VEHICLES OF EXCHANGE AND CHANGE: THE ROLE OF THE STUDENT IN PROMOTING A CULTURE OF RESEARCH IN THE PROFESSION

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In 2008, under a Research for Practice (RFP) grant from the American Institute of Architects (AIA), I developed and evaluated a model for incorporating research into architectural education intended to prepare students and practitioners for the growing trend in *evidence-based design*. Through the design of a "preceptorship program" and a semester-long pilot study, I addressed the question: "How can academic research performed by undergraduates benefit both the undergraduate student and a practitioner?" The "preceptorship program" paired a student with an academic mentor and a practicing design professional in order to structure a research partnership which was innovative, collaborative, publishable, and carried knowledge from "benchtop to bedside" (Banasiak, 2009).

As a result of this RFP opportunity and the preceptorship pilot study, two parallel strands of research have emerged, one developing and testing a more robust model for integrating research into the undergraduate curriculum, and the other addressing how to facilitate access to, and management of, research evidence by practitioners. This essay will discuss how results gleaned in the original RFP project have been shared with architectural practitioners and educators, and how those interactions have informed current and future research trajectories in the undergraduate education and research visualization arenas.

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1. Updated Outcomes and Applications

1.1 Preceptorship Program: Pilot Study Outcomes

The preceptorship program model (Figure 1) was designed as a research-intensive elective course for advanced undergraduate students interested in making connections between education and practice by structuring a research project in collaboration with a preceptor practitioner, such that practice was both the driver and beneficiary of the research. A sequential three stage process to be completed over the course of two semesters was implemented in which students learned to access and understand scientific manuscripts and research findings, learned quantitative and qualitative research processes and methods, and engaged in investigative research.

Figure 1: 'Preceptorship Program', *Undergraduate elective, University of Colorado*
Purpose: to develop and test a framework for establishing an undergraduate research model which produces and exchanges knowledge between academia and practice

During the 2008 pilot study, four students completed the first semester requirement, developing an experimental design. The work of these students was displayed in a poster exhibit at the AIAS 2009 Forum. In conjunction with the AIAS Forum, a special session on "Research in Architecture" was held which invited students, faculty, practitioners, and AIAS attendees to learn about and discuss the benefits of research in practice, research in architectural education, and transferring research lessons from academia to practice. Dr. Mike Martin, FAIA was the guest speaker at this session, sharing his work on the study of practice, collaborative design, and storytelling as a means of knowledge transfer. Session participants were eligible to receive CEU and IDP credit. This AIAS Forum provided a vehicle for celebrating the work of the research students and for recruiting interest and involvement among practitioners and students. In planning the AIAS Forum session on research, the conference organizers and I discussed implementing a juried research poster exhibit at future AIAS meetings to provide an opportunity for students around the country to showcase their original design-related research work.

Of the four students who completed the first semester, one student went on to execute the research over the course of a year. This student was the recipient of an Undergraduate Research Opportunities Program (UROP) grant, and submitted a report of results for publication to the University of Colorado Honors Journal. While this example serves to support the preceptorship program viability and outcomes, it is projected that the program as developed for the pilot study is most sustainable as a model for independent study, especially appropriate for students wanting to pursue doctoral study, rather than as a course in general design education on account of the time and resources necessary to support multiple research projects simultaneously. Feedback from the three students who elected not to complete the research after having developed the experimental design is being addressed in current work on research integration in the curriculum. These three students cited that the research project, being time-intensive, competed with design studio time obligations, and that the research, while situated in a real-world project, was too far removed from direct application, and therefore not as "fun" as design studio (cf Section 3.1).

