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Foraging for the Curriculum: Sourcing Local Projects for an Integrated Understanding of Issues Central to Practice

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Foraging for the Curriculum: sourcing local projects for an integrated understanding of issues central to practice

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Abstract

Historically, the profession has relied on the period of architectural internship to enable graduates to integrate professional practice issues into their design-thinking. However, as the profession looks for ways to shorten the licensure process, eliminating the timeline between graduation and licensure, it is necessary to examine how these issues may be addressed in a more multi-dimensional manner within the academy. This paper documents pedagogical research, supported by the 2013 NCARB Award, that investigates an experiential, hybrid classroom and field-based model for integrating issues central to practice in curricula. Original course objectives focused on introducing students to the relationship between concept and technical execution by reviewing project documentation and then visiting construction sites to discuss issues of constructability. However, testing the format across varied project types, delivery methods, scales of operation, and practice models with a range of practitioners addressed a much larger realm of concerns than initially hypothesized. Rather than replicating practice, this research explores whether the academic setting can provide opportunities to integrate some knowledge domains more extensively than practice-based internship, and, if so, how we may do so.

Introduction

Within the sequence of most professional architectural curricula, open-ended studio projects of increasing complexity challenge students to resolve conflicting issues including, but not limited to, site, program, structures, systems, and materials. This approach attempts to situate students in a learning environment that approximates the experience in which architectural projects are conceived, investigated, and realized in professional practice. Varied criticisms and reconsiderations of the studio

model, particularly of its culture (Till 2005, Anthony 2012), have emerged over the last thirty years. Nonetheless, studio remains a foundation of design education with knowledge from other domains integrated and applied in the studio.¹

But what of the less tangible professional concerns that are difficult to integrate into a design setting? In this category, we find matters such as professional roles, practice models, finances, and delivery methods. Within the academy, knowledge of this domain is typically acquired in comprehensive but compartmentalized professional practice coursework. Historically, the profession has relied on the period of internship to enable architectural graduates to integrate these professional practice issues into their design-thinking. However, as the profession looks for ways to shorten the licensure process, eliminating some months or even years of internship in a practice setting,² it is necessary to examine how these issues may be addressed in a situated learning environment within the academy.

This paper documents pedagogical research, supported by the 2013 NCARB Award, that investigates a hybrid classroom and field-based model for integrating practice issues in architectural curricula. The project, *Voices from the Field*, responded to the recommendations of the 2012 *NCARB Practice Analysis Education Report*, which suggested that academic curricula include more job-site experience to enable graduates to better visualize the construction process so that they can apply this construction knowledge to their design work.

Original course objectives focused on introducing students to the relationship between concept and technical execution by reviewing project documentation and then visiting construction sites to discuss issues of constructability. However, testing the model over two semesters and across varied

project types, delivery methods, scales of operation, and practice models with a range of practitioners addressed a much larger realm of concerns than initially hypothesized. The course was able to meaningfully address many of the Recurring Themes identified in the *2012 Practice Analysis* as requiring additional reinforcement in curricula including communication, collaboration, professional conduct, practice and project management, site design, constructability, sustainability, and technology. Moreover, it was able to integrate professional practice issues that are difficult to cover in a classroom by situating them in the context of active construction projects.

Ongoing research is concerned with whether this method of experiential learning through interacting with practitioners and personal observation on construction sites yields a deep integration of concepts, and whether the course structure and assignments provide for good retention and “stickiness.” (Cheng 2013) This paper analyzes student deliverables, reviews a student survey, and incorporates non-faculty practitioner feedback. Discussion follows for fine-tuning the course to enhance this integration in future course iterations. Additionally, the paper puts forth that that by testing the model in a mostly rural area with few large firms, it is replicable in other scenarios.

The intention is to develop a model that complements and integrates information amassed in comprehensive courses. Finally, rather than replicate practice, this research explores whether the academic setting can provide opportunities to integrate some knowledge domains more extensively than practice-based internship, and, if so, how we may do so.

Background

The design studio remains one of the primary vehicles for simulating a practice environment by integrating multiple domains of increasing complexity over the course of academic architectural study. Moreover, there are many schools doing innovative work stretching the studio model to incorporate an ever-evolving number of practice concerns. For example, in the growing network of design-build studios, students must address constructability, financing, and regulatory issues. Additionally, community-engaged

studios work with real-world clients, while interdisciplinary studios may address landscape design, real estate and business concerns or engineering parameters.

