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Intern architects in the academy: preparing for future practice

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ABSTRACT: In the summer of 2014, the National Council of Architectural Registration Boards (NCARB) announced its intention to provide a structured path to licensure upon graduation to qualified candidates. As the period of internship becomes embedded in the academic curriculum, with students eligible to become licensed upon graduation, identifying pedagogical methods that navigate the relationships among theory, design, construction, and practice becomes essential.

This paper documents pedagogical research, supported by the 2013 NCARB Award, that investigates an experiential, field-based model for integrating issues central to architectural practice in curricula to better prepare architectural students for future practice. The paper considers coursework carried out over two semesters, with varied project types, delivery methods, and practice models to evaluate the method's efficacy addressing recurring themes identified in the 2012 NCARB Practice Analysis recommendations. The ongoing research examines a pedagogical model for understanding the myriad issues that comprise contemporary architectural design decision-making and project delivery.

KEYWORDS: NCARB, practice, experiential education, field research, building technology

INTRODUCTION

The relationship between theory and practice in the architectural academy is a persistently debated topic. Meanwhile, the preparedness of architectural graduates for the profession remains a point of contention and accredited architectural programs continue to maintain a delicate balance between art academy, research unit, and vocational school. (Newman and Vassigh 2014) This summer, the National Council of Architectural Registration Boards (NCARB) announced changes to dramatically shorten the internship timeline to provide a structured path to licensure upon graduation to qualified candidates.¹ The American Institute of Architects (AIA) and the Association of Collegiate Schools of Architecture (ACSA) supported this initiative.²

As the period of internship becomes embedded in the curricula, with students eligible to become licensed upon graduation, the academy must grapple with integrating practical concerns into its courses. As this conference's theme illustrates, architectural practice itself is rapidly advancing through technological changes, advanced construction techniques, shifts in design delivery methods, and changing professional roles, all of which impact architectural design and technical execution. Identifying pedagogical methods to navigate the relationships among theory, design, construction, and practice thus becomes essential.

This paper documents pedagogical research, supported by the 2013 NCARB Award, that investigates an experiential, field-based model for integrating issues central to practice in architectural curricula to better prepare architectural students, or "intern" architects, for future practice. The paper considers course work carried out over two semesters examining varied project types, delivery methods, scales of operation, and practice models. The course is evaluated in reference to recurring themes identified in the 2012 NCARB Practice Analysis recommendations, particularly regarding the availability of sufficiently diverse and meaningful examples. A discussion evaluates the practicality of widely applying this methodology. The ongoing research posits the question of whether sacrificing traditional coursework's subject matter comprehensiveness for applied field-based integration is an effective vehicle for understanding the multiple paths and myriad issues involved in contemporary architectural design decision-making and project delivery.

1.0 BACKGROUND

Architectural coursework typically addresses building and construction technologies through materials and methods courses. Project delivery and professional roles are taught in professional practice seminars, and construction documentation is taught in "integration" or "comprehensive" studios. Each of these course types

seeks to provide a comprehensive overview of methodologies and issues in the profession. However, the profession has largely relied on post-graduate internship to allow developing architects to apply information gained in compartmentalized university-based coursework to more holistic project-based work. This practice setting provides a context in which knowledge is “based on repetitive, socially situated events and relationships.” (Johnston 2012)

The NCARB Practice Analysis provides one metric for identifying when knowledge is acquired and how this knowledge is being used in practice. The 2012 Practice Analysis included reports on Education, Examination, Internship and Continuing Education. The final analysis sample contained 7,867 responses that outline a detailed description of what those respondents believe practitioners need to know, the skills they must possess, the tasks they perform, how frequently those tasks are performed, and the respondents’ ratings of the relative importance of each. (NCARB 2012)

This paper draws upon findings from the Education Report. The data analysis for the Education Report included 2015 responses generated from licensed architects, recently-licensed architects, interns, and educators. (NCARB 2012) The survey asked educators whether specific tasks were covered in their programs and how students performed each task by graduation. Interns and architects were asked to indicate the extent to which they performed specific tasks by the completion of their architecture degree. Educators and architects were asked when specific knowledge and skills should first be acquired, and whether these should be acquired during an accredited degree program. Finally, interns and architects were asked to indicate when they acquired specific knowledge and skills and how these are typically employed in practice. (NCARB 2012)

1.1. 2012 NCARB Practice Analysis Recurring Themes

The 2012 Practice Analysis identified eight areas for particular focus and reinforcement within curricula: communication, collaboration, professional conduct, practice and project management, site design, constructability, sustainability, and technology. Additionally, there were Qualitative Findings that to adapt to changing professional demands, curricula should include more on-site experience. Both the Education Survey and the Internship Survey recommended job-site experience to prepare graduates to better visualize the design and construction process and to be able to apply construction knowledge to design.

