

## Scale and its implications

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This paper addresses the issue of project scale and its implications in design build studio pedagogy and structure. The topic relies on three recent case study projects at Tulane School of Architecture; Grow Dat Youth Farm (a 6,000 s.f. 3 semester project), URBANbuild (a 1,200 s.f. single family residential 2 semester project), and LOOP (a 250 s.f. outdoor shade structure 1 semester build). Through the lens of these three projects this paper explores how scale impacts the project delivery timeline, budget, setup, and the effectiveness and learning outcomes for students involved in the project. This paper discusses the implication of single and multi-semester projects in order to provide information for those intending to establish a program or looking to expand an existing program.

The proliferation of design build studios marks a reunion of design and making that looks to the Bauhaus educational model and follows a thread through the work of the Yale Building Project, Rural Studio, and the variety of flavors of design build studios that have emerged across North American schools of Architecture in the last 15 years<sup>1</sup>. While once viewed derisively by traditional academics as something akin to vocational training<sup>2</sup>, currently there is broader agreement in the value of design build as an educational tool, as evidenced by the explosion of design-build offerings at schools of architecture<sup>3</sup>.

While these 'learning through making' programs vary greatly in their project scales, programs, sites, timeline, methods of delivery, research agendas, and just about any other imaginable category, most of them share a few core pedagogical aims<sup>4</sup>:

- > Inform design through the act of making
- > Provide students with an understanding how to take a design from concept to reality
- > Understand tolerance, material, and connections in a 1:1 scale
- > Empower students by broadening their experience and skills<sup>5</sup>
- > Cultivate collaboration and communication as part of the design process
- > Provide an introduction to professional practice issues such as: project planning, funding acquisition, clients, liability, and the physical realization of design products for use by actual users.<sup>6</sup>

### Size = Time<sup>7</sup>

For the sake of this essay I propose separating scale, program, 'instructional intentionalities'<sup>8</sup>, and designed lifespan (temporary vs. permanent) and thinking about design build and its pedagogical aims primarily through scale. This essay is a comparison in scales between recent projects at one School of Architecture and the pedagogical and logistical implications of those scale decisions. The outlined projects are all done in collaboration with a partner organization (non-profit) and have a program as well an assumed lifespan of a typical light construction structure.

Scales are divided into Small, Medium, and Large with a pavilion representing the small scale, a single family house representing the Medium scale, and a 6,000 s.f. Urban Farm representing the Large scale. One additional scale that is not covered in this article is that of the XS installation scale<sup>9</sup>. This includes projects such as temporary exhibits, detail explorations, furniture, sukkahs, and other studio and seminar projects which provide students the opportunity to explore material potentials and fabrication methods often without the constraints of a client, a program, or structural longevity beyond the installation timeline.

Tulane School of Architecture, whose programs and projects this article relies on, has had a continuous design build program since 2005. In the last 12 years the school through its 2 main design build initiatives (Small Center<sup>10</sup> and Tulane URBANbuild) has constructed 11 single family homes with Neighborhood Housing Services, an affordable housing provider in town, as well as 25 structures with more public programs in collaboration with a variety of partner organizations in New Orleans. The university design build programs grew in the aftermath of Hurricane Katrina in 2005 and the federal levee failure that followed. With 60% of the structures in the city substantially damaged by flood water the faculty and students of the university returned to a city in need of rebuilding and in need of more equitable systems for determining the built environment. Those recovery years shaped the design build studio agendas towards projects with clients, utility, and impact.

### **SMALL**

Small scale includes projects ranging from bus shelters to pavilions and interior build-outs, and is the most widely used scale in design build education<sup>11</sup>. University Design Build programs favor this scale of projects because the time frame and regulatory hurdles needed to complete this scale of project are the least disruptive and demanding when inserted into an established curriculum. What's more, from the pedagogy perspective this small scale model allows a single group of students to experience the arc of initial client conversation to design, prototyping, and fabrication all within a typical semester. The benefit of an individual student being part of this full arc lies in their comprehensive understanding of how design affects detailing and construction and vice-a-versa.