Nonetheless, it is increasingly difficult to incorporate professional practice concerns at all scales of contemporary practice. For example, student-led design-build projects cannot likely approximate the process and practice issues that arise in a multi-year, 60,000sf, \$35 million dollar project (such as the McGuirk Football Performance Center visited by the *Voices* class). Beyond project scale, it is difficult for studio to simulate the non-design aspects of practice, among these professional roles, practice models, financing systems, delivery methods, and even highly fluctuating variables like weather, changing material prices and available labor.

Knowledge Acquisition Timeline

The *2012 NCARB Practice Analysis Education Report* findings identified eight areas requiring additional focus and reinforcement in academic curricula: communication, collaboration, professional conduct, practice and project management, site design, constructability, sustainability, and technology. Additionally, the *Practice Analysis Qualitative Findings* recommended that to adapt to changing professional demands, curricula should include more job-site experience so that graduates are better positioned to visualize the design and construction process and to be able to apply construction knowledge to their design projects. (NCARB 2012)

According to the *Practice Analysis*, practitioners overwhelmingly indicated that these capabilities should be acquired during an academic course of study. By contrast, recently-licensed architects and current interns indicate that they are gaining these knowledge and skills primarily during their period of internship. (NCARB 2012) This disconnect partially reflects the different priorities of the architectural marketplace and the academy. However, as a shortened timeline for the licensure process is explored, new models may need to be developed so that topics typically covered through compartmentalized academic coursework can be presented, explored, and experienced in a multi-

dimensional and integrated manner, more akin to practice.

Voices From the Field

One such model is being explored through an experiential seminar entitled *Voices from the Field: from Design Concept to Reality*, a project supported by the 2013 NCARB Award for the Integration of Practice and Education. The initial course objective was to bridge education and practice by increasing students' understanding of the relationship between concept design and technical execution. While constructability was certainly a primary focus, the intention was to expose students to the complex web of factors that go into taking design decisions to realization, including issues such as operations and maintenance. The course was piloted in the Spring 2014 semester and was tested again in the Fall 2014 semester.

Research Questions

A primary research question for this course concerns student learning outcomes. This research inquires whether the experiential and situated learning that occurs through interacting with practitioners and personal observation on construction sites yields a deep integration of concepts typically covered in a compartmentalized manner. For example, in academic coursework, building and construction technologies are typically addressed through materials and methods courses. Professional practice seminars cover topics such as project delivery, professional roles, practice models, and financing. Construction documentation is taught in "integration" or "comprehensive" studios. Research conducted through the *Voices from the Field* course inquires whether this hybrid model can complement and integrate information acquired in comprehensive courses.

Method: Hybrid Course Structure

In this hybrid course structure, students examined active building construction projects with practicing architects to enable students to further their understanding of the myriad factors that go into taking design decisions through construction, including sustainable strategies, building technologies, and

construction means and methods. First, students compared documentation to projects in construction to advance their understanding of the role of documentation in communicating design detailing for construction. They then attended site visits with the architect conducting construction supervision to enable students to gain direct experience of the construction process and to become familiar with the architect's role during construction. Students also discussed the issues that arise in practice with a diverse group of practitioners from intern architects to architects with more than ten years of experience to gain insight into professional conduct issues that arise in architects' daily work. (Figs. 1)



Figure 1: McGuirk Football Performance Center site visit with Alec Zebrowski, UMass M.Arch'11

During the semester, students spent approximately half of the allotted course time at construction sites, and the other half of the allotted course time preparing for these site visits. In-class preparation prior to the site visits allowed for more targeted observation during the site visits. Before arriving on the site, students were already focused on which elements of the project would be most important to observe. These elements varied for each project, depending upon the current construction phase of construction, the project scale, the building type, and the specific construction techniques and assemblies. For example, in preparation for visiting the Integrated Learning Center, a project in the finish work phase of construction, students focused on the cabinetry details, wall sections, lighting plans, and other drawing sheets containing elements that would be visible during the site visit. This conversation on site focused on punch lists and the importance of experimentation and collaboration when resolving construction difficulties.

By contrast, in preparation for a visit to the Champions Center, students focused on sitework, foundations, and steel structural drawings. They read background resources on pressure-injected footings, sustainable site preparation, and steel frame construction. In class, we reviewed unfamiliar documentation conventions for steel drawings. This enabled the conversation on site to focus on the integration of building systems and the placement of steel members that seemed counterintuitive. One such member deviated from students' expectations because it accommodated roof drainage. (Fig. 2)



Figure 2: Project Architect Rich Halm discusses steel structural choices at Champions Center site visit

Each semester, students reviewed five projects: four in construction and one finished building - a Living Building Certified project. During the Spring 2014 semester, students went on seven site visits. Projects ranged from 2500 sf to 150,000 sf in size and from \$400,00 to \$93.5 million in budget. Practitioners included an alum and intern architect at a large multi-national firm, a University Campus Planning architect, and three experienced architects with more than ten years in practice. Despite winter conditions, students were able to observe projects in a diverse range of construction phases including sitework, foundation construction, steel framing, envelope construction, envelope retrofitting, interior build-out, lighting, electrical, mechanical and plumbing roughing and finishing, and interior finish and millwork installation. Projects visited were being delivered through Design-Bid-Build and CM at Risk methods.