Recently-licensed architects and current interns indicate that they are gaining knowledge and skills in these areas prior to licensure. At the same time, the practitioners overwhelmingly responded that these capacities should be acquired prior to graduation. By contrast, respondents indicated that their point of acquisition is actually during their internship period. (NCARB 2012)

1.2. Changing Circumstances – Licensure at Graduation

NCARB considers accredited architectural education the “foundation,” and describes the ensuing internship period “as a structured environment where theory and precedent can be applied to actual projects, and knowledge of materials and systems is transformed into thoughtful construction details.” (NCARB 2012, p.118) However, as internship gets pushed deeper into the academy, the discrepancies identified in the Practice Analysis bear further examination.

The concept of licensure at graduation is not an entirely new idea. (Frank 2014) Until recently, the three components of licensure – professional education, practice experience, and registration examination – were undertaken as a linear process. However, NCARB has been steadily changing the relationship among these three components, making overlaps between timelines feasible. For example, since June 2007, NCARB has endorsed early eligibility, or the ability to take the Architect Registration Examination (ARE) while completing the Intern Development Program (IDP). In 2007, approximately 25% of all divisions of the ARE were conducted under early eligibility. By 2014, that number had more than doubled. (NCARB 2014)

NCARB introduced additional changes by expanding eligibility dates so that students could begin earning hours as early as the completion of high school. Moreover, these changes, known as IDP 2.0, broadened the definition of experience settings by permitting interns, whether employed or not, to gain experience in more ways and under a broader range of supervisors. These changes have already created overlaps between internship and the academy. In 2001, the average licensee did not begin to count their IDP hours until after graduation, whereas by 2014, at least half reported IDP experience concurrent with education. New policy changes announced this summer regarding retroactive reporting of earned hours will provide an even greater opportunity to do so.³

However, recent research identified that the median time between graduation and completion of internship is 5.4 years, with an additional two years to complete the exam, so that the path to licensure can still take

seven to twelve years. (NCARB 2014) This research has prompted NCARB to take additional measures in an effort to shorten the duration of the licensure process. NCARB has convened a Licensure Task Force with a three-year plan to study how the path could be made more efficient, including the possibility of integrating internship and examination requirements into a professional architecture degree.

2.0 VOICES FROM THE FIELD EXPERIENTIAL SEMINAR

If the point of acquisition of capabilities that NCARB deems “central to practice” are increasingly removed from the practice setting, formats must be developed that can mirror this environment within academy. One such format is being explored through an experiential seminar entitled “Voices from the Field.” Supported by the 2013 NCARB Award, the course puts forth a method for examining the integrated relationship between concept design and technical execution by examining active building projects with practicing architects to advance an understanding of the myriad factors that impact design decisions during construction. In doing so, the course takes topics that are sometimes difficult to understand in an academic environment and links them to real world examples, thus providing students with direct experiential knowledge of critical practice issues.



Figure 1: Job-site visit with Non-Faculty Practitioner

The project addresses many of the recurring themes and qualitative findings identified in the 2012 NCARB Practice Analysis. Central to this effort is establishing an early understanding of construction sequences and familiarizing students with the Architect’s role from design to construction and maintenance. The course was piloted in the Spring 2014 semester and was tested again in the Fall 2014 semester. This enabled an analysis of the differences in construction practices between seasons. The course structure evolved over the two semesters maintaining consistency in its activities and assignment types. First, students were provided with construction document sets for review. Next, student facilitators presented a critical context for each project in a seminar setting. In their presentations, they reviewed the project’s financial and institutional details, and presented research on the project team and project delivery method. Then, supported by the faculty member, students led a walk-through of the construction document set, highlighting primary as well as unusual materials and construction methods, noting drawing conventions, and supplementing with relevant information. Finally, they gathered a list of questions for meetings and site visits with practitioners.