**Small Project Case Study: LOOP Pavilion**

**Size:** 250 s.f.

**Project Duration:** 14 weeks (Fall semester 2014)

**Academic Credits:** 6 credit option studio

**Students Involved:** 12 (4<sup>th</sup> year and graduate students)<sup>12</sup>

**Material Budget:** \$12,000

**Program:** A shade pavilion and seating area for 20-30 people

**Client:** Louisiana Outdoors Outreach Program (LOOP NOLA), a nonprofit organization whose mission is to provide positive, life-changing outdoor experiences for children and youth in Greater New Orleans.<sup>13</sup>

**Additional Studio Pedagogical Goals** (beyond the core goals stated above):

- > Experiment with non-traditional building components and project delivery method
- > Devise systems of constructing that are suited to remote sites and lack of utilities
- > An introduction to Public Interest Design

**Project Summary:**

LOOP NOLA provides urban youth with outdoor experiences through a series of activities including a high ropes challenge course in New Orleans' City Park. The ropes course site is located on an island without access to shade or seating which make activities and events difficult and has resulted in several recent cases of student heat stroke. A new pavilion on the island allows LOOP to provide safer and better programs for the students.

After engaging LOOP NOLA staff to assess their needs, Small Center design build students designed a pavilion that incorporated seating into a large shade structure used for teaching and gathering before and after challenge course activities. The design was inspired by the tree canopy surrounding the challenge course and uses blank aluminum traffic signs as a modular, exterior grade unit to create an abstracted, high-performing canopy overhead. In keeping with the detail language of the adjacent ropes course structure, the canopy is suspended with steel cable from a larger steel structure in a way that creates an undulating complex curve. Connections are a repetitive system made with fasteners that require only hand tools, allowing assembly without a power source. The seating is built into an earth berm created by reusing railroad ties from the historic St. Charles Avenue streetcar line.

**Assets of the Small (one semester) model:**

The one semester (14 week) design build studio allows a single group of students to see a project from an initial design conversation with a client through to a built project. The small footprint this studio has in the curriculum means that more students are able to engage with this type of project. In particular, graduate students who do not have as much flexibility in their credit requirements are able to participate fully in a design build without compromising their other required coursework.

Additionally, the small project scale and lack of performative requirements (no sealed building envelope or systems) leaves more room for experimentation with materials, detail, and project delivery methods. While a city permit is required for these small structures, it is a quick 'over the counter' process that does not require a full plan review, a process which would disrupt a rapid one semester design build. Furthermore, the small scale translates to a small material budget making these small projects easier to fundraise for from sources either externally or within the school. Material budgets on these small scale projects at the Small Center range from \$6,000-20,000 with the typical project costing \$14,000.

**Issues of the Small (one semester) model:**

The short and rapid one semester time frame requires more careful planning, and choosing an achievable scale of project before the semester begins is essential. The disadvantage of small projects is that, "one semester is simply too short a time to design a project, build it and then possibly evaluate it in a serious manner and that the quality of the design or execution suffers as a result of the tight time frame"<sup>14</sup>. Steve Badanes one of the godfathers of modern design build education who has headed the Howard S Wright Neighborhood Design-Build studio for over 25 years counters with the argument that, 'simpler work is better work, but it is very difficult to convince an architecture student of that'. While students learn a good deal from the process the university is usually less enthusiastic about these small scale projects from a marketing and 'wow factor' standpoint as compared to Medium or Large scale projects.

After 6 years of using this 6 credit/1 semester design build studio model we started adding an additional 3 credit seminar course that runs in parallel to the studio to give students more time to build skills and learn how to use tools at the beginning of the semester and also provide time to experiment with mockups and fabrication techniques as the design and construction develops.

## **MEDIUM**

Fattinger's Research indicates that the medium scaled, typically residential program, is the second most common form of design-build in University settings. There are a range of programs from portable high tech high budget solar decathlon homes to low cost (Rural Studio's 20k houses) or tiny home models (Yestermorrow) that take on a Medium sized project, typically housing, within a two semester timeframe.



### **Medium Project Case Study: URBANbuild 04**

**Size:** 1200 s.f.

**Project Duration:** 19 weeks (Fall semester design 2008, spring semester build 2009)

**Academic Credits:** 18 (6 credit option studio fall, 6 credit option studio spring + 3 credit technology elective + 3 credit professional concerns elective)

**Students Involved:** 23 (4<sup>th</sup> year and graduate students)<sup>15</sup>

**Material Budget:** \$120,000

**Program:** a 1,200 s.f. single family home – 3 bedroom, 2 bath

**Client:** **Neighborhood Housing Services of New Orleans** – NHS is a non-profit dedicated to rebuilding New Orleans' urban neighborhoods. In operation for over 40 years, one of NHS' main mechanisms for revitalizing neighborhoods is developing and selling affordable housing with a parallel homebuyer training program<sup>16</sup>. NHS is an affiliate of Neighborworks.

