2023 Annual Conference & Exposition

Baltimore Convention Center, MD | June 25 - 28, 2023

The Harbor of Engineering
Education for 130 Years

ASEE

Paper ID #36882

Combining Evidence-Based Practices with Technology to Enhance an Architectural Technology Design Studio

Prof. Darrell D. Nickolson, Indiana University - Purdue University Indianapolis

Darrell Nickolson serves as an Associate Professor at the Purdue School of Engineering and Technology on the Indianapolis campus and also is a member of the design team at Curran Architecture. Professor Nickolson teachers Architectural Technology, Interior Design, and BIM coursework, and he leads students in community-based experiential learning design projects and most recently solar energy research.

Kelly Scholl, Indiana University-Bloomington

Combining Evidence-Based Practices with Technology to Enhance an Architectural Technology Design Studio

Abstract

This paper describes beta testing of an interactive classroom space for an Architectural Technology course focused on Wood Framed Construction. To enhance the Scholarship of Teaching and Learning (SoTL), we will be utilizing a newly constructed lab on the Indiana University Purdue University Indianapolis (IUPUI) campus called the Active Learning Classroom of Valuable Experiences (ALCOVE) that looks to create a stronger working partnership between students, faculty, and classroom designers.

Understanding the difference between **Scholarly Teaching** and **SoTL Research**, is critical in assessing a project like this. In their article *Using Assessment and SoTL to Enhance Student Learning,* K. Laurie Dickson, Melinda M. Treml expand on the intrinsic difference between the two strategies. They explain Scholarly Teaching as one's observation of student learning and behavior while implementing new teaching strategies, while SoTL Research collects, analyzes, and interprets data, as explained in the graphic below.
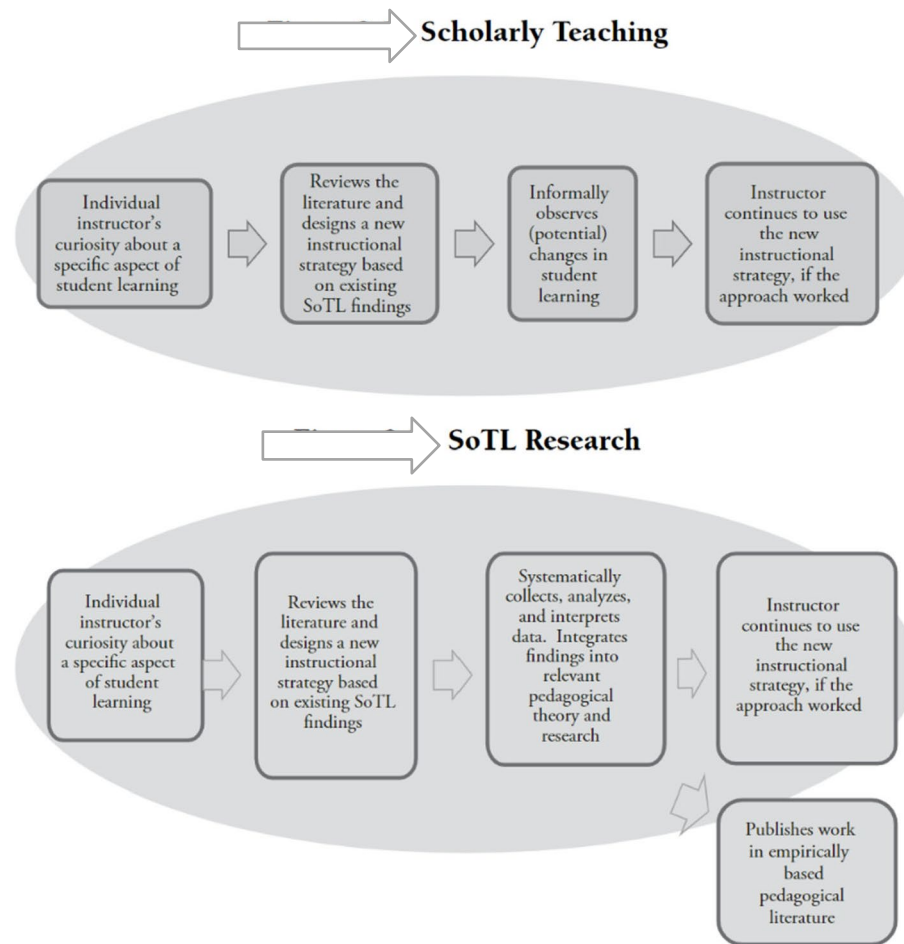
Figure 1.0 Scholarly Teaching vs SoTL

