowing. It takes time to strike the right balance between the abstractions of design and the pragmatics of architectural practice.

In an effort to counter the “fast life,” we will continue to attempt to teach slowly—to build a deeper awareness of and response to our being-in-the-world. We feel that this commitment to slowness is necessary to our program and to the future of design. Without the lessons of slowness in second year, the tectonic making of first year appears meaningless. Form making for the sake of form making is not how we envision architectural practice. Further, the pragmatics of third year are meaningless without a knowledge of the why of architecture; a knowledge that comes slowly. In second year, our commitment to slowness hopefully allows students the opportunity to create a richer, more sensitive, and more responsive architecture in their future studios and beyond.

Notes

1 Berg, Maggie and Barbara Seeber, The Slow Professor: Challenging the Culture of Speed in the Academy (Toronto: University of Toronto Press, 2016).
3 Nelson, C. E. “What is the most difficult step we must take to become great teachers?” National Teaching and Learning Forum, 10(4), (2001): 10-11.
9 Shahjahan, Riyad A., Educational Philosophy and Theory, 2015.
**Mentorship: Engaging Freshmen in Professional Practice**

Mo Zell, UW-Milwaukee

**Externship: Professional Experiences**

An architect’s education encompasses varied experiences. The academy and practice offer different opportunities. Exposing students early in their careers to both of these environments reinforces common lessons.

Having a practice-based experience in a professional architecture program is an essential and transformative hands-on learning opportunity. The highly structured practicum heightens the value of the relationship between school and professional practice. The UW-Milwaukee School of Architecture and Urban Planning externship program provides a student an intensive professional practice immersive workshop in a design firm allowing the student to discover and explore various career opportunities. Externships are considered short, practical experiences. While participating in an externship the student mixes classroom knowledge with real-world experience. They broaden their network gaining contacts in professional offices who then serve as mentors during the experience. In many cases the externship helps with the transition from school to professional practice. Hands-on activities during the externship include conducting research, scripted exercises, attending city planning or client meetings, and visiting construction sites. Most students experience some form of job shadowing during the time with the host firm. One student identified these as “activities ranging from Healthcare 101 discussions, facility tours, field trips, meetings, witnessing inspections, and one-on-one dialogs with key individuals.”

This paper will detail our school’s externship program and how modifications to it can engage freshmen pre-architecture students in meaningful professional practice experiences. Starting early enables students an opportunity to control their future.

**Logistics: Providing a Framework**

*Time: Is It A Vacation Or Not?*

Externships can vary in length of time but typically are scheduled in 1-week increments. UWM has an extended winter holiday including 3 full weeks in January. This provides UWM students an opportunity to extern any 1-week period during the 3-week winter break starting after the New Year’s holiday as well as 1-week during spring break (typically in March). It has also allowed for experimentation with longer externships including a 2-week externship. Firms see these longer externships as an opportunity to allow a student to immerse more fully into a project. In addition, the January break has provided students the opportunity to travel internationally to participate in externships abroad. Due to the time needed to travel overseas and return back to the states the 3-week break in January offers ample time, typically 2-weeks, for worthwhile experiences in international offices.

*Fig. 1 Extern dining with coworkers from Sou Fujimoto’s office - Toyko.*
**Quantity: How Many Can You Fit In?**

Students can participate in one externship per break (winter or spring break) with the possibility of eight externship experiences during their undergraduate degree if they begin in their freshman year. More typically students participate in 1 or 2 during their undergraduate enrollment. Although it is becoming more common for students to ask for more experiences including two different firms for 1-week each during winter break or exterining at one firm over winter break and another during spring break. Having multiple mini-experiences exposes students to a wide variety of firms and aggregates into a broad understanding about professional practice. This is highlighted by the following student comment: “there are many things that go into a building and it was helpful to be able to see different stages of construction and design.”

![Fig. 2 Externs visit a range of construction sites.](image)

**Matches: Process of Making Connections**

In mid fall, students register for the externship program via an online survey. The various data points requested include status as a graduate or undergraduate, degree program, certificate program (minor), areas of interest, preferred location, 2nd and 3rd location options, transportation needs, model making skills, which session (winter, spring break or both), which week(s) during winter break, previous externship experience, and additional information. This data provides enough information to strategically place the students in their externship. The highest priorities for placement include location and time frame due to the variations of having four weeks with which to choose (and often choosing multiple options within those four choices).

