Designing the Build Experience Through Inhabitable Deliverables: Three Case Studies Housing Project-Based Instruction

While academic curricula and pedagogical delivery methods vary, coursework and opportunities outside the traditional classroom offer new millennial students specific encounters with the global professional practice of architecture.[1] Design-build learning environments inspire students to move from typical studio-based small-scale representations of design schemes into development of full-scale inhabitable space(s).

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INTRODUCTION TO INHABITABLE DELIVERABLES

Varied in scale and disposition, design-build opportunities allow students to create deliberate and expressive inhabitable deliverables where design concepts address materials, function, and scale for global environments. An inhabitable deliverable begins as a full-scale prototype, allowing students the ability to incorporate various curriculum topics while designing within a project-based environment. As Marshall McLuhan states, "Everybody experiences far more than he understands. Yet it is experience, rather than understanding, that influences behavior."[2] Educators can provide opportunities for experience, aspiration, and comprehension; but behavior is the outward manifestation of passion, knowledge, and opportunity. The relationship between design and construction phases establishes the foundation of what defines the architectural terminology "creating-making." This paper explores the pedagogy of design-build engagements by showcasing three collaborative projects within a haptic curriculum focused on sheltering the "inhabitant" ranging in scale, scope, and diversity as listed below:

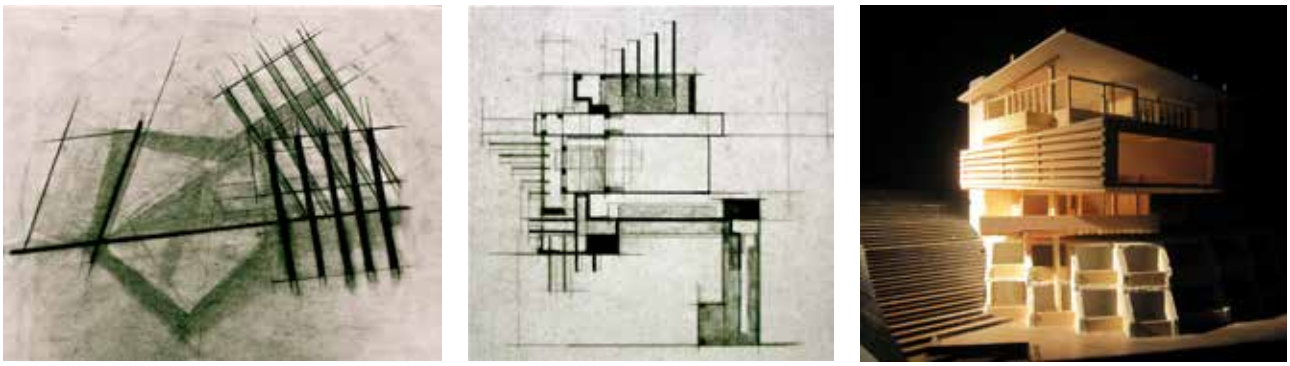
1. Housing an inanimate object for human interaction - Exhibited through the Little Free Library (LFL) project integrated into Spring 2013 2nd year studio
2. Housing children at play - Exhibited through the 2012 CASA Playhouse Parade project as a dedicated design-build short course
3. Housing adults/families in a residential setting - Exhibited through an ongoing collaborative multi-disciplinary research-based community project

Vital to core requirements within a creating-making curriculum, incremental exposure to design-build projects allows students kinesthetic correlations

between learning and doing. Exposure to multiple design-build experiences strengthen retention, collaboration, and professional proficiency.

THE SPIRIT OF CREATING-MAKING

In the professional spirit of creating and making, architecture curriculums explore integration across thinking, developing, crafting, and physical building. Varied opportunities in and out of the classroom allow students to produce inhabitable deliverables in lieu of orthodox small-scale models and drawings. Often generalized as materiality in two and three-dimensional representations, full-scale constructs mandate the manifestation of ideas into material selections through specific requirements and capacities. While models and drawings graphically communicate and correlate to the presentation of concepts and creativity, full-scale constructs demonstrate human scale interaction and perspective.