Effective scholarly teaching is difficult to assess, particularly so in design studio-based courses because outcomes may not always be based on project success, but instead feasibility of design

approach. This teaching methodology is informal in nature and doesn't really get to the heart of what worked and why did it work in terms of classroom instruction. Secondarily there is not closing of the loop to circle back around and test a theory more than once. This even more emphasizes the importance of content delivery and early by-in by students to be active participants in the classroom environment. The scholarship of teaching and learning (SoTL) however, requires a more in-depth investigation into collecting and analyzing the data, and in the case of this particular project we have gone through multiple semesters of utilizing the classroom with four different student groups of varying academic rank from freshman through senior. This project looks at ways that technology can help create rigorous forms of discussion and inquiry, as well as creative ways to disseminate information from faculty to student and student to student. We also incorporate Evidence Based Design practices, with the technology available to share real-time information in groups/teams to effectively create design solutions in a relatively short time frame.

From the classroom design perspective, the design process traditionally seeks out the best technologies to build advanced active learning classrooms that meet the needs of all students and instructors. Post occupancy surveys are given to learn what works, and what hinders, learning in the space. With the ALCOVE, we are flipping the process around and building one room that will continually serve as a proving ground for future classroom technologies. Rather than a one-time test or scheduling a demonstration, we continually build our relationship with instructors and students throughout an entire academic year to truly understand the aspects of the room we want to build out in other spaces across all our campuses.

Keywords
Interactive learning, learning management system, student engagement, evidence-based design.

Interactive Learning
The ALCOVE, while still in its infancy stage as a teaching & learning space is well on its way to setting a new standard in the Indiana University system. Initially installed on the Bloomington Campus as a one-of-a-kind teaching space, the idea quickly grew into a model for duplication on other XX campuses. Whereas learning environment have typically referred to pedagogical design as well as cognitive and emotional space (including the online environment), recently, the field is beginning to acknowledge and research the role of physical space in educational settings (Vercellotti 2018). Creating a space where the center of attention is not the traditional lectern and the professor at the front of the classroom, but instead with a mobile device such as a tablet the professor can matriculate through the classroom and interact with the students. VIA, the software application utilized in the space, has had mixed responses from students thus far, mostly due to the learning curve that comes with new technology. The software allows for both faculty and students to share information in large and small groups simultaneously.

Increasing student engagement was and is still one of the major on-going initiatives at Indiana University, and this new space is helping to do that. Interestingly, many of our studio workspaces for the Interior Design and Architectural Technology students are located in parts of the building that don't have windows. This new collaborative classroom has one oversized window, and the feedback was clear that it makes a huge difference, as some of the early survey feedback centered around the uniqueness of being in a classroom space with natural light. We

now know that natural light impacts the working and learning environment in many ways, "Lighting in the classrooms has been the subject of many studies for over a century. In recent years, special attention has been given to the impact of natural light on learning as light has physiological, psychological, and behavioral influences" (N. Shishegar, M. Boubekri 2016).