At the same time students are registering for the program online, administration is making connections with past firm participants as well as enrolling new firms. Contacting firms in early fall allows for the individualization of student requests for participation in the program for the following January and/or March. In connecting with firms, there is an opportunity to verify any changes to last year’s options — including number of students hosted or weeks willing to host as well as acknowledging the firms for their continued support of the program. In late November or early December matches are made. Firms are connected with students via email. Students are required to follow up with the firms with a short introductory email and resume. As one firm mentioned “(e)arly matching and communication between students and firms allows customized experiences.” Given our large pool of alumni in the region, students typically select amongst Milwaukee, Madison and Chicago for location. Although the program can support other regional and national locations made by request. More students are asking for non-regional locations and often for externships at specific firms. Our LinkedIn site as well as personal contacts with alumni or firms serves as a resource when making connections with firms outside the region.

Included in the survey questionnaire is a student’s area of focus/interest. Answers to this data point allow for a more fine tuned approach to firm placement. Although this information is helpful, the priority data points are still location and timing since these typically trump all other match requests. Ultimately the program is intended to match students with firms whose interests align.

Some firms have requested a particular kind of student (graduate versus undergraduate or area of focus) or have required a portfolio review of student applicants. This often comes from firms who see the externship as a way to assess potential interns.
Externship: Engaging Freshman

パートナーシップとの関係

インターンシップはパートナーシップであり、私たちは会社と協力して非常に成功した学生体験を手助けします。会社は学生が入社してから最初の数時間まで非常に緊張した状態であると受け入れ、それまでに家に帰る学生たちを提供しています。テストプログラムの目的は、学生に様々な体験をもたらすことですので、インターンシップからインターンシップへの移行は低い優先度（それでも学生と会社側はそれぞれのニーズによります）と考えられます。

多くの学生は、会社の雰囲気を気軽に感じるのを楽しみ、インターンシップ後、テーマパークの学生はこのインターンシップ中に学生を働かせることで、学生は新たな道を選択することを学びます。インターンシップ者は他のインターンシップの学生の経験を動かすために、より多くの学生が参加することを望んでいます。学生はそのような状況を生かして、良いアドバイスを受け取ります。全体的に、学生たちは自分自身をチームの一員に感じています。

メンターシップと結びつける

メンターシップの強化を促すために、インターンシップの構成を改善し、会社は両方の学生の異なる専門知識を持つ2人の学生を同時に受け入れるようにすることを奨励します。初級生や二年生を学部生や卒業生とペアリングすることで、彼らが再入学してからも強固な同級生のネットワークを形成できるようにします。インターンシップ者は、インターンシップの期間中、他のインターンシップ者の体験を共有するための数回の短期の会合が組織されます。学生は、これは「majors still a blur tome, not knowing if it's the right choice, but after the short externship I now know I like it.” Smaller group

Fig. 3 Extern at commercial construction site in Chicago.

Fig. 4 Externs join landscape design firms as well as architecture firms.

メンターシップ：学生をつなぐ

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meetings are also arranged with students who participate as freshman or in the 2-week externship. This provides important feedback on how to improve the program.

Fig. 5 Externs demonstrate cutting edge digital technologies to a firm.

Feedback Loop: Blogs

Experiences for all students are recorded through the externship blog (https://www.tumblr.com/blog/sarupexternship). The blog provides assessment to both participating firms and prospective externs and an opportunity for the student to reflect and share their voice. After students post, the link is shared with the firm to reinforce the positive experience. A student who was not initially keen on gaining exposure in a healthcare setting stated this on the Tumblr blog after her experience: “this externship has definitely increased my interest in pursuing a career in the healthcare world.” Students also share summary comments that can be useful to any extern. One student offered these words of wisdom to other externs on the blog: “What I walk away with most is the mindset that was repeated by the P+UD team: don’t be afraid to ask questions. Do the research, and dig deeper than just the surface. Make mistakes, but make them quickly and implement what you learn.”

