DESIGN-BUILD IN ARCHITECTURAL EDUCATION: 
MOTIVATIONS, PRACTICES, CHALLENGES, SUCCESSES AND FAILURES

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Abstract
Based on a comprehensive survey of design-build programs conducted in 2011-2012 consisting of interviews and reviews of a number of programs, this article provides a sketch of the motivations, practices, challenges, successes and failures associated with this popular and unique educational practice found in many architectural design programs. It provides a history of, documents the variety of rationale for, as well as the methods used in upstart and well-established Design-build programs. It serves as a guide for the development, improvement, and maintenance of existing and future programs.

Introduction
In looking to document the current state of Design-build education in the US; what follows are the findings of an extensive survey consisting of 15 in-depth interviews with program directors and an extensive review of 19 others. The set of practices and pedagogical activities collectively known as design-build are diverse, but share commons threads, assumptions, and challenges. Uncovering these will serve to benefit those currently facing such challenges and those who wish to. To begin it will be necessary to lay out a description of the heterogeneous practice of design-build, through activities I have gleaned from the literature as well as direct communication with many of those involved in such programs.

As a practice, design-build has many faces. In the industry, it is an alternative to the standard tripartite legal structure comprised of owners, architects, and contractors. In contrast, design-build combines the design and construction entities, typically with the goal of reducing project cost. 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. With design-build, students engage in both the design and construction of projects, small and large, simple and complex. Common to most programs is the intention “to extend students’ design skills by making a stronger link with material experimentation and construction.” (Wallis, 2007: 201-202). It is referred to variously as hands-on learning, learning-by-making, learning by building, 1:1, and is seen as a variant of experiential learning promoted early by John Dewey and later by David Kolb. Important to this variety of architectural pedagogy is the revision of the context to which the designer responds and an expansion of the designer’s role in the making of the built environment. 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” (Chi, 2002: 161-162).

The heritage of such educational programs can be located in the 19th century with John Ruskin who engaged his students in a community service project by building a road through the marshlands of Ferry Hinksey southwest of Oxford, England (Ellman, 1988: 49-50). About a decade later in the United States, Booker T. Washington prevailed upon the students of the fledgling Tuskegee University to build more than forty campus buildings in exchange for fees to complete their studies (Erdman, 2008: 79-80). In the 20th century, origins of design-build in education lie in the 1920s with the Bauhaus. Under Walter Gropius, they “re-established the critical relationship between the designer and the medium: the materials of construction, the processes of forming and fabrication, and the constraints these place on the design. In a sense, the Bauhaus was the first Design/Build program of the twentieth century” (Lonman, 2010: 67). At mid-century students of R. Buckminster Fuller at Yale, and students at New Zealand’s Architectural Centre, built a geodesic dome and demonstration house, respectively (Hayes, 2007: 23). A clash of ideologies sparked the growth of design-build programs in the 1960s. Then as a reaction to the perceived aesthetically driven Beaux-Arts methods, students at Yale sought a socially responsible, non-elitist direction under Charles Moore. By 1967, the Yale Building Project was underway building a community center in Appalachia and continues to this day in a more formulaic fashion, building low-income houses annually in New Haven, Connecticut. Again, in the 1990s, design-build programs expanded, likely in response to theory-laden “paper architecture” and stylistic historicism of the 1980s. Steve Badanes program at the University of Washington along with the now iconic Rural Studio under the direction of Samuel Mockbee emerged at this time. Both are still in operation and continue to influence programs. The themes of alterity, community service, and experimentation that define this history remain and provide a sketch of the activity overall.

In 2010, it remains impossible to know the number of design-build programs in architecture schools worldwide. Nor is it possible to find a singular and common focus, structure, or intentionality
behind them. There are established recurring programs such as Yale’s Building Project, Studio 804 and the Rural Studio, but there are many more initiated intermittently by individual faculty. In 2005, there were at least 60 programs and my rough estimate is more than 100 today (Wallis, 2007: 202).

**Instructional Intentionalities of Design-build**

By “intentionalities”, I refer to the primary pedagogical motivations for the institution of the program. Such “intentionalities” can influence the internal processes carried out by the students and faculty, the kinds and sites of projects selected, and even the time frame allowed for the work.