**Additional Studio Pedagogical Goals** (beyond the core goals stated above):

- > Understand the integration of sub-contractors and consultants in the design process
- > Understand and execute a successful LEED certification process

**Project Summary:**

URBANbuild 04 is a LEED certified 1,200 s.f. single family home in New Orleans' Central City Neighborhood. This is the fifth house the Tulane School of Architecture built with Neighborhood Housing Services of New Orleans (currently the program is building house 12). Each home is a different studio's design solution to the same program – a 3 bedroom, 2 bath house on an infill lot (typically a 30'x90' site). The construction budget for each house ranges from \$100,000-\$120,000. Students do the majority of the construction work and subcontractors are hired for Electrical, Plumbing, and HVAC work and for driving piles as needed. Prototype 04 was the first LEED certified home of the program, the previous 3 experimented with different framing systems as a way to research building systems for the partner organization to use in their affordable housing projects. The design build studio worked to create a contextual response to common local housing typologies and focused on developing a hurricane ready shutters for the home.

The partner organization (NHS) supplies the lot and sells the home typically to a first time home buyer who has gone through their homebuyer education class. Students submit a permit set to the city at the end of the fall semester and the building permit is approved by early January. Design begins in August, build began in January and concludes in May.

**Assets of the Medium (two semester) model:**

This medium scale of project, in US schools of architecture, typically takes the form of a two semester project and as such allows time for more in-depth design, permitting, and construction process. These projects include collaborating with common building trades and consultants to execute the project all of which is beneficial in understanding a more normative design process. Students are typically enthusiastic about building a house and understanding a more conventional system of building. In our program there is a consistently strong demand for this studio.

Rob Thallon outlines many of the strengths of this scale in regards to scaling up his BILDS program at the University of Oregon, "There are a number of lessons to be learned from residential design-build projects that are not typically found in less complex projects. There is the value of learning directly about energy efficiency. There is the value of understanding fundamental daily human activities as they relate to the built environment. There is the potential of contributing knowledges about housing, a critical, human need. And there is the opportunity in every project to collaborate with landscape architects, interior architects, code enforcement agencies, realtors, and the entire panoply of persons and agencies that must interact to bring a project to satisfactory conclusion<sup>17</sup>.

In addition to learning outcomes an additional benefit of this scale, particularly in regards to Housing as a program, is that a School of Architecture can establish a relationship with a partner organization, in this case an affordable housing provider. This relationship as a long term recurring project partnership streamlines project setup friction and relationship building, and decreases the time needed to work through liability issues and Cooperative Endeavor Agreements.

### **Issues of the Medium (two semester) model:**

The Medium scale project carries with it the constraints of permitting, hurricane rated structural requirements, and in a one semester construction schedule there is less room for exploration with materials, construction systems, and detail innovation. Additionally, the increase in project scale typically requires more teaching and 'gopher' support either in the form of an additional faculty or staff member as part of the project team – requiring a larger program budget.

The Medium scale project and its longer time frame also have implications for who can participate as a student. The scale of the project is challenging to achieve even in two semesters therefore some programs like ours treat the build semester as a kind of in-town study abroad experience. That is to say, a large number of credit hours are required on site leaving little room for other courses or requirements. In addition, graduate students have a narrower window of opportunity in their curriculum for Option studios and electives. As a result we see strong participation by graduate students during the Design focused studio semester and less participation during the intensive Build semester. While some students continue on from Fall semester design to Spring semester build others do not. This student participant changeover from one semester to the next provides less continuity in the concept to execution arc and in communication and team dynamics. These can all be overcome to produce a high quality design-build project but the learning outcome for those students involved in only one side of the design-build equation are not as robust as those who participate fully.

Lastly, as relates to program, housing offers a range of lessons for architecture students involved in the project yet as a private home these projects can rarely be visited and understood in-person by subsequent design students after a family has moved in.

### **LARGE**

Large projects are the rarest of the university design-build project models. These projects tend to take anywhere from three semesters (as in the case of Grow Dat) to three years (the time it takes for many Rural Studio thesis projects). Inevitably, these projects involve some student turnover which result in issues of student ownership of design ideas and quality of execution, as well as the learning outcomes. These can all be overcome but it requires effort and planning.