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The union of creating and making begins when students possess curiosity for bridging between stereotypical designers and constructors, thus recognizing the two aspects of creating are intrinsically linked. Peer learning, applying content outside the classroom, compulsory participation, multiple levels of accountability, and the effects of projects beyond academia are key components of project-based instruction.

To be successful and productive, students must first be exposed to small-scale design-build projects and then commit to larger projects. Although all design-build projects are built constructs, larger projects lend more exposure to the reality of architecture and construction professions. As Winston Churchill exclaimed, “We shape our dwellings, and afterwards our dwellings shape us.”[3] Similarly, Marshall McLuhan states, “We become what we behold. We shape our tools and then our tools shape us.”[2] A one-time project may spark or attract interest, but design requires iterations or repetitiveness to cultivate experience. Curriculums offering a series of design-build projects allow scale, scope, and diversity to develop from holistic intellect through a physical crafting method of learning architecture. As Alvar Aalto defines, “Building art is a synthesis of life in materialized form. We should try to bring in under the same hat not a splintered way of thinking, but all in harmony together.”[4] Architecture students must understand construction and materials to develop inhabitable structures for future clients.

The LFL, CASA, and CEB projects showcased in this paper exemplify three types of learning (auditory, visual, and kinesthetic methodologies) within a design-build framework and intently address the paper session question, “Can design-build projects enrich the teaching and practice of architecture?”[5] The creating-making pedagogy offers examples of students and faculty working together to improve

Figure 1: Interpretive and diagrammatic drawings and model. Lower left and clockwise: third year model, first year armature and rhythm, and first year diagram of procession.

delivery and efficacy within project based instruction, critically analyzing needs of the student, pedagogy, and lessons learned upon completion. Alacritous students are subsequently exposed to technical evolutions, client requirements, and awareness of global environmental issues within a studio, short elective course, and long-term research.

THE LITTLE FREE LIBRARY

The foundation of the design-build methodology begins with an introduction into full-scale materials and crafting within the typical curriculum. A forced engagement at a relatively small scale and scope presents the creating-making approach to students as part of their required courses, providing an introduction to design-build projects. One such project is entitled the Little Free Library (LFL), which serves as a precursor to larger and more sophisticated projects for students who convey interest and curiosity in project-based learning. The LFL project was introduced by the local chapter of The American Institute of Architects (AIA), The Neighborhood Alliance, Barnes and Noble Bookstores, and the Start Helping Impacted Neighborhoods Everywhere Program, and joined together to promote the establishment of 15-20 LFL locations in a metropolitan area. Patterned after other projects around the country, the LFL project is a community-based project where small book receptacles are installed in neighborhoods and shared by communities. The Spring 2013 second year architectural design studio adopted the LFL project to augment student comprehension of and aptitude for materials.

2

Figure 2: Student teams working on the LFL and one example prior to installation (Spring 2013).

The self-chosen student teams, based on perceived personal strengths and weaknesses, formed 11 groups with each group assigned one of three neighborhoods. The metropolitan area and each neighborhood association selected a total of six LFLs for installation. The students began with the following set of program requirements:

- Use available recycled, salvaged, and found materials
- Demonstrate green building techniques
- Construct for durability and weathering
- Provide inside space for books: 20” wide, 15” deep, 20” high
- Connection to 3’-0” high 4”x4” post

The students were tasked with researching the neighborhoods, gathering materials, and documenting the process through photographs spanning the two-week

project schedule. Given the time restraints, some teams immediately worked together by sketching out ideas while others created both physical and digital models. One team started directly in the shop and designed while they built one piece at a time, internally developing a build-design approach. Within the first few days, the teams exchanged their typical home in the studio for the accessibility to tools and material crafting abilities in the model shop. For most of the class, it was their first time building something full-scale and having to consider tolerances of materials and constructability. As the first week progressed, students with previous shop experience began to mentor other students on craft, accuracy, and assembly.

