Project Title:
High-Definition Screens for Architecture Studios:
Digital Media Pedagogy Integration

Proposers:
Shelby Doyle, Assistant Professor, Department of Architecture
Leslie Forehand, Lecturer, Department of Architecture
Nick Senske, Assistant Professor, Department of Architecture

Proposing Unit:
College of Design, Department of Architecture

Project Leader:
Nick Senske
(515) 294-8711 (office) | (402) 981-8758 (cell)
nsenske@iastate.edu
Project Method and Plan

Purpose

This project is a follow-up to a successful 2015-16 pilot program that improved and innovated architecture studio teaching through the use of portable high-definition screens in five selected architecture studios. This pilot program was made possible by $3,185 of funding from the ISU Computation Advisory Committee.

Surveyed responses to the screens were extremely positive, with the 100 impacted students reporting increased use of digital media, improved classroom experience, enhanced learning outcomes, and savings on printing costs. When presented with these findings in January 2017 the twenty-seven Department of Architecture faculty present voted unanimously to develop a second CAC program in response to the successes of the pilot. The requested funding of $17,412.93 will be used to purchase seventeen additional sets of screens and presentation accessories. This will provide one screen for each architecture studio and will impact every student in the Department of Architecture: 301 undergraduate students and 63 graduate students in addition to about 30 interdisciplinary students taught by Architecture faculty for a total of around 400 students impacted by these funds.

The architectural profession is continuously evolving in response to the latest technology. The pilot study demonstrated how the addition of high-definition screens supports the introduction digital technologies and visual communications skills as they are changing. With the proposed upgrades, other subjects such as history, theory, and building technology can be further integrated into design studio, increasing our teaching effectiveness and greatly improving our students’ learning experience. These upgrades will further impact student learning by allowing more faculty to introduce and experiment with instructional technology in their studios. Bringing a screen into every studio will help Iowa State University continue to lead among design programs through innovative curricula that engages with students through developing technologies.

The screens will be introduced in the Fall 2017 semester followed by a new evaluation and analysis of their impact upon curricula and student learning. This new study will utilize classroom observations, student surveys, and interviews to judge the impact of the screens on classroom culture and student learning outcomes. We will produce a new report on our findings which will be presented to the department and Dean of the College for the consideration of similar upgrades for other Colleges. Based upon the successful 2016 pilot, the Department Chair is prepared to provide additional funds for future purchases.
Impact on Student Experience

In order to be competitive and innovative future architects, it is imperative that Iowa State students develop a flexible skillset for communicating and designing across multiple media. Our 2016 pilot study demonstrated how movable high-definition screens enhanced student learning outcomes by increasing the range and sophistication of methods and media that students can learn and practice in their studios. We collected survey results from 89 architecture students across 4 years of the undergraduate program. 77% reported experimenting with different media as a result of the high-definition screens in their studio. In particular, 90% of students added video to their work and 68% added digital animations to their skillsets. Before the use of screens, this media was rarely used due to the inaccessibility of audiovisual equipment. Additionally, 47% of students used the screens outside of studio time to experiment and practice presentations; about a third of students (31.9%) used them at least once per day. Every student who responded to the question “did the screens improve your educational experience in studio” answered “yes.”

High-definition screens also impact student experience by reducing labor and material costs. One specific way high-definition accomplish this is by reducing printing needs: 71.3% of students reported that they printed less often and used fewer square feet of paper because they used the screens in studio to present their work. The average student estimate was a savings of $150 in printing costs over the semester. If we multiply this by an average of 15 students per studio section, this represents a reduction of $11,250 in financial burden achieved by the five studios over the pilot study. Additional screens will help alleviate the pressure on the College of Design Output Center to produce printing and plots, particularly during midterm and final reviews.

Screens also reduce the time spent by faculty and staff arranging for resources. Although the College of Design library and ITS has projectors available to borrow, these are in limited supply, must be reserved in advance, and most of the architecture studios do not have proper light levels or sufficient wall space to make use of them effectively. At the same time, the College has a limited number of spaces available for architecture faculty to present lectures, slideshows, and other materials to their studio classes. Lecturing to one’s class with a laptop presentation, for example, requires one to reserve a space in advance and then move the entire class to and from the room (or to another building) during the studio course. This is a considerable time expense, which discourages such supplemental activities.