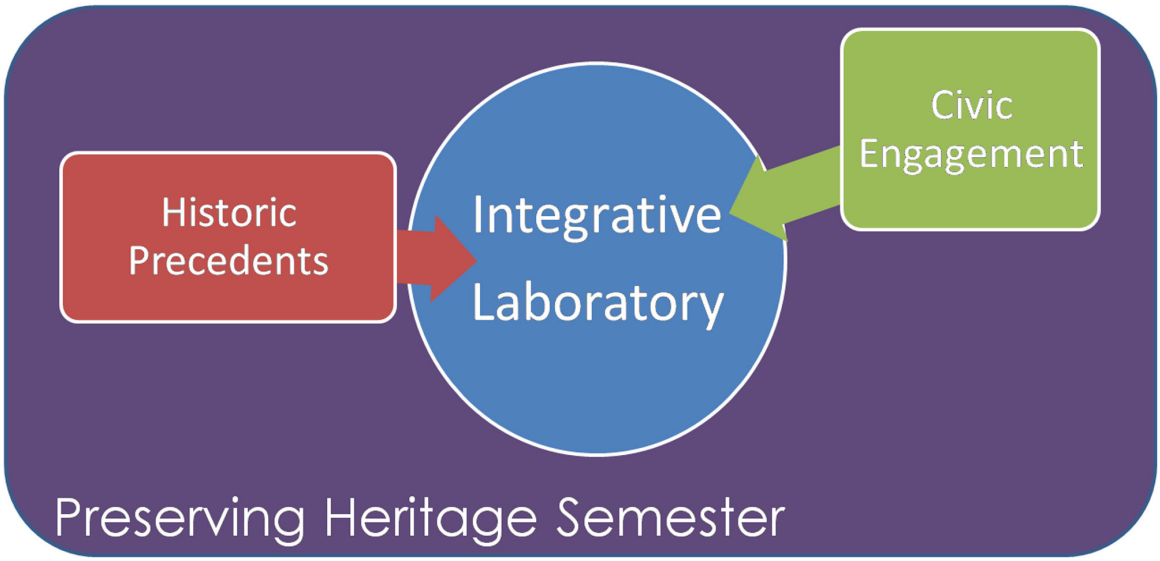

Figure 2: Environmental Design Integrated Curriculum Model, *University of Colorado Boulder*

1.2 Research Integration in the Undergraduate Curriculum

At the core of this study is the recognition that there exists an emerging evidence-based design culture: clients are increasingly demanding evidence-based design for their capital assets, and acknowledging that research is adding value to design. In response to this call, our profession may be *evolutionary* about this change and hand over its management to research specialists, or may be *revolutionary* about the change so that we create opportunities for practitioners to manage a new culture of participation in the formation of research-based knowledge. Ultimately, these efforts will enhance, not replace, our work force. This revolutionary change needs to begin at the very onset of design thinking, in undergraduate education, not merely in elective courses and independent studies, but rather by being integrated into the current architectural curricula so that research opportunities collaborate, not compete, with design studios. Outcomes from the preceptorship program pilot study confirmed that there is not room in the current curriculum model to allow for research courses separate from studios and core classes. Analogous to practice, many architectural firms with research departments are not structuring research services as a separate business entity, but rather are integrating the services so that the research question always originates from the built environment.

Over the past two years, the University of Colorado has been developing an integrated undergraduate curriculum proposal which launched in fall semester 2009. The curriculum design was the outcome of an intensely collaborative process among the entire faculty. In this model, design studios integrate knowledge from coordinated seminars into design projects (Figure 2: “preserving heritage” semester). In terms of learning outcomes, students are exposed to a variety of research methods among the varying thematic semesters, and in a final semester have the option of completing a senior capstone research project. This integrative model proposes an approach to research and design that is mutualistic and synergistic, and more aligned with practice models. As a member of the undergraduate curriculum committee, I was integrally involved in the curriculum design, and as a faculty member teaching a first year required lecture course, I am among those tasked with providing projects and processes for implementing the integration between lecture and studio courses.

2. Defining Research in Architecture: Toward a More Rigorous Research Model

2.1 Definitions and Learning Outcomes

In March 2009, I was invited to serve on the Architectural Research Centers Consortium (ARCC) "Research Session: Research in the Design Studio" panel at the Association of Collegiate Schools of Architecture (ACSA) Annual Meeting. As part of this panel, I presented the integrated undergraduate curriculum model, supported by a definition of research and learning outcomes which address the research aspects of design thinking. Moving from a form-centric to a performance-based strategy for design requires negotiating a balance between the rigor of academic-based research and the relevance of applied research. The goal is to preserve the positive attributes and mitigate the cons of both ends of the spectrum. Thus, in terms of learning outcomes for a performance based design education, a student should be able to:

- **Access Research**: (beyond Wikipedia and 'Googling') A student should know how to search and access research manuscripts and scientific journals, and should be able to distinguish between more and less robust studies in research design and methods.

- **Understand and Synthesize Transdisciplinary Research:**
  The student needs to understand terminology and synthesize information, and compare/contrast relevant studies.

- **Perform Research:**
  Students should have the skills to engage in novel and independent research projects, of an appropriate scope, whose questions are rooted in and arise from practice.

- **Apply Research to Design:**
  Students must demonstrate the ability to apply findings from research investigation to a design context with the result that the design performance is improved by the evidence provided.