**Large Project Case Study: Grow Dat Youth Farm**

**Size:** 6000 s.f. campus, 7 acre site

**Project Duration:** 34 weeks (Spring semester design studio 2011, Fall semester design-build studio 2011, Spring semester build seminar 2012)

**Academic Credits:** 15 (6 credit option studio spring, 6 credit option studio fall, 3 credit technology elective)

**Students Involved:** 45 (4<sup>th</sup> year, 5<sup>th</sup> year and graduate students)<sup>18</sup>

**Material Budget:** \$180,000

**Program:** a 6,000 s.f. teaching campus that includes food washing and prep, classroom, kitchen, bathroom, and office spaces.

**Client:** Grow Dat Youth Farm<sup>19</sup> – The mission of Grow Dat Youth Farm is to nurture a diverse group of young leaders through the meaningful work of growing food. Grow Dat offers first time job opportunities and leadership training on their farm in New Orleans City Park

**Additional Studio Pedagogical Goals** (beyond the core goals stated above):

- > Sustainable Building methods and site strategies for on site rainwater, greywater, and blackwater management
- > Challenge existing city building codes through built examples of alternatives
- > An introduction to Public Interest Design

**Project Summary:**

Grow Dat Youth Farm was founded by a former New Orleans high school teacher who was looking to address the dual needs of youth job and leadership opportunities paired with fresh food access and education. Small Center worked with Grow Dat Youth Farm to incubate a non-

profit program (the school acted as the non-profits' fiscal sponsor in the first few years), and design and build a sustainable 7-acre campus over a few years.

A Spring 2011 studio designed the 6,000 square foot urban farming campus and a seven acre farm site plan for organic farming and sophisticated water and soil management. With approvals from the Grow Dat staff, City Park, and state Fire Marshall construction began on the campus structures. Students from the Tulane School of Architecture built the facility from foundation to finished space in a two semester sequence. Subcontractors were hired for more complex crane operating, plumbing, and electrical work.

All rainfall is sequestered on site, all gray-water is bio-filtered on site, all black-water composted on site, and the farm/classroom was built largely with recycled and repurposed materials. Additionally, the youth farm uses a former golf course fairway rethinking the target users, use, and potential impacts of this shared public park space.

#### **Assets of the Large (three semester +) model:**

Large projects offers more programmatic and technical complexity and site opportunities than the medium scale residential projects. With that complexity comes the opportunity to expand the research agenda of the studio and bring in more collaborators and consultants. Grow Dat's design, construction and now occupancy phases have offered the School of Architecture team a reason to reach out to other schools and experts on campus to ensure a more robust outcome for the design.

In general, these larger scale projects when partnered with a public program serve greater numbers of users and have a more measurable set of impacts and outcomes. Recent large scale projects at schools of architecture include a Boys and Girls Club by Rural Studio, a town hall by the same program, an Ampitheatre by design/buildLAB, and Parisite Skatepark by our Small Center program. With the current funding and grant landscape programs find themselves in having projects with a higher public profile and Public Interest Design agenda can be an asset.

In addition to the opportunity to collaborate across disciplines, the project has also allowed the school to successfully pursue funding from non-traditional sources. For the first time in our school's history we were receiving grants from Blue Cross Blue Shield, the NCAA, and other sources interested in supporting the health and advancement of our city's youth. In addition the fundraising opportunities, these large projects also provide Universities and Schools of Architecture with impressive images they can use in recruiting, alumni giving campaigns, and general promotion.

#### **Issues of the Large (three semester +) model:**

As with the Medium sized projects, the Large scale projects expand the struggle to maintain the continuity of studio team members throughout the process and therefore the learning outcomes for each individual student vary according to how involved in the process they are. Additionally, the increased scale and complexity of the Large projects requires more faculty and staff support. Grow Dat was unusually large for us and involved the hard work of several faculty members and staff members throughout a 3 year project set-up and execution process.

Legal hurdles involved with large projects can be quite arduous depending on the partner organization and the ownership of the site. Our two large projects, Grow Dat and Parisite Skate Park each required a Cooperative Endeavor Agreement to be in place before the start of the project, a process involving many lawyers, much time, and the active support of the School's Dean to work through several rounds of legal negotiations.

Lastly, a project of this scale requires a much larger budget due to the simple increase in materials and difference in machinery required to build the project<sup>20</sup>, as well as the amount of additional faculty and staff support. In addition there is an increased cost of re-tooling a program depending on the type of construction used in the project and larger contingencies should be in place particularly if extensive site work or a rigid timeline are necessary.

