Size Matters: Investigating the Scale of Projects, Teams and Time Through Four Design-Build Studio Iterations

As schools grow and the market demands more qualified graduates, schools will attempt to compress more knowledge and experience into the undergraduate curriculum. This trend seems unlikely to shift in the near future and it only further obligates educators to deliver high quality, efficient and effective learning experiences such as the immersive, motivating environment of the Design-Build studio.

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INTRODUCTION

The proposition of honoring and refining student design work through construction while leveraging that effort towards altruistic goals has been widely adopted by schools of architecture over the past several decades. The resources required to undertake these efforts are significant and while positive outcomes in terms of practical pedagogy, community service, and collegiality dominate the experience, those who operate these programs are aware that, as with all projects that leave the design phase and enter construction, negotiations and compromises are involved. In the case of Louisiana Tech's Design-Build program the navigation of these compromises has prompted the program to employ the Design-Build process in a variety of formats, scales and participation levels. This paper tells the story of the evolution of this program's effort to define the role of the Design-Build format within its curriculum and analyzes the four distinct modes it has assumed over the past 13 years. These modes have covered a significant range of project scales, class sizes, and time constraints yielding a valuable set of case studies in which only a few specific variables differ from one iteration to the next. At each of the temporal, physical and participatory scales discussed there are critical alignments and capacities to be reconciled with client and studio objectives as well as challenges that can inhibit achieving certain goals. It is the goal of this paper to illustrate how these qualities of scale have come to shape the evolution of the Design-Build studio format at Louisiana Tech in order to illustrate how similar programs might tailor their objectives to the resources available and/or justify resources based on their pedagogical and service learning goals.

GENESIS OF THE PROGRAM (2000-2004)
PAVILION SCALE / SMALL GROUPS / 9 MONTHS

In 2000, in an effort to create a "capstone studio" [1] experience for students completing their five-year Bachelor of Architecture degree, the Louisiana Tech School of Architecture adopted the Design-Build format for their terminal undergraduate studios. Seeking a comprehensive project experience at the intersection of "community, collaboration and craft",[1] the curriculum was set up around a full academic year of studio courses and complimentary seminars which sought to evaluate and inform it's students of their ability to deliver competent and valuable design projects vetted by the constraints awaiting them following graduation.

Because Louisiana Tech operates on the quarterly academic calendar, the three studio courses occurring in student's fifth year were aligned to follow the logical project sequence of predesign, design and construction. Each fall students would work to identify potential project opportunities from the municipal parks department, the parish school board and university or related organizations. Students would also, with the assistance of faculty coordinators, contact potential funding and material donation resources. They would then divide into groups of three to four, select from a variety of identified community projects and begin the processes of pre-design and site analysis for their given projects. This system was conceived to accommo-

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date a relatively small class size of ten to fifteen students forming three to four project teams. The design and drawing processes took place in the winter quarter and in early spring quarter of each year construction would begin and continue through the remainder of the academic year yielding several completed projects ranging from 200-600sf with budgets of $5-10K.

A range of positive, though fundamental, developments were realized in the first four years of this process. Sustainable, mutually beneficial relationships with community partners were developed. The students involved enjoyed the obligation and privilege of constructing multiple original designs each year. Friendly competition

Figure 1: I.A. Lewis Outdoor Classroom, *2003*

among the teams motivated individual students and multiplied learning opportunities though project comparison and peer instruction. As a result, students in these first years of the program completed their degrees with new levels of confidence and experience regarding design development, building production, teamwork and a range of practical design knowledge.

In spite of the positive momentum, clear weaknesses accompanied the critical accomplishment of establishing the program. In the format of multiple simultaneous projects, even at smaller scales, the material and monetary donation resources available were drawn upon all at once and spread thin across projects. The single faculty instructor's time and project management abilities were similarly divided across each team creating the variable condition of greater accountability and leadership required from the students. This ultimately led to a wider range of quality and completion in the projects from weaker, less committed student teams, while simultaneously further enriching the experience for stronger students who successfully met the challenges of project management and more autonomous operation.

As this format evolved, growing class sizes led to larger teams, larger projects and increased complexity as a string of enclosed, semi-conditioned projects began to set a new standard for the project scale in 2004.