**For Construction Experience**

Design-build as a pedagogical practice is adopted for many reasons and a variety of intentionalities can be found in almost every program. Yet each program has a focus. As noted above, and implied in the title of the practice, “building” or exposure to construction is common to all, and is for some their primary motivation. In such cases as the Yale Building Project or Southern Polytechnic’s Construction Workshop, the programs have been motivated by a desire to introduce students to the art of building. In them, hands-on construction is a renewed medium for the architect’s creativity or at least “a guerilla course in large-scale carpentry.” (Frampton, 2008: 101).

At its most pragmatic, a focus on building is understood as necessary exposure for future professionals. It is an attempt to demystify the construction site and help students realize what is involved in taking architecture from a drawing to a building. And it is “an opportunity for the students to understand the building process with their own physical labor ... recognizing the value of hands-on learning.” (Brouard, 2007: 35). For many of the students, this is also their key motivation for joining the programs. Comments from KU’s Studio 401 are typical: “the students mentioned an interest in

![Figure 1: Remote Studio students building their first project, a bird watching station in Fort Davis, Texas in 1997 (Source: Used with permission from the Artemis Institute).]
‘learning about building,’ ‘understanding how things go together,’ ‘making things,’ or gaining ‘real life (real world) experience in place of just designing’” (Nepveux, 2010: 80).

It also serves as the reclamation of disciplinary expertise given up for professional status—a view echoed by Peter Wheelwright about the program at Parsons. He holds that “The Design Workshop was conceived as a different kind of design-build program than those rooted in typical designer vs. builder dichotomies, which either decry the architect’s loss of connection to the material world, or their arrogance toward a perceived “underclass” (i.e., builders). Many academic design-build programs were founded with the explicit intention of redressing this situation” (Wheelwright, 2002: 4). In this context, design-build can be understood as a critique of the contemporary class distinctions that characterize contemporary design education. Some historians have argued that such distinctions have been a part of architectural practice since the 18th century when competition emerged between native-born American designer-builders like Asher Benjamin and European-trained architects like Benjamin Latrobe. Historian Dell Upton has, however, demonstrated that early American architects, designers and builders were not divided by class as claimed, but were instead a hybrid mix of gentlemen and craftsmen. In other words, class distinction is a concept imposed on early practices by a society that gradually embraced class-bound categories. Wheelwright and his colleagues are, then, part of a long American conversation (Upton, 1984: 107-150).

As a Form of Community Service
Outside of construction, the most prevalent characteristic of design-build programs is their organization around and intention to provide service to local communities. This is done for both pragmatic and aspirational reasons. In pragmatic terms, it is more reasonable for institutions to support and offer services to those in need when using the labor and talents of students. This keeps them out of competition with local professionals as they tend to work on projects with no potential for profit and it sidesteps the conflict between students paying fees so that they can in turn provide services to others. Virtually every program designs and builds as a public service and as such, engages in service-learning.

Other programs do so out of a commitment to social justice. From the outset, this was the case with the Rural Studio, which in accordance with Auburn University’s firm commitment to “outreach,” sends students to rural Hale County to design, build, and support the poor. Some of these programs have their origins in community design centers which first appeared in the 1960s and reemerge as means of continuing their commitment to those in need. Design Bridge, a student-run program associated with the University of Oregon, puts it this way: “The focus is to bring the resources and energy that we have as students to communities and organizations that can use our help. We focus on projects that have a mutual benefit to us as design students and to the community.” Thomas Dutton, who runs Miami University’s Center for Community Engagement, and focuses on supporting the Over-the-Rhine neighborhood, sees a further role. “We’re not just trying to help a community, but we’re trying to deconstruct
students’ privilege. We’re trying to get them to be better citizens, better community advocates, and to understand the complexity of urban areas” (Sokol, 2008: 125). This kind of work sees architectural practice as based in an ethical commitment to others. And design-build serves as a rather potent means for manifesting this commitment as it results in real artifacts and shelters that people can see and touch.

**For a Larger Vision of Professional Practice**

Along with construction, many programs also seek to expose students to a broader range of architectural practice. Dan Rockhill explained it to me by saying that “the building is incidental to the process.” By this, he meant that the goal of Studio 804 is for the students to engage all aspects of the design and construction process – dealing with clients, codes, inspectors, contractors, product suppliers, “engineers and neighborhood associations, signing contracts, doing estimates and driving nails.” At Yale, a similar intention is realized by “exposing students to all of the forces that come to bear on the making of a building, whether environmental, technical, or political, they can begin to harness them to become more effective as architects” (Sokol, 2008: 126).