## **Conclusions**

With all design-build studio projects much work has to be done pre-semester to ensure that site access, funding, expectation management with the partner organization, and a well planned timeline are in place. Models currently in use across the US range from 70 students working on a single house over 6 months (Yale Building Project) to 3 students working on a thesis project over 3 years (Rural Studio)<sup>21</sup>. While in the Author's experience a larger student team does not directly translate to more production and collaboration capacity, what is clear is that larger projects require more time and materials to execute.

The challenges and opportunities of each model are outlined above yet a recurring thread through all scales is the issue of student ownership of design ideas and execution, and student learning outcomes, both of which are tightly tied to how involved each student is through the arc of the project from design to construction. Most directly, the shorter the project timeline the greater the student design-build team continuity. A project lasting one semester will have the same team of students start and complete a project while a project stretching over multiple semesters will have greater student turnover; meaning some of those who designed the project are not building it, and some building it were not involved in the design. This fracturing of team composition leads to less continuity of ideas and detailing and diminished learning outcomes amongst individual participants compared to those who work on the full arc of the project.

While there are compelling reasons to confine the scale of a project on the opposite end of the argument, Design Build is being used by schools of architecture as a publicity and recruiting tool. Often there is pressure from administrations, and even students, to engage in projects with bigger scales and impacts. At Tulane these programs (of all scales) have been successful draws for all students, particularly graduate students, and have been used by the greater University in promoting the impact and variety of educational experiences available at the university. As more schools offer design build programs there seems to be an increased desire to differentiate programs and brand those design build efforts under a legible agenda or program type.

Finally, for faculty new to the Design Build teaching experience (and even those of us with experience) a project's scope, budget, and timeline can easily balloon beyond the constraints of capacity, funding, or the semester schedule. These issues can be addressed with adequate pre-semester planning and close collaboration, communication, and expectation management with the partner organization.

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<sup>1</sup> For a more in depth history of Artisan Traditions in Architectural education see Hinson, David. “Community Centered Design/Build Studios: Connecting the Past and the Future of Architectural Education”, (2002) ACSA Technology Conference

<sup>2</sup> For a summary of other predecessors to the modern day design build studio teaching method including John Ruskin and Booker T Washington as well as a summary of the institutional and collegial resistance to university design build see:  
Canizaro, Vincent B. “ Design-Build in Architectural Education: Motivations, Practives, Challenges, Successes and Failures”, International Journal of Architectural Research, Volume 6 - Issue 3 - November 2012

<sup>3</sup> An additional indicator of interest and emerging scholarship in the topic can be seen in ACSA conference submission rates. The Fall conference head in Nova Scotia focused on the topic of design-build had nearly double the number of submissions as each of the preceding 3 years had. (<http://www.acsa-arch.org/programs-events/conferences/conference-acceptance-rates>)

<sup>4</sup> “Grounded in the realities that may include the site, setting, clients, schedules, budgets, and technical demands of construction, design decision-making is made more informed and responsive. Such training, it is assumed, will result in more informed and responsive future architects. And while construction is common to all, each program adopts the design-build pedagogy for their own reasons that can range from community service, experimentation with digital delivery methods, to various forms of “building speculation” from Canizaro, Vincent B.

<sup>5</sup> Hailey, Charlie. Design/Build with Jersey Devil: A Handbook for Education and Practice Architecture Briefs. 2016

<sup>6</sup> Gjertson, Geoff W. and Christopher D. Trumble. “Design-Build Gone South”. Working Out; Thinking While Building (2014) ACSA Fall Conference Proceedings

<sup>7</sup> This simple equation comes from Deal, Brad. “Size Matters: Investigating the Scale of Projects, Teams and Time Through Found Design-Build Studio Iterations”. Working Out; Thinking While Building (2014) ACSA Fall Conference Proceedings

<sup>8</sup> A term used to structure a comparison of design-build projects by Vincent Canizaro.