Learning Management System

Currently the learning management system utilized at Indiana University is Canvas, and the tool allows for lots of information sharing and content storage. The Modules and Pages tools were most effective with our classroom dynamics. The interactive digital camera made using the dry-erase board most effective. Still doing a large volume of sketching during lecture to describe building sciences, I was able to take real-time photos and quickly upload them to Pages (See image 2.0 & 2.1)
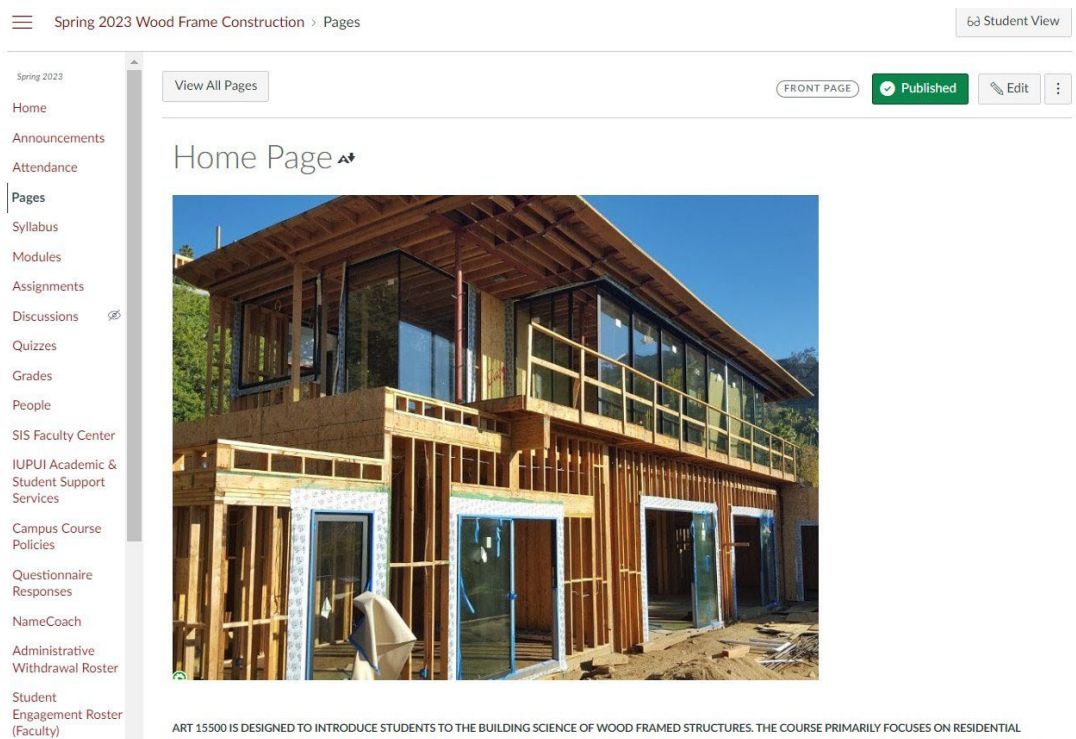
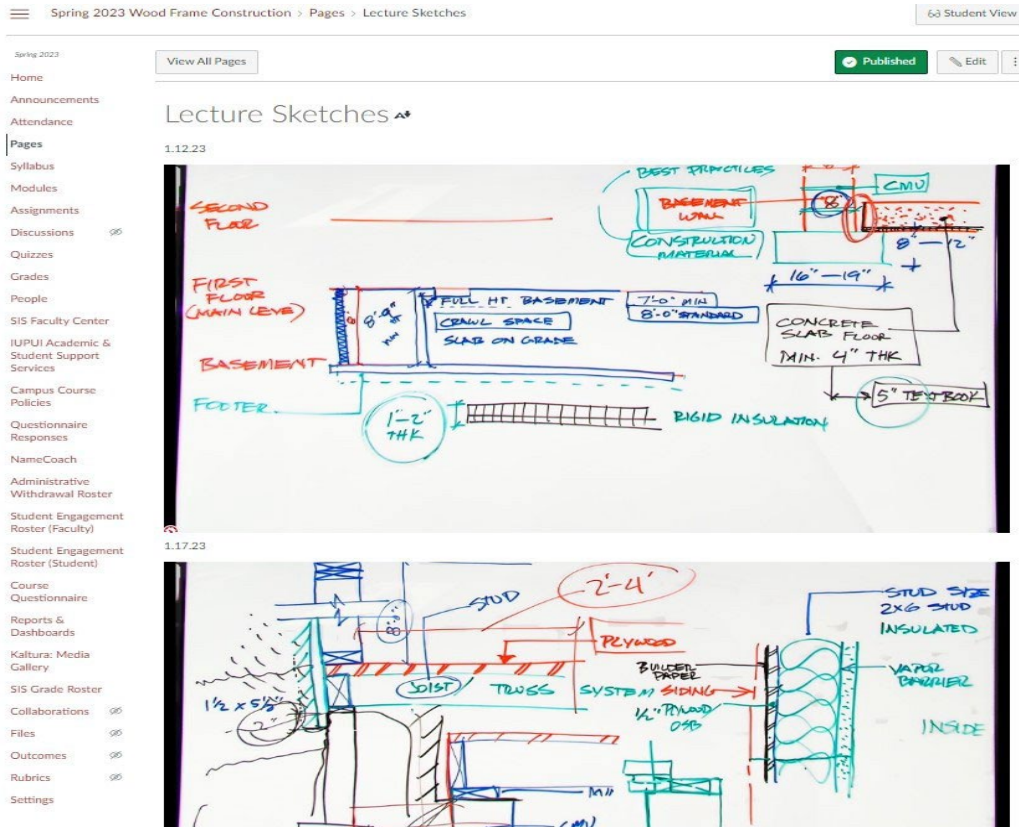