**As a Critique of Academia**

A few programs see design-build as an alternative practice, in which the kinds of questions asked, criteria of success, and basis of judgment are made more relevant by the reality of the project setting. It is a critique of the lack of reality found in many hypothetical academic studio projects as well as of the representational tools used by students in those settings. Mostly, such programs see design-build as a manifold design activity that enriches the student’s decision-making through direct engagement. Design solutions are less personal, theoretical, and grounded valuably in a “messy reality” (Hoppa, 2002: 4). Timothy Gray with Ball State University points specifically to the “distance and disengagement’ often associated with virtual representation and the inherent abstraction of design studio” (Gray, 2010: 64). While for Brian Mackay Lyons, “Ghost Lab is a critique of the current state of architectural education – of both the role of practice and of the academy in teaching the discipline of architecture. It is based on the view that there is but one world. Thinking and doing, the mind and body are necessarily connected.”

**For Enhanced Awareness of Place**

The realness of design-build projects has also allowed some programs to adopt them as means to train student to be more responsive to specific site and local conditions. Such sensitivity is focused, in these cases, on both climate and local culture. In the case of climate, the necessary performance of the structures for cooling, access to natural light, etc. is not solely diagrammatic, but real. It is out of the same responsibility and presence of a real place, that the students are challenged to respect and consider local architectural character, heritage, and ways of life. This last intention is central to the Koshirakura Landscape Workshop; Travis Price’s unique program entitled Spirit of Place/ Spirit of Design, and the Rural Studio. Described as dealing with the consequences of their design work, Koshirakura’s projects “are as a result informed as much by the local culture of the community as they are by the craft and tectonic lessons contained in the old buildings in the town.” (Coar, 2010: 27). In sympathy with Koshirakura, Andrea Dean has said of the Rural
Studio, “It was also thought that this experience would demonstrate that sources for design inspiration could be born from understanding culture and place” (Dean, 2001: 78).

To Enhance Collaborative Skills
A further clear alternative to the studio environment offered by design-build is that of necessary collaborative work, which some programs make a significant point in emphasizing. Most prominent is Steve Badanes Neighborhood Design/Build Studio at the University of Washington, where building consensus is central to his pedagogy. His point is that design-build is by nature a group project that benefits from collegiality and diversity.
and that working well together with your team mates is of no less importance as working with your clients and neighbors (Badanes, 2008: 248-255). Projects are of such a scale that “it exposes students to working in teams and accepting that you may not be great at everything. It allows [the students] to grow in self-confidence in terms of working in teams and accepting they don’t have to be a genius in everything” (Sokol, 2008: 122).

To Explore New Methods of Project Delivery
A few programs have also begun to realize the potential in design-build to explore new possibilities for project delivery and new ideas about design. Often these projects involve the potentialities that lie in digital design and production or CAD/CAM. At the Harvard Design School, like many others, their aim has been “to realize a project and, through that process, explore and learn about design, material properties, fabrication, and construction techniques” (Better, et al, 2002: 180-182). A more unique case lies with the EcoMOD program run by John Quale at the University of Virginia. Quale has realized the speculative potential that is a part of standard academic design studios. Design-build projects are designed and built as operating hypotheses about the future potential of modular housing. Their mantra, “design/build/evaluate,” links design to experimental science in very productive ways. Upon completion, as in science, each evaluation feeds the subsequent design parameters of the next project.

To Explore Materials & Materiality
Lastly, design-build programs have been used as a vehicle for students to explore the uses, characteristics, and potential within building materials, their assembly and tectonic/spatial possibilities. These “1:1 investigations” are intended to serve as both a medium of exploration for the designer-builder, and as a kind of critique of conventional building and assembly (Erdman and Leslie, 2006: 3). They are often singular works that are more sculptural, experimental, and temporary in nature. About the design-build projects completed at the “Ghost Lab”, a research laboratory affiliated with MacKay-Lyons Sweetapple Architects, Thomas Fisher praises the opportunity afforded the students “to build and illuminate structures without concern for client programs, code requirements, or change orders” in direct contrast to many of the goals outlined above (Fisher, 2008: 123). More characteristic are “projects [that] share an intense preoccupation with both the making and material of building ... a desire for architectural education and practice to engage with materials and processes (Erdman and Leslie, 2006).

In sum, these eight intentions are, in practice, fused or emphasized in patterns that render every program unique.