2.2 Case Study: Social-Technical Tools for Collaborative Sensemaking and Sketching

As an example of applied research in a course context involving collaborative and transdiciplinary investigation, my "Computer Graphics Applications" class participated in a research study to inform the design of technology and software tools under development by my computer science colleagues Jim Sullivan and Chris Messick. The goal for the software tools was to support simultaneous sketching, diagramming, and annotation within the same work space by multiple participants working collectively, without traditional bottlenecks of "turn taking" by passing a single pen. In this class study, twenty-one architecture students participated in an evaluation of the tool and software (Figure 3) so that both the student users and computer science designers could understand how the prototype application and interface support collaborative sensemaking and pre-design processes within an architecture design group, and identify potential improvements for the prototype application and interface. Data from class outputs and student surveys were aggregated and analyzed to identify refinements in the technologies and the design problem. Results from this exercise were presented at the Human-Computer Interaction (HCI) International 2009 Conference, and published in the conference proceedings (Sullivan et al, 2009). This example, while not addressing all of the aforementioned learning outcomes, does provide a successful case study for how a research experience can be integrated into design courses in order to expose students to the foremost the value of research and experimentation in design, and the methods and techniques utilized in an investigative study.

Figure 3: A student design team sketching in an evaluative study with FireFly and Sketchbook prototypes on a large display screen.

3: Current and Future Projections

3.1 The Fun Factor: Developing and Evaluating a Process for Integrating Research in the Design Studio

As previously noted, results from the pilot study suggested that future iterations of a preceptorship model need to address how to retain students' interest in research by making the research more "fun". Lack of a "fun factor", i.e. that research is not as fun as design, was the major critique which students who participated in the pilot study project reported, and the reason they cited for not committing to a second semester in the preceptorship program. In December 2009, I was accepted in the 2010 the University of Colorado's President's Teaching and Learning Collaborative (PTLC) program in order to address this question, specifically: "How can design research be made more 'fun' itself, and by directly incorporating research with studio work?". The PTLC is a program, "modeled on the Carnegie Foundation's national work on the Scholarship of Teaching and Learning" (Regents of the University of Colorado, 2009) which provides mentorship and support resources in order to structure and evaluate scholarly projects on teaching and learning.

Over the next year, this study will 1) review the educational and psychology literature on attitudinal studies for assessing "fun" in a learning environment, and collect case study research on existing evidence based design studios, 2) develop a performance based design studio/ seminar, and 3) assess outcomes through the quality of work produced compared with traditional studios, knowledge gains measured through pre and post assessment tests, and attitudinal studies assessing "fun" collected through surveys and interviews of the students. It is assumed that this project will further inform the preceptorship program and integrative curriculum model with specific strategies for integrating research and design in order to support a performance based design in architectural education.

3.2 Architecture Database 3-D: Enhancing Accessibility and Management of Research in Practice

In parallel with efforts integrating research in the design curriculum, I have maintained a research interest in examining how to facilitate access to and management of research evidence by practitioners. Survey and interview data collected during the RFP study suggested that the conventional design process does not currently facilitate research-based activities (accessing, assessing, integrating, and knowledge-sharing), and many architects report difficulty in accessing and integrating empirical evidence into design activities. As such, new tools and methods need to be developed to make existing and future research more useful and meaningful to practitioners. It is hypothesized that spatial and volumetric research findings are not currently conveyed in a format that is useful and meaningful to designers. Thus, research involving collaborations with computer science and cognitive science experts is currently being structured to develop a web-based 3-D volumetric database which models dynamic data in a manner that supports designers' and related stakeholders' ability to visualize research evidence, to compare different types of data within a single building, and to compare similar data among different buildings.

4. Completing the Feedback Loop: the Response from Practice

Over the next year, results published by the student who completed the preceptorship project will be shared with her architect preceptor's firm and the building client. Feedback from the practitioners contacted during the RFP study about preceptorship opportunities indicates that this type of publication product could be considered effective marketing material in today's knowledge economy for prospective clients by serving as evidence of a commitment to performance-based design and community engagement. Since the pilot study, several faculty and practitioners have contacted me inquiring how to be involved in the research initiative between students and practitioners. This increased awareness, interest and application potential support a future viability for the preceptorship model. Building case studies are currently being sought among the practice community for a collaborative study in developing a 3-D research visualization prototype which would support the creation of information access and management for a shared database platform.

References

1. Banasiak, M. "From Benchtop to Bedside: Exchanging research lessons learned in an undergraduate program". *American Institute of Architects 2008 RFP Report.* <www.aia.org/aiaucmp/groups/aia/documents/pdf/aiab081526.pdf>

2. Regents of the University of Colorado. 2009. The President's Scholars Teaching Program. <http://www.colorado.edu/ptsp/ptlc/PTLCCall2010.html> Accessed 16 December 2009.

3. Sullivan, J., Banasiak, M., Messick, C. and Rimey, R. (2009). "Social-technical tools for sensemaking and sketching", Human-Computer Interaction (HCI) International 2009 Conference Proceedings, Springer.