<sup>9</sup> For more on these XS projects: Clouse, Carey. “Micro-Design-Build: A New Gateway to Design-Build Education. Working Out; Thinking While Building (2014) ACSA Fall Conference Proceedings

<sup>10</sup> The Albert and Tina **Small Center** for Collaborative Design, formerly named the Tulane City Center, is the community design center of the Tulane School of Architecture. The projects of Small Center go beyond design build to include visioning, planning, graphic advocacy, and exhibits and programming addressing issues of social justice and the build environment. All projects include robust engagement with partner organizations as a core part of the design process.  
Tulane **URBANbuild** is the other long standing design build program of the Tulane School of Architecture and primarily addresses single family housing prototypes in New Orleans. URBANbuild typically partners with Neighborhood Housing services which provides a site for the house as well as a program – 1,200 s.f., 3br, 2ba home.

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<sup>11</sup> According to a survey of 281 projects by Peter Fattinger between 2008-2010. See: Fattinger, Peter (2011): Design-Build STUDIO Framework, Process and Potentials of Design-Build Projects in Architectural Education." Ph D. Vienna: Vienna University of Technology, Faculty of Architecture and Planning

<sup>12</sup> LOOP design-build team:  
students - Dan Akerley, Madison Baker, Casey Bemis, Jose Cotto, John Coyle, Rachel Conques, Michelle Carroll, Maggie Easley, Ellen Hearle, Emma Jasinski, Kate Luxner, Sarah Satterlee, Meredith Zelenka  
faculty leads – Emilie Taylor Welty, Sam Richards

<sup>13</sup> For more information on Louisiana Outdoor Outreach Program see: [loopnola.org/](http://loopnola.org/)

<sup>14</sup> Fattinger, Peter. "What to Build – On the Thematic Diversity of University-Based Design-Build Assignments and Their Different Impacts on the Learning Outcome", Working Out; Thinking While Building (2014) ACSA Fall Conference Proceedings

<sup>15</sup> URBANbuild 04 design-build team:  
students - Robert Baddour, Amanda Brendle, Ben Flatau, Monica Breziner, Nicholas Cecchi, Katie Champagne, Nick Chan, Chad Cramer, Susan N. Danielson, Shannon Farrell, Matt Fox, Kevin Garfield, Lauren Goetz, Royce Evan Gracey, Corey Green, Chris Halbrooks, Meaghan Hartney, Matthew Hostetler, Colm M. Kennedy, Joseph Keppel, Peter Kilgust, Nicolas Mallet, Lauren Martino, Suzanne Monaco, Emily Orgeron, JP Pacelli, Marian Prado, Marie Richard, Gregor Schuller, Kevin Tully, Karla Valdivia, Colin VanWingen, Bliss Young  
faculty leads – Byron Mouton (URBANbuild director), Sam Richards, Emilie Taylor Welty

<sup>16</sup> For more information on Neighborhood Housing Services see: [nhsnola.org/](http://nhsnola.org/)

<sup>17</sup> Thallon, Rob. "BILDS: A Developing Model for Residential Design-Build Education" Working Out; Thinking While Building (2014) ACSA Fall Conference Proceedings.  
This article is a good reference for those considering starting a Residential Design-Build program.

<sup>18</sup> Grow Dat design-build team:  
students – Mira Asher, Zin Min Aye, Steven Baker, Hee Cho, Sophie Dardant, Matt Decotiis, Rachel Finkelstein, Sean Fisher, Patrick Franke, Marianne Graffam, Seneca Gray, Ellen Hailey, Katie Healey, Natalia Hidalgo, Jade Jambutr, Lindsey Kiefer, Mike Landry, Emile LeJeune, Vicky Leung, Sam Levin, Jason Levy, Marda Lugar, Mary Beth Luster, Jeremy Maloney, Rebecca Miller, Oren Mitzner, Ian O’Cain, Ellanny Page, Justin Park, Robert Pekara, Fernando Polo, Allison Powell, Cameron Ringness, Julie Sanders, Allison Schiller, Justin Siragusa, Christopher Tellone, Ana Lucia Teran, William Trakas, Claire Tritschler, Erin Vaughn, Nichole Woggon, Brad Rohman, Michael Welsh, Jen Wickham  
faculty leads – Scott Bernhard, Dan Etheridge, Emilie Taylor Welty  
additional support – Abigail Feldman, Sam Richards, Seth Welty, Zach Lamb

<sup>19</sup> For more information on Grow Dat Youth Farm see: [growdatyouthfarm.org/](http://growdatyouthfarm.org/)

<sup>20</sup> These larger scale projects can be built with wood framing and a more typical set of university based design build tools and skill sets, yet often they require structural steel work, larger landscaping moves, and concrete work which require different tools, skills, and machines; all of which require more time, training, and money.

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<sup>21</sup> Fattinger, Peter