HABITAT FOR HUMANITY (2005-2010)
RESIDENTIAL SCALE / LARGE GROUP / 9 MONTHS
In 2004-05 the Design-Build program began its formal relationship with the local Habitat for Humanity Chapter. In order to embrace the trend of increasing project scales and consolidate previously sparse donation resources and faculty oversight, the entire fifth year class formed one large team to design and construct a single-family home alongside a deserving family in the standard Habitat for Humanity fashion. Research agendas for the initial house included a design challenge from Judith Hefland to construct the home PVC free in order to promote occupant and student awareness of the unintended consequences of toxic material use.

A wide range of Architecture schools, from Auburn's DESIGNhabitat[2] program to SCI-Arc's recent LA Housing initiative[3], have partnered with local Habitat for Humanity chapters to leverage the strengths of each organization in service of affordable housing and education. As Louisiana Tech began their relationship in the 2004-2005 academic year, many of the unintended consequences and missed opportunities of the previous mode of operation were addressed through the partnership. By concentrating efforts on one large project, the fundraising, material donations and faculty guidance resources were far more focused and therefore valuable. Design efforts were similarly concentrated resulting in higher quality design decisions, as they were the synthesis of the best ideas from a larger group. A clear qualitative improvement in the experience was also realized in the social justice agenda generated by the client. By engaging a specific charity and family, the students and the Design-Build program as a whole benefited from the identity and clarity of the project narrative provided by Habitat for Humanity and their clients.

In terms of additional learning opportunities for students, the construction of an entire house with a true thermal envelope, MEP systems, extensive waterproofing details, and structural considerations was a far richer and more complex set of practical experiences than the construction of unconditioned pavilions in previous years. Despite their normative qualities, the framing of typical stud walls the installation of roofing, lighting and plumbing fixtures etc. allowed students to internalize

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a far clearer understanding of a variety of building systems that were not a part of previous build efforts. While these activities and assemblies are not a product of an academic research agenda, it is critical that these systems and their inherent tendencies and limitations are understood by students in order to facilitate exploration of projects that involve them.

Along with these improvements to the Design-Build program, came some standard Habitat project considerations that were at first innocuous design parameters, but were proven over the course of multiple projects to be genuinely problematic. The most obvious of these was the classic struggle between the competing aesthetic and formal desires of student designers and the necessary desires of affordable housing clients. The Habitat for Humanity client base was interested in a vernacular and unobtrusive aesthetic – something comfortable and familiar that embodied the normative idea of "home" for them. Students on the other hand, having been trained to think critically and creatively, sought forms that were site, climate and function specific. Examples of such formal expressions include asymmetrical roofs that offered water catchment and fenestration arrangements that create natural light and views that corresponded to activity patterns. Additionally students sought to employ the digital fabrication tools available to them through the university for elements such as railings, screened porches, doors and cabinetry. Their inexperience with these tools and often rushed execution did little to convince clients to trust student aesthetic inclination. In general the student's desire to highlighting the unique features of the projects ran contrary to the client's desire for familiar, traditional residential design.

In addition to formal and aesthetic struggles, the rigid budgetary and programmatic constraints of the Habitat for Humanity's ~$47,000, 1050sf, 3 bedroom home led to negotiated degrees of repetition from one year to the next. And the unoriginal design elements came to be justified by the accelerated schedules and client's interest in uniformity, low maintenance and predictability.

COMPETITION VS. BUILD AND THE 4+1 CURRICULUM (2010-2013)
RESIDENTIAL SCALE / MEDIUM GROUP / 6 MONTHS

Figure 2: HabiTECH House, *2008*

The relative success of the program's relationship with Habitat for Humanity led to the design and construction of 8 consecutive homes from 2005 to 2013. During this sequence, the school's 5-year Bachelors of Architecture curriculum was restructured to become a 4+1 Master of Architecture program. Because the Design-Build studio had been seen as the culmination or "capstone" to the undergraduate degree program the Habitat for Humanity Home became the responsibility of fourth year students. This compression of the undergraduate degree program shifted the timeline for the house from three quarters to two. Predetermined clients, fundraising and donation sources allowed much of the preliminary work to be easily accomplished under the tighter schedule and at the beginning of each winter quarter (November) the students would begin the design process with construction occurring from December through May.

As class sizes began to further increase an alternative terminal undergraduate experience was offered. Beginning with the fourth year class of 2008/2009 students could choose to spend their winter and spring quarters developing an entry for the annual ACSA student competition or spend that time in the Design-Build program on the Habitat for Humanity House.[4] The development of competition and Design-Build tracks within the program reduced the number of students participating in Design-Build, but also represented an increase in the average motivation and hands on skill set of the students who actively choose the Design-Build track.