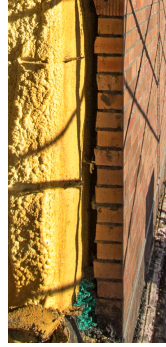
Students also visited the active construction sites accompanied by the corresponding non-faculty practitioners. (Fig 1) Students compared the topics that were studied in the classroom with the reality of the construction progress at the site. Following the site visits, students synthesized and reflected on their experiences by composing individual Field Observation 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. Field Reports also included written reflections on aspects of the design and construction process that were not readily apparent from the construction documents alone, particularly issues of project management, construction scheduling, collaboration, the role of technology, and professional conduct. (Fig. 2)

OBSERVATION 01 BRICK FACADE

While looking through the drawings, I understood that the majority of the facade of the building was brick, but I didn't look closely at how the bricks would be connected to the structure, and what was going on behind the brick veneer. It wasn't until the site visit when I saw the details in the brick facade and how it connects to the wall behind. One aspect of this wall system that I found very interesting was how metal brick ties protruded through the spray-on insulation, to fit between rows of bricks to anchor them to the wall.



A201 Brick close-up on West Elevation



Left: Air Space Between Insulation and Bricks

Brick ties are placed every 16" on center horizontally, and vertically. This anchors the brick wall to the structure of the building. The ties can be seen in the section below, and poking through the yellow insulation in the photo to the left.

The green mesh is meant to break up the mortar that falls down the air space during construction, so that air can still pass through this area and exit or enter the vents at the bottom.

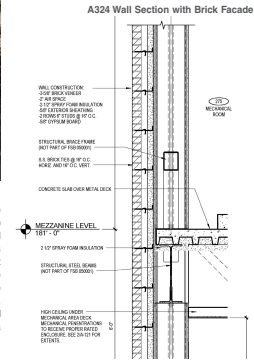


Figure 2: Field Report Connecting Construction Documentation to Site Observations
Source: (Dylan Brown 2014)

3.0 RESEARCH QUESTIONS

There are several research questions embedded in this work. The first question concerns course content. In particular, the work inquires whether sampling available projects from a mostly rural region will enable the course to cover a sufficiently broad spectrum of project types, project issues, and professional roles to address the 2012 NCARB Practice Analysis Recurring Themes.

The author began this study with the hypothesis that the University's \$500 million construction plan over the next decade would provide a stable base of course material, and that the local architectural community would supplement with smaller projects. It was unclear at the outset whether there would be sufficient diversity of project and construction types and whether there would be sufficient opportunity to examine projects at varying stages of construction due to New England's inclement weather and project scheduling.

A second research question concerns student-learning outcomes. This research inquires whether the 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) Collection of data to evaluate this question is ongoing and will be presented in a future paper.

3.1. Method and Data Results

Logging each semester's construction site visits by project type, size, budget, delivery method, stages of construction observed, primary structure systems, and targeted energy benchmarks demonstrates the diversity of experiences.

During the Spring 2014 semester, students reviewed construction document sets for five projects, and made seven site visits, including three projects on the University of Massachusetts Amherst campus, and two projects regionally. Architectural practitioners included a recent graduate, at a large multi-national firm, a Campus Planning architect, and three architects with more than ten years in practice. Despite a long, cold, and snowy winter, students were able to observe projects in a range of construction phases. They also visited one completed project. Projects visited were delivered through traditional Design-Bid-Build and CM at Risk methods. (Table 1)

During the Fall 2014 semester, students reviewed construction document sets for five projects, and made six site visits, including one project on the University of Massachusetts Amherst campus, and four projects regionally. Architectural practitioners included recent graduates, at a sizeable multi-national firm, a Campus Planning architect, and three architects with more than ten years in practice. Students were able to observe projects in a similar range of construction phases. Projects were delivered through traditional Design-Bid-Build, CM at Risk, and Integrated Project Delivery methods. (Table 2)

Project	Type	Size	Budget (millions)	Firm Size	Phases Visited	Structure	Rating System	Delivery Method
Integrative Learning Center (ILC)	Academic	150,000 sf	\$93.25	14,000	Interior Finishes Millwork, MEP	Steel	LEED Gold	CM At Risk
Football Performance Center & Pressbox	Athletics	55,000 sf 5,800 sf	\$34.50	1,600	Cladding, Interior Build-out, MEP	Steel	LEED Gold	CM At Risk
Bechtel Environmental Center	Classroom	2500 sf	\$1.79	8	Complete,	Wood: glulam	Living Building	Design-Bid-Build
Powdermill Village	250 unit Affordable Housing Retrofit	240,000 sf / First Phase: 8,900 sf	\$3.00, First Phase: \$400,000	8	Testing retrofit strategies	Wood	30-40% energy savings	Design-Bid-Build / Design-Build
Champion Center	Athletics	56,500 sf	\$19.00	90	1: Sitework, Foundations 2: Steel	Steel	LEED Silver Min.	CM At Risk