Innovations: Making Adjustments For Freshman

To encourage more freshmen to participate we modified the externship into a one-day version for freshmen only. Not only are freshmen paired with upper level students in firms that agree to host two students, this new one-day experience is geared as an introductory externship. As such freshmen are paired with the full-week externs but only for the first day. This first day exposure allows freshman to be introduced to local and regional firms while also building a network of peers at the School. Freshmen in these one-day experiences ease into a new professional environment, tour the office, meet team members, hear how the design process works at the firm, and examine projects and tools. These one-day experiences also provide freshmen access to upper classmen mentors. One firm referred to the program as the ‘add-on opportunity’ describing the first day as follows: this day tends to be a more “generalized introduction to the firm and to practice, which we believe will well serve the freshmen without detracting from a higher-level of engagement for the other students during the balance of the week.”

Fig. 6 Externs out on the job site.

Long Term Goals: Growing The Program

In four years, the program has grown exponentially, increasing by almost 400% to 80+ students. Although freshmen are a small proportion of this number, we are gratified by the role the program plays in encouraging these students to engage with practice. The externship program is a long-term investment in our students and
we plan to track statistics to see if freshmen who participate in the externship program stay in the profession at a higher rate than those who don’t.

**Modifications: Making the Experience Better**

Freshman participants need more coaching and/or training before they participate in these experiences. The unknowns are so great that students often do not know where to begin in terms of firm research or what questions to ask. In an effort to combat these issues, returning externs can mentor and prepare the freshman with information about what to expect, what to ask, and how to navigate the externship.

**Future: What’s Next?**

In an effort to get small firms (typically 1-person offices) more involved in the externship program we ran a pilot program this winter where two small offices offered a 1-day experience for a single student. Given that small firms do not typically have the capacity to offer the variety of experiences associated with the externship, these 1-day experiences can aggregate over 5-days into a more robust experience. The week provides variation within a particular office typology. It is anticipated that next year five small firms will host a single student each providing a different experience for the week.

To understand the long term effects of the program it is anticipated that former externs will be contacted after one year from the time of externship and after graduation to comment on the externship experience. These reflections will help provide data to the effectiveness of the externship and its influence on jobs, job searches, and professional practice attitudes.

**Challenges: For Externs And For Firms**

So far the main challenges have been extern preparation before arriving at the office and externs isolated from others with limited interaction while at the firm. More practically, although the externship is used in marketing pieces for undergraduate and graduate recruitment there is no clear connection between the externship and increased enrollment.

**Conclusion: Does This Make A Difference?**

Encouraging freshman to start their education with an externship gives them more career options, exposes them to various professional practice cultures, and most importantly engenders professional and peer mentoring. Ultimately, the externship offers these millennials more control over their decisions as they seek to gain valuable experience and create their own professional path.

**Notes**

1 I want to thank all of the firms and students who have committed to participating in this experiment. Many other schools have models of externship that I looked at before starting the one at UWM. In particular I am thankful for the UVA externship (which I also participated in as a student) and Michigan’s externship program.
Peer to Peer: Finding Inspiration From Within
Brad Deal, Louisiana Tech University

Each Spring at Louisiana Tech University, a group of students embark on their first experience to construct a permanent structure of their own design in a 10-week design build studio for a community-based client. This presentation will screen a short film that summarizes the motivations that go into and come out of that experience. The student’s exposure to an exhausting process that requires salient personal motivation has been a powerful and accessible source of inspiration and purpose as they each discover within themselves an answer to the question of “Why?”

film link: https://vimeo.com/180121925
The Drawer’s DRAWER: a supporting role

Anne Patterson, University of Kansas School of Architecture, Design & Planning

Unsung heroes of Foundations Studio part 3: The drawer’s drawer. So much more than ‘a sliding, lidless, horizontal compartment... it is the great tool belt of the studio desk: the saddlebag of studio. The drawer’s drawer holds the tools that make ideas come alive. Its contents are inert until activated by an idea: a concept wanting to be brought to life.

This tinyTED explores the supporting role of the drawer’s drawer and the constant journey of its contents to the desktop and back. Perhaps its inherent order or chaos, or its level of privacy tells its own story of the user. This tinyTED pays homage to not only the lowly drawer, but other unsung vessels that provide a supporting role in our creative process.
Digital Storytelling: The Digital and The Human

Allegra Pitera, University of Detroit Mercy, School of Architecture

In a digital storytelling workshop I held for youths from Southwest Detroit, students harnessed digital storytelling methodologies to tell powerful stories. The content of their brief, written narratives describes a ‘moment of change’: a series of events that led to their being engaged with their community and how those connections changed their lives, and those around them, for the better. Through the process, students honed their storytelling and technical skills but most importantly, they garnered confidence in the power of their ‘voice’.