In the three years that the program operated under this model, internal debates surfaced regarding which track was best preparing students for practice and for the graduate program.[4] This was a debate of skill set priorities as the Design-Build student's knowledge of detailed assemblies, materials and construction means and methods was superior, but their software skills, graphic communication abilities and research methods were typically less developed than their peers who had spent 6 months preparing competition entries. The dual track arrangement set up a particularly interesting experiment that more clearly defined the value of construction knowledge as well as the trade offs involved in missing additional research, software and drawing experiences.

Under this model the Design-Build program retained all of the benefits originally gained by adopting Habitat for Humanity as their client, but over time and across multiple project iterations, the less desirable conditions of this format became more prevalent. The unchanging project parameters, accelerated design processes, and continued formal aesthetic struggle between student and clients led to a high degree of repetition, effectively reducing their value as academic design problems. Operating under time and man-power constraints, paired with the inefficiencies and repetition of tasks necessary with novice builders, led to a truncated, less exploratory 2-3 week design process and a more intense building season in which students would often log an average of nearly 40 hours per week on site. This would occasionally lead to the neglect of other classes and responsibilities by the Design-Build students and a noticeable difference in graduate school applications and portfolios when compared to the competition track students. The argument surfaced regularly that there was too much "hammer swinging" and not enough thinking, designing and research happening among the Design-Build students. However the conclusion remained that both the competition track and Design-Build tracks were highly valuable experiences.

JUNIOR SPRING EXPERIENCE (2013-PRESENT)
PAVILION SCALE / LARGE GROUP / 12 WEEKS

In response to the critiques of the Habitat oriented Design-Build process and the acknowledgment that both the competition and Design-Build experiences were highly valued, in 2013 the role of the Design-Build studio underwent its most recent evolution. Rather than two simultaneous tracks, the competition and Design-Build time allowances were reduced to a single quarter and the two studios were inserted into different points in the curriculum. Design-Build was no longer considered a terminal studio, but rather as a growth experience to be built upon while still in the program. It was shifted into the spring quarter of student's third year with the competition studio occurring in the spring quarter of the fourth year. Reduction to a twelve-week (one quarter) time frame marked the intentional move away form full-scale residential construction and the suspension of the programs relationship with Habitat for Humanity. Returning to other community and public clients, the Design-Build program found the variety of design problems, budgets, site influences and client interests it sought in the new format.

In 2013, the first iteration of this twelve-week time frame maintained the dual track studio model in which half of the third year students worked towards at competition entry and the other half, 12 students, participated in Design-Build. The client was the municipal parks department who needed signage for a pedestrian entrance to a neighborhood park. While the design process was an accelerated one at 3 weeks, the program constraints and client demands were minimal allowing the flexibility to add seating and shading programs and prioritize research and design exploration of structural folding strategies and generative design tools. The result was a sculptural concrete and steel pavilion that was well received by the voices that typically espoused the competition studio track. The identified areas for improvement in this project were the lack of the standard framing, MEP and waterproofing systems experience and the lack of clear end user and social narrative.

In 2014 the Design-Build program moved beyond its transitional year and implemented a curriculum that required all students to experience Design-Build in their third year and a competition studio in their fourth year. This move yielded a Design-Build team of 25 students, and in identifying a project the organizers attempted to

3   Figure 3: Huckleberry Trails Entry, *2013*

address the critiques of the previous year. To maintain the positive social narrative and clear client identity the program partnered with Med Camps of Louisiana, a non-profit organization that provides summer camp experiences for children with special needs at no cost the campers. They were particularly good fit as they pair a clear positive agenda and deserving end users with a range of small-scale project opportunities at their rural camp facilities. Their most pressing immediate need was an ADA accessible central meeting space that would be illuminated at night, circulate water from a stagnant pond and accommodate up to 65 people or 32 wheelchairs at once.

By reprioritizing the client needs and narrative, significantly increasing the project size to over 1500 sf, and still operating in the 12-week time frame, the 2014 process was more client based than research based. The larger class size did not translate directly to the larger project size and the majority of the work was accomplished by 30% of the students with heavy support and many hours contributed from faculty. The intensity of building process exceeded that of previous Habitat for Humanity projects with students averaging 50 hours per week on the project. And as before, noticeable neglect of other student responsibilities resulted. Beyond these difficulties, the project resulted in an intense but rewarding experience for students in a range of fabrication, construction, project management and design translation lessons complimented by a clearer understandings of electrical, plumbing and structural systems. The project was also an exponential success for its client, not only through the practical creation of the facility, but in the generation of first time fundraising of more than double the projects cost, in renewed infrastructure investment from its community partners and in clear a appreciation from its campers for the renewal of the life of the camp.