The Design Studio and Materials course instructors were present for consultation and safety requirements. Teams experimented with materials beyond the conventional uses of wood and acrylic, yielding both success and failures through the process. As architect Michael Reynolds believes and has fought to overcome, progress evolves through making mistakes.[6] Sometimes mistakes prove to be successful learning opportunities. Student experiences were evident when presenting ideas and process of the final constructs to a design review board and the associated neighborhoods. Students were also required to complete a self-assessment and team member assessments, providing feedback of both personal and group lessons learned.

THE CASA PLAYHOUSE

Building upon the lessons of the LFL, a second type of project-based learning within the creating-making curriculum provides a dynamic where students vertically interact with other students and faculty outside the typical design studio. As promoted by Walter Gropius and the Bauhaus, the creation of a building is the ultimate synthesis, the apex of art, craft, and technology.[7] The living union of art, design, and construction is the key component to a creating-making curriculum, teaching architecture as interactive and participatory activities.

The 2012 Playhouse Project benefitting Court Appointed Special Advocates (CASA) annual Playhouse Parade was produced within a four-week summer course as an addition to the core creating-making curriculum. An ambitious collaborative team of students, faculty, and staff set out in a whirlwind 25-day design, construction, and delivery process to meet basic requirements of safety, time, and budget while offering an experiential alternative to preconceived ideas of a playhouse. Students and faculty were challenged to construct a playhouse within the following guidelines:

- Material budget of $500
- 7’-6” x 7’-6” x 8’-0” envelope
- Transportable in pieces for display
- Assembled within a couple hours inside a shopping mall
- Displayed during the 10-day raffle
- Disassembled and transported to the winner’s home
- Permanently reassembled on site

The team immediately searched for salvaged and reused materials as necessitated by environmental stewardship and limited budget. Aligned with Peter Raisbeck and others, “there needs to be a shift in design pedagogy towards an approach which mends the schism between construction, waste production, design thinking and resolution, and fosters a greater understanding of the nexus between design, materiality and construction detailing, and actively explores adaptive re-use of material and construction waste.”[8] Inspiration quickly befell

upon locating milled cedar harvested from a 2007 ice storm that became the proverbial "found object" and the design immediately responded. Due to time constraints, budget, and student skills, the project developed into a hybridized form of design-build that favored the building component as a real-time method of designing, which parallels the build-design approach mentioned in the LFL projects. Students found themselves in agreement with architect Steve Badanes who stated, "there is no substitute for hands-on experience." [9]

3

Figure 3: Developing design concepts, meeting with elementary students, and constructing the full-scale playhouse in the model shop prior to raffle (Summer 2012).

With the CASA Playhouse project as their single focus, the team was able to immerse themselves in the entire process without digression. Students studied historical aspects of playhouses, compared sketches of rough ideas, developed digital models and drawings, and validated ideas in physical full-scale mockups. Initial mockup iterations demonstrated stacking, layering, and composition of materials simultaneously defining aesthetic, acoustical, structural, and modular qualities for transport and display. The project introduced students to various phases and stages of an inhabitable construct while the short time frame mandated quick decisions and commitments. Per Scott Wing in his essay *Sore Shoulders, Bruised Ethics*, students were faced with multiple facets of professional projects. Wing states, "As students confront material consequences and cope with physical exhaustion, struggle to reconcile the divergent missions of clients and classmates, and ponder the limits of time and money, they experience the act of construction as a process of 'doing the right thing.'"[10]

The 2012 Playhouse Project final result has been published and publicized with positive feedback. Those who have visited the playhouse, either at the COA Model Shop during fabrication, shopping mall during the Playhouse Parade, or at its current home 40 miles from campus, comment about the structure, aesthetics, and how the unique learning environment spans outside the classroom and curriculum. The team's diligence for harnessing and combining materiality and form into a showcase of architectural ingenuity, sensory interaction, teamwork, meeting deadlines, and ultimately constructing something that appeals to people of all ages, demonstrates ability to produce an inhabitable piece of art.