Instructional Tactics of Design-build
By “instructional tactics” I refer to the specific means adopted by each program in order to carry out its intentions.

Design Process
With regard to pedagogical process, there are two clear models in operation (Wallis, 2010). The first is the collaborative model in which students work alone or in one or more teams to develop a design project for construction. If they work in teams, proposals are developed and fused with other proposals in search of the best set of ideas.
The other model, competitive, asks the students to individually develop proposals, which are then subject to review by faculty, peers, and/or clients for selection. For some it is a single stage process, for others a multi-stage process such that winning selections are redesigned in each round for further competitive judgment. The most dominant model combines the best characteristics of these two approaches. Individual projects are competitively judged and then paired with sympathetic proposals in each subsequent round. Ultimately a single proposal is selected, but the benefits are that everyone has had a say, if not a hand, in the final proposal slated for construction.

**Clients**

In terms of clients, most design-build programs tend to work for public entities and/or non-profits that work in service to those in need such as community development and housing organizations. A very few work for private clients, and they do so mostly by request and typically in order to advance an agenda that is in the common interest, such as a park pavilion. For most programs having real clients and interacting with them is key, in terms of the student exposure to the building process. Further, some program directors have commented that by working for clients, the students often feel a greater responsibility to something beyond themselves, making them more serious and motivated to complete the work.

**Projects**

The scopes of projects vary widely both among programs and over time within each program. Many build pavilions, park and recreational structures, interpretive centers, and other outdoor structures, especially at the beginning of a program. The reasons given for the selection of these projects include the desire to avoid code constraints, project visibility (as these are typically in public view and for public use), greater ease of construction, ability for students to explore structural, material, and tectonic issues, and so that projects fit neatly within an academic term. The more established programs tend to build houses as a means of community service by aiding housing providers for those in need including Habitat for Humanity, although some such as the Rural Studio have designed and built complex public buildings as well. Some have lamented the shift to residential housing construction, as it often includes a turn towards more conventional construction and less exploratory potential for the young designers (Hayes, 2007: 40).

**Getting Started**

A common theme of many start-up programs is that of building trust with the community. Start-ups tend to work on small-scale projects, renovations, and other “as-needed” projects for communities of modest means. The Rural Studio is again, emblematic of this common tactic. As a means of gaining trust in the community, they sought to “do whatever they could” to help completing small renovations to houses and businesses throughout Hale County. The idea being that they could offer skills, labor, and were ready to help so they took on whatever was required. A more recent example at the Rural Studio occurred when the program took stock of its projects to date in Mason’s Bend. Upon discovering that the building of houses had neglected one of the three extended families in the area, the Fields, a student sought to rectify this by approaching the family directly. Initially met with skepticism, he was dismissed with the
challenge that if he wanted to help, he could cut weeds in the backyard. He did, and in the process built up the trust needed to work more widely for the Field family in the years since (Bell, 2003: 26-28).

In a more activist vein, the University of Kansas School of Architecture initiated what they refer to as either “guerilla architecture” or “insurgent architecture” when they sought to help the citizens of the Seventh Ward of New Orleans in the wake of Hurricane Katrina. Not unlike the Rural Studio, they simply wanted to help. As they put it, we “were paired with a fledgling

Figure 3: Students build a wind shelter for horses in Montana as a part of the Remote Studio (Source: Used with permission from the Artemis Institute).
community organization [the Porch Cultural Organization], and together we set about deciding what we would do. It was perhaps inevitable that we would start something unorthodox" (Corser and Gore, 2009: 33). What followed was a collaboration of identifying needs and unique solutions that resulted in, to date, five projects that began with “Notice Boards” that aimed to give the neighborhood “a voice in citywide dialogues ... and also provide an opportunity for residents to talk with each other about race and class, creativity and activism” (Breunlin, 2008). This was followed by a more conventional set of projects, including a community garden, shade structure, tool shed, and mobile stage, but each integrated/woven within the fabric of the communities emerging needs. Their reference to “insurgency” here, which has become something of a mantra, is instructive. Derived from the work of David Harvey, the “insurgent architect” is a theoretical political figure who employs both a “speculative imagination” and “has available some special resources for critique, resources from which to generate alternative visions as to what might be possible” (Harvey, 2003: 237-238).