Table 1: Project Distribution Spring 2014 Semester

Project	Type	Size	Budget (millions)	Firm Size	Phases Visited	Structure	Rating System	Delivery Method
Champion Center	Athletics	56,500 sf	\$19.00	90	1: Brick Cladding, Interiors 2: Curtain Wall, Interiors	Steel	LEED Silver Minimum	CM At Risk
Bechtel Environmental Center	Classroom	2500 sf	\$1.79	8	Complete,	Wood: glulam	Living Building	Design-Bid-Build
Plains Elementary School	Pre-K-2	63,400 sf	\$28.00	10	Sitework, Foundations, Steel Structure, CMU	Steel, CMU	LEED Silver Min.	Design-Bid-Build
Parson's Village	38 Unit Affordable Housing	32,430 sf	\$12.00	21	Sitework, Utilities, Foundations, Structure, Windows	Wood Frame with Roof Trusses	Zero net energy with PV's	Design-Bid-Build
Baystate Hospital of the Future South Wing & Pharmacy Relocation	Healthcare Fit-Out	70,500 sf + Pharmacy: 14,000sf	\$33.00 + \$5.5	150+	Interior Build-out, MEP, Millwork Mockups	Steel, Curtain wall, CMU	MA Stretch Code, Green Guide for Health Care	Integrated Project Delivery (IPD)

Table 2: Project Distribution Fall 2014 Semester

3.2. Analysis of Student Assignments

The primary assignment was to complete the Field Reports submitted following each site visit. Each Field Report comprised ten observations, with students required to submit five per semester. With fourteen students in the spring and twelve students in the fall, the Field Reports yield 1492 data points regarding how often "Issues that are Central to Practice" were explored and how these align with the "Recurring Themes" identified by the 2012 Practice Analysis. The total data points for each project varied as some students made multiple points per "Observation" while other students did not meet the requirements. (Table 3)

Observations necessarily interrelate. For the purposes of this study, a data point was logged in Constructability if the student paper was primarily discussing the construction detail and implementation, whereas it was logged in Sustainability if the student observation discussed the detail's impact on the energy performance of the project. Similarly, if the student observation concerned the way in which the architect implemented the work with respect to Construction Administration or issues of the project contract, that point

was logged in Project Management. A future paper will discuss the degree to which students were able to comprehend the interrelationship of these issues and their impact on design decisions.

Recurring Themes	Constructability - Structures, Systems, Materials, Methods	Constructability - Building Codes	Professional Conduct	Site Design	Project Management / Construction Administration	Role of Technology	Sustainability	Collaboration	Documentation	Design	Total
Integrative Learning Center (ILC)	71	12	0	3	6	0	7	10	11	0	120
Football Performance Center & Pressbox	102	27	0	3	16	0	0	0	0	0	148
Bechtel Environmental Center (2 visits)	165	7	6	35	3	0	92	0	10	0	318
Powdermill Village	84	0	41	0	17	0	6	4	25	0	177
Champion Center (2 visits)	164	3	0	6	70	5	20	2	3	0	273
Plains Elementary School	98	0	0	5	18	0	9	5	0	11	146
Parson's Village	90	9	2	13	20	0	8	0	1	0	143
Baystate Hospital of the Future	102	0	0	0	32	6	0	14	0	13	167
Total Observations	876	58	49	65	182	11	142	35	50	24	1492

Table 3: Distribution of 2012 NCARB Practice Analysis Recurring Themes Exhibited in Field Reports

3.3. Analysis of Student Survey

Additional data is extracted from a survey conducted at the conclusion of the Fall 2014 course. Students were asked to indicate 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 employed questions with language adopted from the 2012 Practice Analysis.

4.0 FINDINGS

The tables describing Project Distribution, the analysis of data points extracted from student Field Reports, and the results from student surveys describe a course with a robust diversity of project types and budgets, construction materials and methods, sustainability targets, and project delivery methods. Additionally, meeting with a broad variety of non-faculty practitioners enabled students to discuss myriad issues relating to professional conduct, ethics and the architect's role from project inception through construction, and maintenance. The non-faculty practitioners ably articulated issues identified in 2012 NCARB Practice Analysis that applied to their projects and professional practice. The student's Field Reports demonstrated that these complex topics were made accessible to them.

Given the stated emphasis of the course, it is not surprising that the overwhelming number of data points logged from student Field Reports (58%) concerned Constructability, particularly building structures, systems, materials, and methods. Another 4% concerned with Constructability relating to Building Codes. In their comments, students noted how the course changed their thinking about the relationship between design intent and constructability, particularly the level of technical expertise required to take a concept they might include in a studio project through detailing and construction, such as the thickened roof plane at the Champions Center.

