

# Digital Teaching Tools and Their Impact on Student Learning in Large Design Courses

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Effectively delivering instruction to students in large-size classes (over 35 students) is an increasingly common but difficult pedagogic proposition (Benton & Pallett 2013). The learning environment associated with large groups often increases distractions, decreases engagement, and makes focusing on the present nearly impossible. Teaching and learning in large-size classes is a developing trend at many schools. This trend is shaped by factors like funding, enrollment management, and space availability. As such, there is an increasing need for taking time to experiment with and explore new instructional strategies for large-size classes and studios (over 15 students) in beginning design education. Regardless of why class sizes may be increasing, there is a reality faced by those who teach these classes that a large-size class of students frames pedagogy in a way that makes achieving course learning outcomes through typical approaches more challenging.

The learning environment associated with teaching large groups can be challenging. However, there is an increasing body of knowledge at the intersection of how today's students actually learn and teaching methodologies for large-size classes. The research in this area is highly informative for beginning design educators that teach classes with more than 35 students. For example, scholars such as Prince (2004) and Bonwell and Eison (1991) have studied how to keep students engaged when teaching to large groups. They recommend implementing active learning approaches that utilize student-centered learning principles (Kuh et. al. 2006). The use of active, student-centered learning is already a key feature of conventional studio pedagogy whereby learning occurs within a traditional small group studio environment (Powers 2016). However, the traditional focus of design education on small-size studios, one-on-one instruction, and desk critiques may have unknowingly marginalized pedagogy tailored for large-size classes. Various shifts in higher education are starting to suggest that large and very large (over 50 students) classes, even in design education and especially at beginning levels, may become more common in the near future (International Education Advisory Board 2008).

## STUDY PURPOSE

This study explores the relationship between large-size classes in beginning design and the pedagogic challenges and potential solutions associated with them. A key study construct is that the pedagogic challenges posed by large design classes cannot be addressed by conventional methods alone. Thus, design educators must begin to search for and re-search new instructional strategies for large-size classes and studios that optimize the learning environment while enhancing prospects for achieving learning outcomes. Simultaneously, generational differences amongst teachers and students highlights an increasing need for technology in the classroom according to the International Education Advisory Board (2008).

## STUDY THESIS

This study focuses on technology as a means to enhance active learning and support student-centered teaching. The goal of the study is to inform the development of new design pedagogy aimed at large-size classes in beginning design. The study's central thesis is that blended, active learning environments, made possible by new digital technologies, are effective at organizing, communicating, and engaging students in

large-size courses. An important belief underlying the study is that pedagogical methodologies should respond to how today's design students are most likely to learn rather than simply relying on what design educators have always done.

## STUDY OVERVIEW + PARTICIPANTS

This study examines the relationship between the delivery of instruction related to design skills, principles, and professional life and the use of blended, active learning environments that emphasize digital technologies. Additionally, the study probes the associations between different learning environments for large-size classes and new teaching methods. A case study of a freshman-level design course is used to collect data and explore the study's thesis.

The case study examines an "Introduction to Architecture" course at Clemson University during the Fall Semester 2017. The very large-size course involved 120 students, six graduate teaching assistants, and one professor. The course included lecture and studio components within a blended, active-learning environment. The course was a 3-credit hour lab totalling 6 contact hours per week. The course is split into a one-credit hour lecture and a two-credit hour studio.



Figure 1: ARCH 1010 class during a sketching session (Photo by Author).

All course materials including lectures, tutorials, assignment descriptions, and evaluation rubrics were moved to Canvas, an open source learning management system used by over 3,000 schools including Clemson University. Contact hours were spent on desk critiques, small group discussions, on-site sketching sessions, guest lectures, and other engaged and small group activities. The use of Canvas had several advantages that translated into new and additional pedagogic opportunities. For example, by putting course materials online, a significant amount of contact hours were saved and reallocated to guest lectures that were aimed at making connections between course assignments and the

profession.

## STUDY METHODS + ANALYSES

The case study is comprised of three research methods used in conjunction to collect data and understand study findings. The methods included: (1) observations, (2) interviews, and (3) questionnaires. For method one, the authors and graduate teaching assistants made routine observations that focused on signs of student engagement relative to specific teaching interventions. Observations were done regularly during the course and discussed afterwards by the authors and the assistants. The observations were recorded and themes developed using open-coding and content analysis techniques. Method two involved a series of interviews conducted at the end of the term with randomly selected student participants. The interviews were semi-structured and attempted to probe the student's perceptions of course materials, technologies, and pedagogic methods. Content analysis was used to analyse interview data. The third research method was a questionnaire given to all students. The questionnaire had 20 questions related to the course and

study. The completion rate was over 90%. Basic statistical procedures and content analysis were used to analyze the questionnaire data.