Most students in the class had not previously worked in close vertical collaboration with other students of various year levels and faculty. The following quotes were randomly selected from course evaluations and correspondence with CASA:

I never thought I would learn as much as I did from research, design, working with others, and actually putting a design into reality. – student

Students and professors worked together to create a collaborative experience unlike any course I have taken in the past. – student

It might be hard to imagine college students being excited about building a kid's playhouse, but when you see the intricate detail, originality, and overall craftsmanship of the playhouse, you know there was enthusiasm every step of the way! – CASA

The team did a terrific job! I get many compliments on the playhouse. – raffle winner

Incorporating projects similar to the playhouse, with students of varied year levels, involvement of various faculty members, emphasis on recycled and reused materials, budget, safety, client or demographics interaction, and definitive milestones enhances and accelerates the learning process. The research, teaching, and production process may not always be linear or cumulative, but active multidisciplinary hands-on involvement is always fruitful.

4

Figure 4: Playhouse being assembled for 10 day raffle in shopping mall and final interior view depicting use of salvaged cedar, cypress, and acrylic (Summer 2012).

THE CEB RESIDENCE RESEARCH PROJECT

Small-scale projects initiate student interest, which can lead to service learning via full-scale research projects and local community-based charity projects. As W. Geoff Gjertson states, "surveys have shown that our architecture students increasingly prefer a hands-on education serving their community. Whether it is for altruistic reasons or just the desire to get their hands dirty, they want to get out of the classroom and into their community."[11] Students and faculty have definitely gotten their hands dirty with one service learning opportunity originally developed as a research project to evaluate Compressed Earth Block (CEB) as a viable type of residential construction in central Oklahoma.

Students and faculty completed a Fall 2011 Earthen Design and Construction multidisciplinary course of 22 students focused on alternative construction and using modular CEB as a building material for affordable community housing. The course led to a partnership with Cleveland County Habitat for Humanity (CCHFH) to construct and compare a new CEB residence for structural, thermal, acoustical, and energy consumption to an adjacent conventionally built new wood-frame

house. The entire research project consists of Architecture, Construction Science, Landscape Architecture, Structural Engineering, and Civil Engineering students and faculty. Collaborations among colleges and departments allow both students and faculty to learn from each other, mutually benefit from diverse research, and physically develop tangible constructs.

5

The importance of drawing and building physical mockups stressed by the faculty, compelled students to understand the need for offsite structural and architectural mockups; determining constructability, capacities, connections, and detailing prior to publicly displaying the construction process. The discoveries addressed open issues prior to constructing the residence. The project also addresses theory, practice, and education embodied in mockup wall panels as a teaching tool during design and construction phases. Mockups of ideas in software, physical modeling, and full-scale versions not only assist the holistic design process, but the process of trial and error is dependent upon the ebb and flow between intellectual and physical making. They were a starting point for the CCHFH single-family residence, involving the community in academic research.

Continued research allows students to be part of soil analysis, CEB production, construction documents, and physically building the CCHFH residence. Various enrolled, volunteer, and employed students intermittently inject physical and intellectual energy into the varied project phases. They are exposed to the entire research and development process of creating and making an inhabitable deliverable.

THE PEDAGOGY OF INHABITABLE DELIVERABLES

Architectural pedagogy, historically established in the kinesthetic hands-on process of creating and making, is a broad topic with various opinions, principles, and pedigrees. While a comprehensive architectural education rooted in history, theory, technology, and sustainability can be conveyed within classroom and studio environments; full-scale collaborative community projects provide synthesis of various course topics. Furthermore, architecture students who typically write, sketch, and construct models of design concepts must understand what information (schedule, cost, etc.) is needed to eventually construct inhabitable space. Newton D'Sozua states, "The idea of a multi-skilled architect is not new. In Vitruvian time, architects were multi-skilled to fit into the role of master-builders." [12] History provides valuable lessons where practice and/or theory support the creating-making character of inhabitable space.