During the Fall 2014 semester, students went on six site visits. Projects ranged from 2500 sf to 85,000 sf in size and from \$1.79 million to \$38.5 million in budget. Practitioners included recent graduates, now

intern architects at a multi-national firm, a University Campus Planning architect, and four experienced architects. Students were able to observe projects in a diverse range of construction phases including sitework, foundation construction, steel framing, envelope construction, interior build-outs, lighting, electrical, mechanical and plumbing roughing and finishing, and interior finish installations and millwork mockups. Projects were being delivered through Design-Bid-Build, CM at Risk, and Integrated Project Delivery methods.

Field Reports

Following site visits, students synthesized and reflected on their experiences by composing Field Reports. The Field Reports included photographs juxtaposed with annotated excerpts from construction documents, and written descriptions of the transformations that occur from drawing to construction. The reports also illuminated aspects of the design and construction process that were not readily apparent from the documentation alone, particularly issues of project management, construction scheduling, collaboration, the role of technology, and professional conduct.

Evidence of Integration

One method for assessing integration of material is an analysis of student Field Reports. The *Practice Analysis* separates their recommendations into eight themes - communication, collaboration, professional conduct, practice and project management, site design, constructability, sustainability, and technology. By contrast, the students' Field Reports describe how they experienced these issues as interrelated when put into practice in the projects that they studied. Moreover, the Field Reports demonstrate that students were able to ascertain moments of conflict, and resolution in design decision-making and project management.

Each Field Report comprised ten "Observations;" students were required to submit five reports per semester. With fourteen students in the spring and twelve students in the fall, each project's Field Reports yielded 120-140 observations. Some students made multiple points per "Observation" yielding a total of 1492 data points. As data points,

these can then be analyzed regarding how often issues identified in the Recurring Themes were discussed and how often they were discussed in an interrelated manner.

For example, students visited the Champions Center during sitework, steel, facade, and finish phases of construction with both the Project Architect and Project Manager for the Whiting-Turner Contracting Company. Over the course of these visits, many topics explored in student Field Reports concerned the interrelationship of constructability and design intent. Students indicated that these visits changed their understanding of the technical expertise necessary to realize a design concept they might propose in studio, such as a cantilever, when they observed the specialized thermal break designed for the cantilevered steel structure. (Fig. 3)

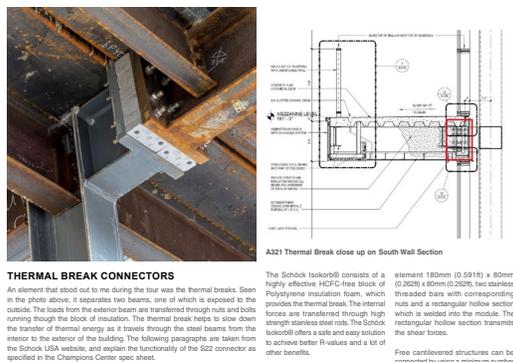


Figure 3: Field Report Connecting Construction Documentation to Site Observations (Dylan Brown 2014)

Moreover, students gained insight into professional project roles as they concern decision-making during the flux of the construction process, something difficult to simulate in academic coursework. During the first visit to the Champions Center in January foundations were being poured under freezing conditions. The Project Manager discussed the interrelationships among construction costs, sequencing and weather, explaining that he was erecting the steel structure prior to pouring the concrete floor slab due to the timing of construction during freezing weather. Based on the construction documentation and their classroom training, students had expected slabs to be poured prior to erection of the steel structure. The Project Manager indicated that financially the sequences were roughly equivalent

but, given the weather, his preferred method allowed for better quality control of the concrete pour. In students' Field Reports, out of a possible 140 observations, thirty referred to the relationship between weather and construction design and detailing decisions.