Figure 2.0 Canvas Student Facing Screen Interface

Figure 2.1 Canvas Student Facing Screen Interface

Also, the digital cloud whiteboard allowed for ongoing lecture and discussion as we are able to add to incomplete lecture from one meeting time to another (see image 3.0). Utilizing the canvas tool to link my google whiteboard we could have ongoing lecture discussion and the students could also add to the sketchpad if questions came up in-between classes.

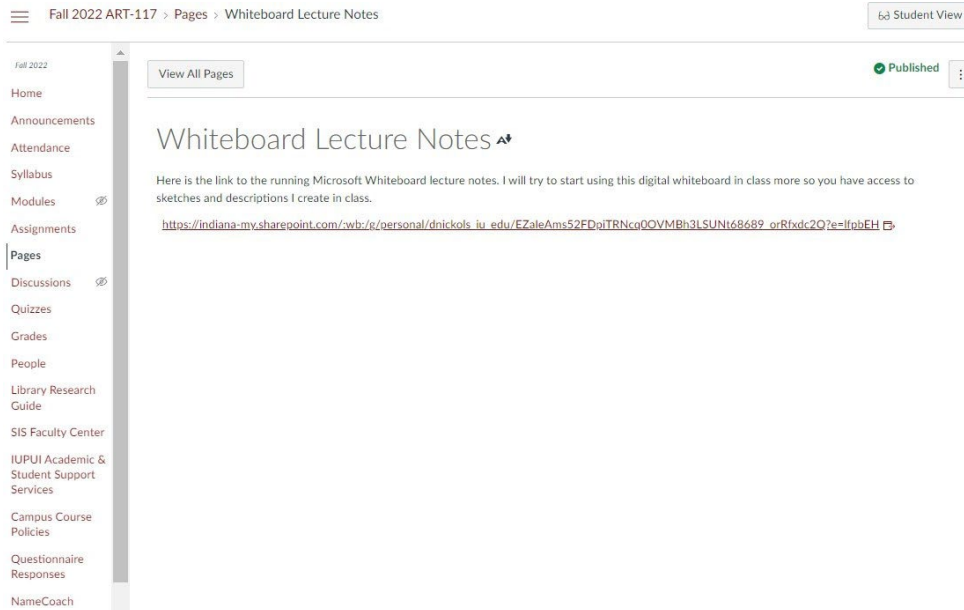**Figure 3.0 Canvas Student Facing Screen Interface**