Work
Generally, programs rely on students to do all of the work, but with supervision ranging from one or more faculty acting as the project manager(s) or facilitator(s), which one likened to “stacking BB’s” and “herding cats.” Due to the complexity of many projects, legal and/or code considerations, programs forced to work with consultants and sub-contractors for electrical, plumbing, specialty trades, and the operation of complex equipment. In these cases, most report that students work closely with the consultants, often coordinating them while also receiving on-the-job training. The faculty member’s role is also consistent across the programs. They secure the projects, primary funding, and serve as the liaison with clients, although in rare cases the students generate both the funding and projects.

Financing
Project funding is one of the most difficult aspects for design-build programs. The money available is often insufficient to do the work, obtained piecemeal, partially siphoned away by the university or otherwise encumbered, or simply unavailable. Many programs try to work with non-profits and other agencies with active and proven fund-raising capabilities, and a few thrive this way in an entrepreneurial manner such as Studio 804 who sells the completed projects. They work closely with a local Community Design Center who bankrolls the project with a loan. Once complete and sold, profits are split and used for the future operations of both the CDC and Studio 804. Other programs include fundraising as a part of the educational process, but the students tend to be most successful with in-kind donations of materials and products. On the downside, Bruce Lonman summarizes, “unable to acquire the funding some programs downsize the project to match the budget. All in all the organization and financing of a design/build endeavor discourages many administrators and department heads who would otherwise be sympathetic to the educational benefits.” (Lonman, 2010: 70)

Scheduling
While there is a wide range of schemas for the scheduling of projects, most attempt to conform to a single or double academic term for both
the design and construction phases. About half of the programs surveyed utilized only one semester, typically Spring, for both design and construction and rely on the summer term as a backup plan. These programs tend to tailor the type, location, size and scope of the projects according to what could be completed within a tight 15-week time frame. In addition, a few have adopted a formulaic approach, building similar types of projects (pavilions, small houses with conventional construction) so as to effectively manage complexity. All programs were keen not to interrupt the overall studies of their students by having to devote an inordinate amount of time to the project. Of those that did use two semesters, some used the first for research and design, with construction to follow. Others were compelled to use both semesters due to the complexity of the projects. Most rare are programs that use less than a full academic term, usually a few weeks in the summer.

Organization
The majority of the programs situated within academic institutions, and many of those that come and go are design studios reconfigured with a construction component. With success these smaller ad-hoc projects may be developed as clearly delineated programs like Studio 804 (affiliated with the University of Kansas), DesignBuildBluff (affiliated with the University of Utah), or ecoMOD (University of Virginia). In a few cases, for strategic reasons, the programs operated as non-profits that are financially independent of the university, but linked via curriculum and faculty salary.

Location
As for the sites of projects, most prefer to work close to home for pragmatic and ideological reasons. It is easier for students to travel to the job site in between other obligations such as coursework, family, or jobs. Steve Badanes suggests that it is best to “work closer to home, where you can be more productive, save energy, and build community credibility with each new project in the same geographic area (Badanes, 2008: 249). Extending this Adam Hopfner of Yale’s Building Project states, “That’s exactly how we feel about New Haven. It’s a really depleted housing stock. Certain communities are really underserved. We feel we can do the most good at home” (Sokol, 2008: 124). Yet, other programs have found great success working far from the university. Some seek out work in places of need around the globe, such as the BASIC initiative Global Community Studios (once, the University of Washington, now a collaboration entity between Portland State University and University of Texas at Austin, School of Architecture). Others have set up shop in areas of need closer to home, such as the Rural Studio and the many programs that migrated to New Orleans to help rebuild after Hurricane Katrina.

Sustainability
Lastly, whether it is a sign of rising general interest among students, or a feature endemic to the kinds of projects being completed, sustainability is a feature in most programs. For many it is rendered as both an issue of the building’s performance as well as the materials that go into its construction as recycling and the use of “found materials” is a common theme. Moreover, inasmuch as sustainability is allied with social justice, the many programs committed to community service also take seriously energy efficiency (as a way to keep operating costs low), and the health effects of
materials deployed in construction.

In sum, these ten strategic tactics describe both the radical heterogeneity of design-build programs as well as the surprising commonalities they share.

**Issues and Challenges of Design-build**

Running a design-build studio or program is not easy. There are a number of impediments to the successful completion of even the simplest projects. In this section, I detail a few of the recurrent issues faced by those involved with this alternative form of pedagogy and practice.