## STUDY FINDINGS + THEMES

Analyses of the observations, interviews, and questionnaires led to the identification of four themes. These themes are: (1) organization, (2) accessibility, (3) guest lectures, and (4) communication. The study's findings also have several implications on beginning design pedagogy, particularly in terms of technology. The study discusses three of the most significant implications including: (a) technology used in the course encouraged activity, (b) technology used in the course helped make delivery of content efficient and effective, and (c) technology used in the course was convenient and aligned with student interests. Overall, the study's themes and implications suggest that the blended learning environment was successful. In fact, over 88% of students felt that the large class size did not affect what they were able to learn in the course's lecture component and over 77% did not feel the large class size affected their ability to learn in the studio component.

### **Theme 1: Organization - Learning to Meet Deadlines**

Study findings indicate that Canvas visually communicated the structure of the course to student effectively. The students reported that via the Modules page, Assignments page, and Gradebook they were able to monitor their progress at any point during the course. Using technology to organize the course allowed the students to be prepared for assignments and the overall pace of the course more readily. Study participants reported that the online calendar feature, showing due dates and course activities, helped them to develop time management skills quicker and more effectively. As one student said, "I think the best thing about Canvas for architecture was the calendar option, and being able to see when stuff was assigned and when it was due. That really helped with personal organization" (Student 1: 12/14/17).



Figure 2: ARCH 1010 Canvas homescreen (Photo by Author).

### **Theme 2: Accessibility - Something for Everyone**

Accessibility, or the ability and ease at which a student can access course information, is an important challenge for students and professors alike. The study shows that the online learning environment adds an accessibility dimension to the course that the live class could not attain alone. Using Canvas allowed students to watch online lectures and to connect with key tools and resources. It also helped students self-regulate their learning, a key factor in problem-based learning (Powers 2016; Ormrod 2012). The study also suggests that online lectures were more accessible than live lectures because students can use a suite of online tools as needed to acquire the information they need to progress. Sixty percent of students thought having lectures available online was helpful and over 77% liked how the class blended traditional lectures/studio and the online course materials. One student stated, "It was a good balance between things. If you don't like heavy lectures, then you don't have that all the time. But if you did like learning online, you had it if you wanted it...I liked the desk crits. I think using every tool appealed to everybody and kept it really balanced. And to me it didn't feel like a class but more of just something I wanted to do" (Student 2: 12/15/17).

### **Theme 3: Guest Lectures - Discussions During Class**

By moving most of the course content online in the form of short videos, class time was freed up for more engaging, face-to-face activities. As previously mentioned, contact time was reallocated to guest lectures from practicing professionals and researchers at an advanced level in the field. These lectures offered a necessary and welcome addition to the class in that they connected the foundation course work with the life of a professional. Unlike other teaching approaches, the online component was key to the live lectures because the students only responsibility during guest lectures was to be an engaged listener. In fact, observation show that the class oftentimes ran long because the students had so many questions and discussions with the visiting lecturers. The questionnaire showed that over 73% of students benefited from the guest lectures and one student said, “Yes. Absolutely. That was honestly the most helpful part of the class. For me to be able to see what I can do in the design world was valuable. Seeing what we are working towards is always good” (Student 6: 12/14/17).



*Figure 3: Guest lecture during ARCH 1010 course (Photo by Author).*

### **Theme 4: Communication - Separated by a Screen**

Within blended learning environments it is imperative to have continuous and strategic communication with the students via email or the online learning platform. The connection between the online resources and the live classes comprises the main channels of communication. In the beginning of the course, the instructor sent several emails a week directing the students to the online resources and reminding them about course activities. As the semester went on, observations show the instructor needn't offer as much communication and student's were asking less questions about materials they could access online. The questionnaires and interviews show that the different forms of communication, especially in the beginning of the course, was effective in helping students navigate the blended learning environment. Nevertheless, some students noted that the online aspect of the course did create a perceived distance between student and teacher. As one student said, “Sometimes the communication was hard. Actually reaching out to the TA's or you. I didn't actually know how to send a message to the TA's and I felt distance since it was online” (Student 4: 12/15/17)

## **STUDY IMPLICATIONS**

The study has many different implications for beginning design education including the need for future studies in class-size and pedagogy. The next sections emphasize three implications of the study on teaching and technology.