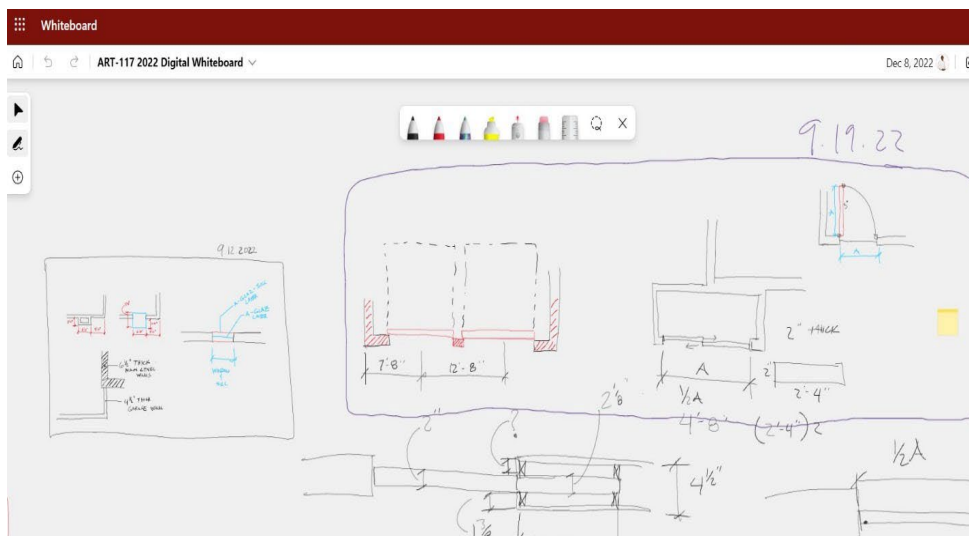**Figure 3.1 Canvas Student Facing Screen Interface**

Figure 3.2 Canvas Student Facing Screen Interface

Student Engagement

The use of this ALCOVE classroom was a competitive application and selection process conducted by the Learning Spaces department on our campus, in which their "goal is to create a mosaic of active learning spaces to support a variety of pedagogical strategies". Their team of pedagogy experts and IT technicians work with the selected faculty individually and in some group activities to assess our use of the space to ensure we are maximizing its potential. Teaching in an architectural design studio classroom style requires the ability to function both in teams and/or pods of students collaborating to generate creative solutions to vertical structure problems and space use issues. Physically putting students in pods where they face each other means being comfortable with some students having their backs to the lecture position or what

we traditionally think of when we say front of classroom, see image 4.0. However, with the mobile tablet the instructor can matriculate through the classroom, while still controlling what's happening on the screen. This is very convenient when navigating a site, or discussing a design concept, but becomes a bit more challenging when demonstrating CAD or Revit software applications.

Figure 4.0 ALCOVE Classroom Photo

Evidence Based Design
Evidence Based Design (EBD) was originally developed to assist in the design and development of health care environments, but the architectural community quickly realized that this research-based approach to solving any design problem would result in a design that had a longer positive impact on the end-user. This approach helped do away with the idea that the architect singularly developed the idea with no input from others and helped pave the way for a more collaborative approach to the entire design idea. Building on that collaborative and research-based approach to design, this interactive classroom space helped to promote sharing of the information first in the pods setup, and then sharing out of the information to the classroom as a whole. Utilizing the multiple screens in the classroom we could have up to six different items displaying at the same time, for digital poster sessions, breakout discussion groups, design critiques, peer reviews, etc. We have utilized this space for all these activities during our time in the ALCOVE, and the