Figure 4: Architect Tom Hartman discussing the importance of collaborating with the contractor to insure proper window installation sequencing on a housing retrofit project

Similarly, in the *Practice Analysis*, Constructability and Sustainability are identified as separate Recurring Themes. By contrast, for the projects studied, students came to understand that these issues were fundamentally interrelated. For example, at Powdermill Village, an affordable housing retrofit project, it was not possible to separate Constructability and Sustainability issues when discussing strategies for retrofitting windows with air barrier, insulation, and installation problems. (Fig. 4) In students' Field Reports, out of a possible 140 observations, twenty-five noted the importance of graphically clear and understandable documentation necessary to convey detailed window and envelope information to the contractor such that the finished construction will meet performance targets.

Finally, students were able to observe the interrelationship of time with these other aspects of the construction process. For example, on one project, a LED light fixture was initially too expensive for the project's budget; the construction documents specified a more affordable fixture. By the time of the site visit, the LED's price had dropped. Construction was also sufficiently complete so that most financial contingencies had been identified. Together, these factors enabled the team to purchase the more

efficient LED fixture. In their Field Reports, students noted that this example demonstrated the rapid pace at which the building industry is evolving. They also observed the flexibility required to take advantage of this opportunity; the project team had to rework already completed underground electrical wiring in order to accommodate the new fixture.

Evidence of Integration in Student Survey

At the conclusion of the Fall 2014 course, students were asked to complete a survey indicating on a 5-point scale whether the course increased their understanding of the following topics: Constructability, Project Management, Sustainability, Professional Conduct, Collaboration, and the Role of Technology. Each topic also employed open-ended questions, asking students to make connections between these topics and their experiences in the field. Despite the fact that the questions were posed in relationship to the discreet categories employed in the *Practice Analysis*, students were able to synthesize across the various “Recurring Themes.”



Figure 5: Field Report Showing Prefabricated Patient Room Mechanical Connection Panels. Students noted that, due to the IPD method, this cost-saving solution was proposed by subcontractors. (Andrew Shea 2014)

For example, students made connections between Professional Conduct, Collaboration, Technology and Project Management when discussing a healthcare project using Integrated Project Delivery. Following this visit, students indicated understanding of the various agents with whom architects collaborate had increased. In particular, they were struck by the architects' descriptions of consulting with end users such as doctors, nurses, and pharmacists. Moreover,

on all the projects studied, students indicated they gained a keen understanding of the need to collaborate with contractors to resolve construction difficulties, regardless of assigned responsibility.

However, students were particularly impressed by the level of collaboration and knowledge sharing exhibited in the IPD process and with the role of technology in facilitating this collaboration. Students noted that IPD encouraged collaborating with subcontractors earlier in the process to produce more creative, timely, and cost-effective solutions without a loss of quality. (Fig. 5) For example, they were impressed that when developing a full-scale mockup for a patient room, the millwork subcontractor worked to understand the interior designer's aesthetic criteria so that they could source materials at a lower price point. As this was the architects' and the healthcare client's first time using IPD, students were able to compare the architect's experience with various project delivery methods and experience professional practice at a moment of transition.

Letters from Practitioners

The participating non-faculty practitioners similarly noted the level of integrative thinking as they talked with students on construction sites. One practitioner wrote of this experience:

I really appreciated the broad scope of the conversation – as I think the students did as well. Instead of focusing solely on construction details (as I did in graduate school), it was far more interesting to relate some of those specific design decisions to the larger context - the role of the client, OPM, architect, and contractor; lessons learned from the project; and how much of the process is really dependent on human interactions in addition to what gets put on paper.

Touring the site with the OPM, as well as the architect, was also very interesting and helped both parties take a step back and examine their roles in the process. [Kristian Whitsett AIA, Associate Principal Jones Whitsett Architects, - Practitioner Letter, 1.5.2015]

Translatable Pedagogic Structures

In considering this course structure's adaptability to a variety of other academic scenarios, I was particularly concerned with other architecture programs located

far from urban centers. A primary research question when I began this project was whether there would be sufficient volume and diversity of construction projects in operation in our region during an academic semester from which to forage sufficient course content while broadly addressing the *2012 Practice Analysis* Recurring Themes.

I had planned to rely on the University's \$500 million ten-year construction plan as a base and forage for other material from projects throughout the region. I saw this as a model for other rural architecture programs that have large firms pursuing complex building projects on their campuses as well as a dedicated base of local practitioners who strongly support their academic endeavors.

Testing the course over one spring and one fall semester yielded some surprising results. First, I was able to source construction projects with a robust diversity of project types and budgets, construction materials and methods, sustainability targets, and project delivery methods. Large University projects did form a core component of the Spring 2014 course iteration. In the Fall 2014 semester, there was only one active building project on campus, so I turned to the local architectural community with excellent results.