Perhaps the primary difficulty faced by design-build programs concerns their reception within their own institution. Programs of all types face purposive and unintentional scrutiny, misunderstanding, mistrust, and marginalization by colleagues, administrators, and students. It is a testament to both luck and will that many of the projects ever see the light of day, much less get built.

**Collegial Resistance**

Amongst colleagues, the resistance to design-build programs is not surprising to anyone familiar with faculty politics. There is a lack of support that appears to stem from both jealousy and legitimate criticism. Much of the jealousy appears to stem from the success of the design-build projects themselves. They are often popular within the community and with administrators because they are tangible, visible, photogenic projects that appear in newspapers, books, and magazines. They are also popular amongst students who wish to be a part of “real” projects after so many theoretical ones. Pedagogically design-build programs critiqued in four general ways:

First, some faculty view design-build as “vocational” because they tend to use conventional construction methods so as to be manageable by students. Many schools see the role of the architect as a critical thinker who challenges such conventions so many design-build studios are dismissed as little more than courses in construction.

Second, other faculty members argue that design-build studios are insufficiently challenging for all students. This logic stems from the fact that only one project is completed in an academic term. Such a low level of production is not seen as a sufficient substitute for the traditional design studio, which allows each student freedom for exploration and expression within the design and representational process thought to be central to professional practice and the role of the architect as artist (The only exceptions to this criticism are those projects described above which are framed as explorations of materials). However, Nick Nepveux countered that design-build programs are a “change from the view that architectural education is about developing individual skills to design “our own” creations, to the view that architecture is an inherently interdisciplinary and collaborative form of artistic expression” (Nepveux, 2010: 84).

Third, criticism is also leveled at the number of credits students receive for their participation in these programs, arguing this stifles opportunities for those students to take a greater variety of coursework, or that it reduces the amount of time available for core studio skill development. And lastly, some feel that design-build studios
may be exploitative because they appropriate student ideas for real projects without compensation.

In sum, design-build programs are “viewed as marginal to design school curricula. They often fall short of the dual goals of exemplary design and lasting social impact, and they are rarely integrated with broader university or national initiatives on community development” (Pearson, 2002: 7). To rectify these impressions, each design-build program, including the AFI, should work harder to develop a discourse that takes these criticisms seriously while also extolling the benefits outlined above. Such programs, as Jori Erdman has argued, need to stop operating at the margins, and be integrated into the “educational framework” of the schools within which they are housed (Erdman, 2008: 77). In this way, perhaps the benefits of both pedagogies can be manifest.

Administrative and Institutional Resistance

Universities and departments are by their nature conservative, if not slow to adapt to change. Design-build programs suffer a variety of impediments due to institutional conservatism, and many of those programs, which have been successful, credit that success to the support of upper level administrators who have paved the way and provided institutional cover. At the local level, some administrators find it problematic to balance unconventional coursework (often exceeding normal workload) within overall staffing demands. Faculty, in turn, finds it frustrating to work so hard only to have such demanding work not recognized. To make matters worse the work of young faculty in particular is not given appropriate consideration with regard to tenure and promotion because few consider it equal to “research” even though community support and funding is often available. At the level of upper administration, there is often pressure for funding to be present at the outset of a project, which does not dovetail with academic schedules. Further, the issues of liability for both student safety and for the protection of property (i.e. risk management) are interpreted or learned differently at every institution as each has their own tolerance for risk. Many programs reported protracted and delayed approvals when permissions were initially sought delaying projects and causing havoc with student schedules and client expectations. Others reported attempts to complete work hidden in plain sight or extolled the benefits of being far from the main campus and out of the sight of the administration. Timothy Gray (Gray, 2010: 65-66) agrees:

“Most faculty that engage in these types of projects over a period of time face burn out if the institution is not structured to facilitate and encourage these types of experiences. The fact remains that ... ongoing administrative and institutional support for this type of undertaking remains the exception rather than the norm. ... The work of Andrew Freear, who is carrying the amazing work of the Rural Studio at Auburn to new levels, still faces a host of administrative frictions with the University. The outstanding work achieved by educators such as Dan Rockhill at Kansas and Bryan McKay-Lyons at Dalhousie is not free from the same issues and concerns experienced throughout the Eco Center project. These flag-ship programs have either found a way to divorce themselves altogether (Studio 804, Ghost Lab) or distance themselves from the many administrative overlays of the
Student Resistance
Students, even those interested in design-build programs, pose a variety of challenges. At the outset, many do not appear to comprehend the scope of the projects and so find the time commitment and skills required to be overwhelming. There are conflicts with the intentionality of the projects, as some join for the chance to work on real projects, but are disinterested in the community service agenda. Others, with the opposite intention, sometimes lack an interest with the demands of construction. Hank Louis of DesignBuildBluff describes the more ideal outcome. “My students come for the hands-on experience. But once we get to the Navajo reservation the whole social aspect of it becomes very strong and there’s a love affair that develops between the Navajo family and these students” (Sokol, 2008: 123).