### **Implication 1: Technology Encourages Activity**

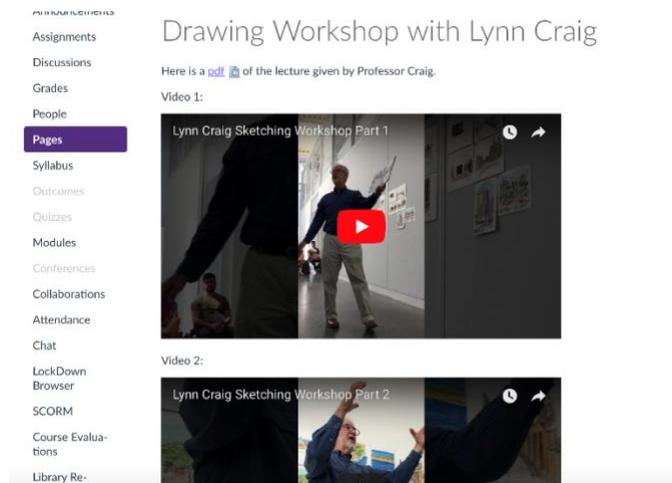
Study results suggest that the technologies tested in the case study are effective at helping students become active participants in their own learning. By offering multiple ways students can engage in the course topic, students choose the methods that are most effective for their learning. For instance, examples are given digitally as well as in the original format. Students are able to access these in a way that is suitable for them. Additionally, lectures are reviewed outside of class via the online learning platform. Students decide when, where, and how they review the material, which increases the probability that they will choose a time that is best for them. Over 82% of students felt that the ability to reference course content online helped them understand the course content better. And, over 63% thought websites like Canvas enrich learning and allow them to learn more.

### **Implication 2: Technology Makes Delivery Efficient and Effective**

The study indicates that the blended learning environment is more efficient in delivering coursework and more effective in generating meaning, relevance, and concept retention. Students are able to organize their learning by choosing times to review the online learning modules when it fits their schedule. They are more likely to choose a time that allows them to focus more effectively on the material. The lectures are also presented alongside the assignments on the online learning platform. This makes the lecture material and assignments closely related. Over 86% of students thought the ability to reference course content online helped them manage their time better. Lastly, the efficiency of the technology allowed instructors to reallocate time towards activities more suited to live, face-to-face interaction.

### **Implication 3: Technology is Convenient and Aligned with Student Interests**

The study's findings suggest that blended, active learning environments are more convenient because new, digital technologies are closely aligned with students' experiences and interests than older, more traditional methods. The new generation of students is accustomed to watching and listening to media via their computers and hand-held devices. By adapting these methods for course content, the class conforms to them and their preferred methods of communication. Over 91% of students thought the ability to reference course content online was convenient (Nilson 2010).



**Figure 4: Online lectures for ARCH 1010 (Photo by Author).**

## **RECOMMENDATIONS**

The study has led to five recommendations and pedagogical guidelines for instructors teaching large-size design courses.

### **1. Organized, Clear, and Accessible**

It is important that the course be thoroughly developed prior to the start of the term as the students can see the course organization online. Therefore, the quality of the content organization impacts their understanding of the class and learning process itself. When large-size courses are well organized, students have confidence in the learning process, which builds trust between the instructor and the class.

In this case study, while the organization did not change with the addition of the online learning environment, the students could finally see the course organization and they repeatedly commented upon it. This change resulted in more confidence in the instructor and the overall blended learning process. Student engagement increased and interaction was observed to be markedly higher than in previous years the course was taught without using Canvas.

### **2.Reinforce Learning/Engagement Options**

It is imperative to continue reinforcing the availability of online tools and resources regularly. Even though, most students are comfortable with the online platform, they need reminders and reassurances to use the tools. At times, this means sharing with students some learning strategies for how and when to use the online tools. This can take the form of directing students to different aspects of the online learning environment at strategic times during the course. This can be done during class activities and through class announcements and emails.

### **3.Keep the Live, Face-to-Face Class Fun and Inspiring**

Activities in class need to be engaging, fun, and inspiring. Anything that can be moved online should be, leaving class time to have discussions and engage in activities that are focused on interaction with students, guests, and instructors. Not only does this increase participation, but it is appreciated by the students as they come to understand that face-to-face time is special.

### **4.Separate Content Delivery**

Content must be kept separate. This means that teachers should not cover content that is available online during the face-to-face portion of the class. Likewise, one should not try too hard to re-cover content that was provided during the live class just to re-post online. If students know they do not have to pay attention during class because they can access the information online, then class will not be engaging. It is equally important that students be held accountable for reviewing the content offered online.

### **5.Regular Communication Blends Content**

Communication between teacher and students should be regular and timely when connecting the live and online content. This is because the instructor's regular communication provides the basis for clarifying different forms of content. Without this communication, the material will not be blended and will exist as separate course requirements. In order for students to make connections between content, the instructor must offer prompts about what, when, and how to engage the course.

## **CONCLUSION**

The study shows that the blended learning environment used in the case study was efficient in delivering coursework to a first year architecture course with a studio component. Students reported that the use of online technology to provide a significant amount of course content was more effective in generating meaning, relevance, and concept retention than a face-to-face delivery alone. Finally, the study's findings suggest that blended, active learning environments are more convenient because new digital technologies are closely aligned with students' experiences and interests than older, more traditional methods of providing design instruction.

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