results have been very encouraging in terms of level of participation and depth & breath of discussions. Image 5.0 demonstrates the overall concept of EBD.
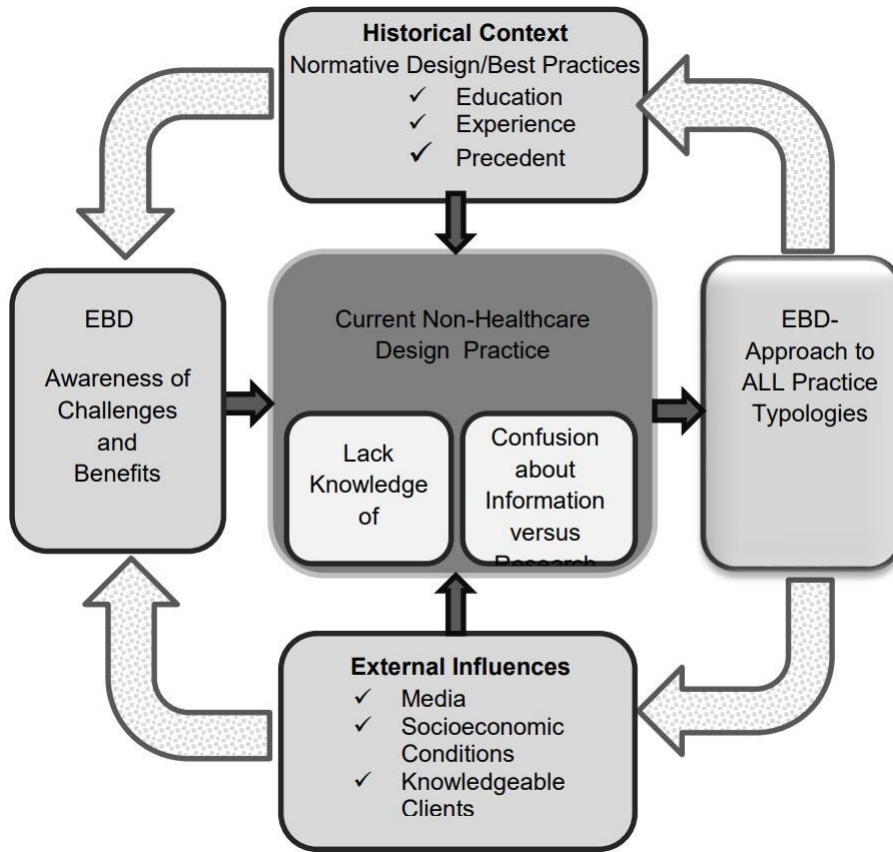
Figure 5.0 Evidence Based Design Flow Chart

Evidence Based Design is a perfect inclusion in the classroom because it results in design students having fact-based approaches. "EBD is a relevant, useful tool for providing evidence that positively affects design decisions" (Codinhoto, Aouad, Kagioglou, Tzortzopoulos, & Cooper 2009). Having the means to generate detailed face-to-face team discussions with the technology to share screens into a larger group has proven to be invaluable, especially for the freshman and sophomore level courses.

References:

K. Laurie Dickson, Melinda M. Treml. 2013. *Using Assessment and SoTL to Enhance Student Learning*

Bass, R. 1999. "The Scholarship of Teaching: What's the Problem?" Inventio: Creative Thinking About Learning and Teaching

(1) Vercellotti, M. L. (2018). Do interactive learning spaces increase student achievement? A comparison of classroom context. *Active Learning in Higher Education*, *19*(3), 197-210.

(2) Yang, Z., Becerik-Gerber, B., & Mino, L. (2013). A study on student perceptions of higher education classrooms: Impact of classroom attributes on student satisfaction and performance. *Building and environment*, *70*, 171-188.

(3) Murillo-Zamorano, L. R., Sánchez, J. Á. L., & Godoy-Caballero, A. L. (2019). How the flipped classroom affects knowledge, skills, and engagement in higher education: Effects on students' satisfaction. *Computers & Education*, *141*, 103608.

(4) Clinton, V., & Wilson, N. (2019). More than chalkboards: Classroom spaces and collaborative learning attitudes. *Learning Environments Research*, *22*, 325-344.

(5) Park, E. L., & Choi, B. K. (2014). Transformation of classroom spaces: Traditional versus active learning classroom in colleges. *Higher Education*, *68*, 749-771.

(6) Chang, R. L., Stern, L., Sondergaard, H., & Hadgraft, R. (2009, January). Places for learning engineering: A preliminary report on informal learning spaces. In *Proceedings of the Research in Engineering Education Symposium, Palm Cove, QLD. Retrieved December* (Vol. 12, p. 2009).

(7) Whittaker, C., & Charles, E. S. (2020). Flipping out–reflections on ten years of development, innovation and design in technology-rich collaborative learning spaces and active learning pedagogical capacity building. *Proceedings of the Canadian Engineering Education Association (CEEA)*.

Shishegar, N., & Boubekri, M. (2016, April). Natural light and productivity: Analyzing the impacts of daylighting on students' and workers' health and alertness. In *Proceedings of the International Conference on "health, Biological and life science"(HBLS-16), Istanbul, Turkey* (pp. 18-19).

Codinhoto, R., Aouad, G., Kagioglou, M., Tzortzopoulos, P., & Cooper, R. (2009). Evidence-based design of health care facilities. Journal of health services research & policy, 14(4), 194-196.