Students possess varying degrees of skill and time available for participation. For those that lack skills, time must be devoted to training and oversight and progress is often slow. Many have commented that the learning curve in such courses is enormous. Architecture students are also unaccustomed to working in groups, and with any group projects, the interpersonal dynamics must be managed. Once construction begins, maturity and experience in construction sets up the hierarchy of the job site and many faculty report spending a lot of time, especially Dan Rockhill, “balancing the fragile egos” of those participating.

Scheduling problems are also serious and exacerbated by weather and the late arrival of materials. In addition, since there is an ethical and legal obligation to the clients to complete the work on time, the need to “get the job done” can often run counter to the pedagogical goals of student learning. The best strategy for dealing with this is the use of a “study abroad” or residency format in which design-build is the only coursework for the academic term. This gives the students and project directors time to balance student needs with the demands of the project. For those without this possibility, programs have turned to prefabrication as a means to keep the work more local, reasonable, and controllable. For those programs that span multiple semesters, the tension between continuity, turnover, and project ownership by students and faculty alike is problematic. “One group gets started, and the next group has all kinds of critique. They want to move the kitchen to this location or that location. A lot of effort is spent in passing the baton and finding your own [as a student] value in it” (Sokol, 2008). Moreover, since, many programs contribute their success to student engagement the program can suffer when continuity is not maintained.

Equipment and Facilities
Having a place to work, facilities, tools, and proper maintenance are the key to any program’s success. In many ad-hoc programs, student and faculty often covertly fund the program by supplying their own tools and replacing consumables such as sandpaper and drill bits with their own funds. More established programs have learned this lesson and build such funding into their budgets, or have already secured facilities. Recently public work by the Rice Building Workshop was brought to a hiatus by the need to erect a covered outdoor workshop on a site accessible from campus just...
so students could survive the brutal heat and humidity of Houston. The Shelter incorporates a mobile woodshop and storage space, each adapted from shipping containers.

Quality of Work
Lastly, it is important to reiterate the limiting impact (or resistance) on the quality and scope of work based on all of the above. Because these programs use novice builders, many are limited to the use of familiar or standard building techniques and methods (Fowles, 1984: 8). The more complex the project, and those that require the use of consultants and trades people for completion are often more expensive and afford students less chance for hands-on or experiential learning, relegating to observers. Academic schedules, those of the students and the institution are influential in reframing of the scope of projects (to make them small enough to complete in a semester) or relocating the site of work to a local shop and thereby forcing the use of prefabrication as the method of delivery. As a comprehensive response, some programs now limit their output to a single building type and as stated above, follow a more manageable and formulaic approach. In the process, they open themselves up, rightly or wrongly to the criticisms leveled above.

In sum, these five issues and challenges are present, to varying degrees, in all of the programs studied. Along with the intentions and tactics examined above, they provide a pedagogical context in which to place and improve any or all programs.

Concluding Word
Beyond the suggestions above, I recommend to the reader, a thorough review of companion design-build programs as a means of mining and learning, if not outright stealing any good ideas that can be found. There are many dedicated program directors, instructors, students, and administrators supporting their own local programs throughout the North America and the world. Many face similar challenges, seek similar goals, and many are succeeding in ways small and large. However, there is admittedly still too little theorization and reflection for so widespread a practice as educational design-build. Greater communication can only help and I hope I have done my part in this essay. The summary review above is only a snapshot of present activity and intentions involved in this constantly changing educational practice. Nevertheless, design-build as a methodology has more to offer than just another way of getting something done. It is a unique and complex interdisciplinary practice that can not only bring the interests of designers, builders, and fellow citizens into common purpose, but also make community-engaged pedagogy relevant to other disciplines. Because design-build pedagogy is grounded in realities that include the site, setting, clients, schedules, budgets, and technical demands of construction the intellectual and practical abilities of future architects cannot but be more informed by such learning experience.

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