Students cited Project Management 12% of the time in their student observations and indicated in their survey that they gained an understanding of various project delivery methods as the implications of the delivery method was discussed in context on every site visit. Student observations specifically referenced Sustainability issues 9.5% of the time. The NCARB Practice Analysis separates out Sustainability as an

“Issue.” However, in the projects studied, Sustainability was inseparable from Constructability. Many of the details students observed were discussed in relationship to achieving energy performance targets. Student survey comments addressed how the course changed their understanding regarding the ways in which these performance targets influenced design decisions. They also noted how much they learned about the role of site planning and design in achieving these targets; site issues were discussed in 4% of the Field Reports. While student Field Report observations addressed Professional Conduct and Collaboration issues less overtly, the survey comments indicated that they had a greater understanding of the variety of architects’ collaborators and the necessity for collaborative skills in a professional setting.

The students brought an encouraging level of integration to their observations, and they developed increasing sophistication and understanding over the course of each semester. At the beginning of the semester, when arriving at their first site visit, students were often perplexed by the sheer amount of unfamiliar materials and infrastructure that they were seeing and experiencing. Similarly, they were overwhelmed at first by the complexity of a 100+ page construction document set. However, as the semester progressed, students were able to more easily identify what they were seeing onsite, ask targeted questions and make connections between projects. This familiarity is confirmed by responses to the survey.

4.1. Discussion: Logistical Challenges

There remain logistical challenges to providing sufficient diversity of project and construction types, project issues, and professional roles as well as sufficient opportunity to see projects at varying stages of construction. The University’s \$500 million construction plan should provide a steady base for sampling construction. While this was true for the Spring 2014 semester, it did not similarly unfold for the Fall 2014 semester, as there was only one active building project on campus.

The cyclical nature of the architecture and construction industry provides additional challenges. Some projects scheduled for visits in the spring did not start until the fall due to financing. Sourcing diversity of construction stages is particularly challenging; despite course planning efforts, delayed construction schedules might yield a semester when all the projects are roughly in the same stage of construction. Local weather and construction work hours are also factors; snow days affect highly choreographed field trips, early darkness renders it difficult to move safely on a construction site. However, lessons learned these first two semesters make the author optimistic about crafting diverse project samples in the future.

5.0 BROADER IMPACTS

NCARB is poised to overhaul the Intern Development Program (IDP) in 2015-2016. The changes are designed to make the process more efficient, less focused on minutia, and more focused on capturing the “big picture” of the great variety of activities, building types, practice types, and projects that comprise contemporary practice. (Serfass 2014) Precisely how these shifts impact the potential for licensure upon graduation is currently being studied.

Currently, under IDP, interns may accrue 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. The Voices from the Field course meets all the NCARB expectations for such an experience.

However, at present, students cannot simultaneously obtain academic credit hours and IDP hours, as NAAB student performance criteria must be met by for-credit courses while IDP hours cannot be met by these same credit-bearing courses. As the academy analyzes curricula to be positioned to graduate licensed or nearly-licensed architects, this policy will need to be addressed. In the not-too-distant future, the Voices course, for example, might offer three credit hours and the possibility of ten to fifteen core IDP hours.

This has multiple implications for the curriculum and raises questions that directly address this conference’s themes. Will an emphasis on creating a path for licensure upon graduation produce a two-tier system of courses, with some bearing IDP hours and others not? IDP core hours necessarily bear a direct relationship to the knowledge, skills and tasks required to practice in “today’s marketplace” as identified in the Practice Analysis. (Serfass 2014)

Would such a system deter the more speculative courses that have the potential to advance the field in currently unforeseen ways? The germs of future practice may reside in experimental studies conducted in the academy. Would courses that do not appear to be applicable to *today’s* marketplace, but rather, to tomorrow’s, wither as students concentrate on the most expedient path to licensure?

CONCLUSION

The Voices from the Field course successfully tested a pedagogical model for integrating issues central to architectural practice in academic architectural curricula. Based on an evaluation of the projects studied and an analysis of student assignments and survey responses, this model forms an effective vehicle for understanding the myriad issues that comprise contemporary architectural design decision-making and project delivery. As such, its experiential, field-based format offers one approach to consider as the academy looks for models that will navigate design and construction, theory and practice. As this conference's manifold themes illustrate, design is advancing in the academy and in the field, through practice and through research. Positioning students in the field while they are still in school introduces them to the challenges of emerging practice issues as they are unfolding and enables students to engage these issues while they are tested on active projects.

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ENDNOTES

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