Figure 5: Progression from soil processing and CEB manufacturing, structural test walls, a sequenced mockup wall, and coursed CEB walls at CCHFH residence adjacent to wood framed residence under construction (Fall 2011 – Fall 2013).

Although pedagogy of the three aforementioned projects did not particularly focus upon any one architectural approach, the participants' backgrounds allowed various interpretations of history, theory, and technology to develop sustainable design concepts and functional inhabitable spaces. The project types and time constraints yielded a hybridized form of designing and building where

creating and making cyclically informed the other. The build-design concept evolved and validated design principles by providing opportunities for students to appreciate physical materials while designing. This style echoes Frank Lloyd Wright's comments to future architects, "go into the field where you can see the machines and methods at work that make the modern buildings, or stay in construction direct and simple until you can work naturally into building-design from the nature of construction."[13]

Kieran Timberlake and other research practitioners who engage in design-build and digital fabrication have called for a return to the architect as "master builder" in order for the profession to remain a central player.[14] Serving as one small step toward master-builder traits, the inhabitable deliverable is an exercise in physical mockups. Not merely the aesthetic manifestation of ideas into tangible materials, the constructs are real time three-dimensional sketchpads for architects, contractors, consultants, and clients to work through connections, decipher compatibility, and foster collaboration. The collaboration becomes a four-dimensional design tool as revisions are developed over time. The transition from small-scale modeling to full-scale inhabitable deliverables is a crucial part of architectural pedagogy.

Discussing the typical studio environment, D'Sozua states, "The primary problem in such a system is the assumption that learning occurs sequentially from a beginning level to an advanced level and that students absorb the complexity of architectural problems in a cumulative manner… Cross disciplinary courses could be encouraged in which architectural design is seen as a continuum between different design disciplines." [12] Involving students and faculty of varied year levels and areas of study, the CASA Playhouse project and the CEB project embody discourse beyond the typical studio environment. Evaluating the vertical pedagogical component of design-build projects, learning is communicated via full-scale constructs to focus attention on developing connections between learning and doing. The listed projects contained community-based collaboration, fostering both contributions to society and initiating public involvement. The projects allowed creating-making principles to open pedagogical doors for incorporation of various design ideologies and associative learning. Architects, painters, and sculptors are craftsmen in the true sense of the word: hence, a thorough training in the crafts, acquired in workshops and on experimental and practical sites, is required of all students as the indispensable basis for all artistic production.[15] The relationship between design and construction establishes the foundation of creating-making.

The pedagogical goal of design-build experiences is to understand the physical nature of assembling materials and technology as a tool, not a reliance and subsequent displacer of architecture from the physical world to the virtual realm. Per Richard Sennett, we must evaluate the technical as an outcome of the "powers of (the) imagination." [16] Students begin to understand how concepts of materiality and functional space develop into the tangible manifestation of inhabitable space through the meticulous attention to materials, physical connections, scale, proportion, and composition. They quickly differentiate between the ease and perfection of drawings and scale modeling when compared to the physical tolerances of crafting constructs in actual materials within three-dimensions.

The pedagogy of hands-on experience and connection between conceptual and tangible aspects of projects help students learn to streamline the design process while comprehending how people are the determining factor of design. Nunzia Rondanini states, "architecture can stimulate and influence social life without

presuming that, in and of itself, it will promote social development."[17] Furthermore, author Alain de Botton professes, "bad architecture is in the end as much a failure of psychology as of design. It is an example expressed through materials…"[18] Design-build projects introduce students to not only the physical crafting side of materials, but also the crafting of the relationship between the client and the final inhabitable deliverable. Aligned with Michael Foucault and evaluated by Paul Rabinow, architecture produces positive effects when the architect's intentions coincide with the practice of people.[19] All three projects have actual clients, which provides students more professional reality to design-build endeavors. The projects also allowed students exposure to the naivety set forth by preconceived ideas of what a book drop should resemble, who a playhouse should serve, or the socio-economic stereotypes associated with earthen construction.