CONCLUSIONS

The evolution of the Design-Build program at Louisiana Tech provides a particularly useful set of case studies for comparison and analysis. They show how a medium sized school of architecture began and continued to refine their Design-Build program. Their models include student teams ranging from three to twenty-five, projects ranging in size from 50sf to over 1500sf and time frame ranging from 9 months to 12 weeks. And woven into these 13 years of Design-Build studios is a parallel tack of students who did not have the Design-Build experience. Recounting the arch of the program, there are many specific conditions that could be explored further, but when considering the string of studios as a whole, the following broad lessons can be extracted:

BETTER, FASTER, YOUNGER: This account highlights a trend found in many aspects of education in the 21st century: We are steadily striving to create equal or higher quality research and service learning in less time, with more students who have less experience. Clearly, the program began with a few fifth year students completing a project over 9 months to 25 third year students completing a project in less than 3 months. As schools grow and the market demands more qualified graduates, schools will attempt to compress more knowledge and experience into the undergraduate curriculum. This trend seems unlikely to shift in the near future and it only further obligates educators to deliver high quality, efficient and effective learning experiences such as the immersive, motivating environment of the Design-Build studio.

SIZE = TIME: As the various modes of operation of the Louisiana Tech program indicate, Design-Build, as a studio format, research endeavor and community service can be executed successfully at various scales. However the physical and temporal

scales must be aligned and the research agenda and client needs must be compatible. Drawing upon the Habitat for Humanity experience, the construction of any project with a thermal envelope of 1000sf or lager, MEP systems, waterproofing etc. should be carefully considered if the available time is less than 7 months. Considering the successful recent 12-week pavilion studios, it is clear that smaller unconditioned projects are possible when less time is available, but more students do not directly translate to the ability to accomplish a larger project with equal effort. In an academic process with unskilled labor, larger projects simply take more time.

AGENDA=CLIENT: When examining past clients and research agendas for a Design-Build studios often one is prioritized over the other, or, in the case of exceptionally successful projects, the research agenda align with the client interests or needs. A residential client requires attention to their own idiosyncrasies as they will live with the design for years, however other clients can be more flexible to accommodate academic agendas or when Design-Build programs have the privilege of being their own clients, the research agenda can remain the top priority. But as project durations are reduced, it becomes more difficult to ensure student learning while satisfying client and/or research goals. When the parameters of size + time and agenda + client are consciously aligned the ability to satisfy all involved is far more attainable.

EVOLUTION IS NOT OPTIONAL: When considering the Habitat for Humanity relationship with the Design-Build program, It seems clear that any rigid program, site, client or scale pursued for too many iterations is subject to loosing academic value through repetition unless the research agendas are clear and evolving form one project to the next. In the case of Louisiana Tech's Habitat for Humanity Homes it became clear that the prioritization of the client despite aesthetic disagreements led to a less thoroughly perused design and research agenda that was further diminished by the shortened project calendar and unfortunately led to the suspension of the partnership. Had the client offered a wider variety of projects over the years or the time constraints allowed for more rigorous research and exploration, the partnership may have gone farther.

Louisiana Tech's Design-Build program has consistently worked over the past 13 years to define the role of the Design-Build studio format within its curriculum. Over the course of its evolution the program has covered a significant range of project scales, class sizes, and time constraints each of which was pursued to improve the project and educational outcomes relative to the previous. The trend of attempting to extract more research and learning over shorter and shorter projects will soon find its limit and the format will continue to evolve and be improved upon. The intent in sharing these experiences and observations is to allow others to do the same.

ENDNOTES

1. Karl Puljak, Director of Louisiana Tech School of Design, personal interview, 20 May 2014

2. Justin Miller and David Hinson, DESIGNhabitat design/research + Design-Build: Expanding the Design-Build Model 2009

3. Global News Wire, SCI-Arc and Habitat for Humanity of Greater Los Angeles Team Up to Build Innovative, Sustainable and Affordable Homes in LA County. 11 Sept 2014

4. Robert Brooks, Associate Professor, Louisiana Tech School of Design, personal interview 19 Sept 2014