Sourcing a diversity of construction stages was more difficult. Financing and construction schedules made it challenging to align site visits with academic calendars. Other logistical challenges included weather variability in the early spring semester, early darkness in the fall semester, practitioner availability during class times, and the willingness of contractors to allow student groups on active jobsites during work hours. Thus foraging successfully demanded flexibility from students, causing conflicts with their jam-packed "millennial" schedules.

However, a few lessons learned will enhance course adaptability to other settings. First, in the future, I will be more explicit in my foraging, establishing a matrix with diversity of construction phases as the priority. Students were best able to understand the transformation of the project from concept to reality when seeing a range of construction phases over the course of the semester. However, observing the sitework phase had a particularly profound impact on

students' comprehension of construction project management issues. This experience enabled students to understand the larger endeavor of building sustainably as it relates to construction staging and site protection. Thus, sourcing a project in the sitework phase will be a priority for this course.

Second, alternating visits to projects with different structural systems was particularly effective. In the Fall 2014 course, the projects visited alternated between steel and wood structures. This enabled students to gain increasing confidence understanding what they were seeing on the construction site. It also enabled students to compare the systems in process and to understand distinctions between decisions on each project. For example, after visiting the Champions Center steel structure early in the semester, students were better able to apprehend and ask pointed questions about the Plains Elementary steel structure a few weeks later.

Third, a few project types yielded particularly meaningful experiences for students. After primarily studying new construction, a retrofit project provided an opportunity to learn about the alternate strategies, required to execute a cost-effective energy reduction plan. Likewise, after visiting singular buildings, a multifamily housing project in various stages of completion permitted students to compare several different stages of construction simultaneously and to appreciate infrastructural site design concerns. Finally, students highly valued the experience of revisiting projects to see progress after a few months.

Next Steps: Priming Practitioners

One of the privileges of this project was engaging non-faculty practitioners in an evaluation session following the second course iteration. Three non-faculty practitioners participated by reviewing a selection of course materials and completed assignments, reading the results of the student survey, and meeting to discuss further refinements.

One of their primary recommendations was to involve practitioners in a classroom session prior to a site visit. However, to be more productive with the visit, they suggested that I create a template to "prime" visiting practitioners. This emerging template will be an active tool to orient practitioners to the course

objectives and establish the level of discourse. It will also prepare them to come to class ready to discuss project narratives that address course issues such as those drawn from the Practice Analysis Recurring Themes or the NAAB Student Performance Criteria in Realm D: Professional Practice.

More Expansive than Practice?

As students look to graduate with a shorter timeline to licensure, models will need to develop that capitalize on the academic setting to provide opportunities that are experientially denser and more encompassing than time spent in a practice setting. Currently, interns enrolled in NCARB's Intern Development Program may earn up to 40 out of 120 core hours in the Construction Phase experience area for visiting construction sites with a mentor as a recognized supplemental experience. NCARB's expectations for such a visit are that the experience should be interactive, with opportunities to discuss why particular design decisions were made and how project issues were resolved. NCARB encourages interaction with members of the design and construction industry involved in the project and recommends reviewing and discussing the project relative to the drawings. In short, NCARB hopes the experience includes a level of learning consistent with what an intern might learn if their firm was working on the project.

The *Voices from the Field* course far exceeds these expectations for supplemental experience. An intern working at an architecture firm might, if they are very fortunate, gain construction observation experience on projects of multiple types and scales. However, it is highly unlikely that they would experience five different documentation methods and five different approaches to construction administration. Most interns work for less than three firms while completing the IDP, and this includes internships during school and summer breaks. (NCARB 2014). By contrast, in the course of one semester of the *Voices* class, students review multiple Construction Document sets, visit varied projects types, and talk with a range of practitioners from different-sized firms engaged in various project delivery methods and professional practice issues. On a per-hour basis, by these measures, the *Voices* course provides an experientially more dense experience.

Conclusion

The *Voices from the Field* course successfully tested a pedagogical model for integrating the myriad issues that comprise contemporary architectural design decision-making and project delivery. The hybrid classroom and field-based format and the accompanying assignments yielded a deep integration of concepts that are typically covered in a compartmentalized manner. As such, its experiential method offers one approach to consider as the academy looks for models that will address these issues in a multi-dimensional and integrated manner, more akin to practice.

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Notes:

¹See, for example, ACSA's description of architectural coursework. <http://www.acsa-arch.org/resources/student-resources/overview/architecture-programs>

²See "NCARB Endorses Additional Path to Becoming an Architect: Architect License Upon Graduation." 2014, May 30. <http://www.ncarb.org/News-and-Events/News/2014/05-BODendorsesLTF.aspx>