Ideas can be conveyed through various mediums of expression and instruction, but the experience of architecture does not take root until one physically inhabits the full-scale space. Steve Badanes continues, "Three-dimensional reality suggests solutions that are elusive or simply impossible to detect at the drawing board or computer screen. The best architects understand the logic and poetics of construction, and the best way to teach this is to build."[9] Learning becomes intentional and visual as explained in the book, "Places of Learning" by Elizabeth Ellsworth. Ellsworth openly discusses learning as an undeniable look of simultaneous absorption and self-presence – being part of an experience, not compliance. Specifically, she states that the look has become "the face of Learning with a big "L" – Learning itself."[20] The relatively small, close-knit setting of these design-build projects allows students and faculty an academic nod to the Bauhaus model of working and learning together.

SUMMARY

Design-build opportunities fuel students to fuse creating and making as one entity, promoting the collective process of defining experiential space. As defined by Walter Gropius, "Artists, let us at last break down the walls erected by our deforming academic training between the 'arts' and all of us become builders again! Let us together will, think out, create the new idea of architecture." [21] The collaborative approach to design allows students hands-on experience with various materials, how those materials physically go together, and how to work within various disciplines. Personal experience and involvement in every decision ultimately impacts the character of inhabited space(s). When compared to a typical design project of scale-modeling an idea with various materials of certain color or tone to emulate the specified full-scale materials, design-build projects embody necessary personal interaction to facilitate learning and applying lessons learned to future projects.

Educators should provide opportunities which support design curriculums where ideas are physically built, allowing the general public to be critics. As Bruno Taut set forth in 1918 concerning a site on which architects could erect large-scale models of their ideas, "Here, too, new architectural effects… shall be tried out, perfected and exhibited to the masses in full-scale temporary constructions or individual parts of a building. The layman, the woman, and the child will lead the architect farther than the inhibited specialist."[21]

All three documented design-build projects address various areas of social, technical, economic, and environmental advocacy as outlined per the following lessons learned:

ENDNOTES

1. Howe, N., and W. Strauss. *Millennials go to College*. New York: LifeCourse, 2003.

- Focused effort with rapid decisions
- Cross-collaboration among various individual skill levels
- Non-linear process of drawings, models, mockups, and final construct
- Deliberate merging of sensory stimuli
- Consulting potential clients, age group, and demographics
- Material and financial stewardship in sustainable design
- Client guidelines and interaction
- Modular construction for transport and display
- Accountability to a design review committee
- Safety procedures and concerns
- Challenging preconceived ideas
- Using materials and tools with a high level of craft
- Benefitting community-based charitable efforts
- Combining digital and analog technologies
- Producing constructs to house and support human activity
- Vertical peer learning experiences

The lessons learned thus far in these projects will continue throughout the 2013–2014 academic year. The LFL project or similar will be offered to the second year architecture studio again, the Playhouse course will be offered for the 4th year in a row resulting in 5 consecutive entries, and the CEB residence will be completed with monitoring in place and active data collection.

The inhabitable deliverable connects design with occupancy and allows personal interaction with materials, the medium in which design concepts are manifest. McLuhan states, "The medium is the message. This is merely to say that the personal and social consequences of any medium—that is, of any extension of ourselves - result from the new scale that is introduced into our affairs by each extension of ourselves, or by any new technology."[2]

Aside from the necessary pedagogy of teaching the link between creating and making, the importance of working with community-based organizations in service-learning environments is critical to advancing student appreciation and comprehension for social, technical, economic, and environmental needs. Gjertson recommends, "Design-build programs partner with community and/or industry organizations/companies…" He continues, "Few question the importance of experiential, project-based, service-learning. Collaborative team skills, communication, leadership skills, and interdisciplinary practice, the benefits of service-learning, are also accrued through design/build teaching and experience."[11]

Students are and should always remain the primary subject of teaching. Every student can be successful and achieve their goals if they make learning their top priority. If inquisitive students and faculty embrace design-build projects with a creating-making curriculum, the threads of information will form a woven tapestry of knowledge, expression of function, and an inhabitable deliverable.

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