Our students believe that screens would be a welcome addition: 94% of students surveyed agreed that there should be one in every architecture studio.

The pilot study found that students overwhelmingly supported the introduction of screens. The following is a selection of comments from the surveyed students:

\[\text{I believe that it has improved my education experience, because it has led us to more digital presentations, videos, animation usage. For reviews, less printing is needed to print out boards. The LCD screens allow us to present our boards for small gatherings to allow the image or presentation larger than on a computer screen.}\]

\[\text{It was much easier to present on a daily basis and share our work in an efficient and professional manner.}\]

\[\text{It helped us to all be able to see the work produced and be able to discuss and change in real time, which was instrumental in fine tuning our presentation for the Biennale}\]
They helped us in adding more than just printed boards to our presentations and also were helpful in gathering information to share with the whole of the studio.

I do not like printing documents to simply throw them away an hour later. This streamlines the presentation process and make the students more efficient within their presentations.

Tutorials on the screens were easier to go through.

The ability to use the screens allowed us to quickly visualize and update data and graphics without taking away time to reformat, reprint, and repin up information

Given the results of our pilot study, we are confident that the other architecture faculty will be able to take full advantage of this technology in the classroom. The requested funding for this new study will impact approximately 400 students, each with a minimum of 12 contact hours in studio per week and who work in studio 30-40 per week outside of class time.

Integration with Current University Infrastructure

This project is a continuation of an existing CAC-funded project. The three instructors who oversaw the pilot encountered no significant issues with security or use in the past semester. However, our study did find several upgrades which would make the screens easier to operate in the studio. One change to the previous specifications will be to use combination locks instead of keyed locks. In practice, we found that the small keys were difficult to distinguish, easy to misplace, and made coordination between faculty difficult. Locking the screens to fixed infrastructure (such as desks) with cables worked very well, so we see no need to install security bars and have removed them from the proposal. The Kensington systems were adequate (if a bit large) for securing the Chromecasts. We have added a flexible security cable to help secure the TV remotes, which were also frequently misplaced. With respect to the HDMI cables, we were surprised to find that half of the StarTech cables purchased for the pilot study had quality issues and would not stay connected to the screens. In response, we received department funds to purchase braided cables, which are much higher quality in addition to having improved length. These appear to be more durable and working more reliably, so we have included them in the new proposal.

The proposed technology to be integrated into the architecture studios will be in line with the overall classroom technology plan for campus, and the interfaces, software, and networking standards will be consistent with other ISU classrooms. The classroom technology maintenance and upgrade responsibility for these studios will fall with the College of Design IT Services which support the entire College of Design. In preparing this proposal, we have spoken with the Director of Operations and Systems Support Specialists and their concerns regarding storage and security are addressed by a security retrofit of the stands with durable locked cables that will prevent their removal from the studio classroom. In collaboration with Mike Miller, College of Design Director of Operations, we will continue to review the performance of the screens and report on how to most effectively secure this equipment in the studio spaces.

The technology used by the screens is standardized (VGA, HDMI, etc.), which should prevent them from becoming obsolete for many years. This new round of screens will be upgraded in size and resolution to 4K, which students requested often in our surveys. This should help improve the viewing angle and with the scale of presentations. In addition, a continuing goal of the project is to experiment with how different wireless presentation systems (e.g. the Chromecast and Solstice Pod) work with the College’s existing network infrastructure. Last year, we found that the Chromecast systems were most frequently used by students (40%) but their initial set-up required extra effort. The
Solstice Pod worked better, but their substantial price difference cost and limited number led to infrequent use. For this reason, we opted to specify only Chromecasts in the new study. The system is modular and uses HDMI cables, so it could be replaced easily if new technology (such as a 4K Chromecast) becomes available and necessary.

**Budget**

**Itemized Budget**

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<tr>
<th>Description of Item</th>
<th>Number</th>
<th>Unit Cost*</th>
<th>Total Cost by Funding Source</th>
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<tr>
<td><strong>Total</strong></td>
<td></td>
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<td>$17,412.73</td>
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<table>
<thead>
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<th>Description of Item</th>
<th>Number</th>
<th>Unit Cost*</th>
<th>CAC Initiatives</th>
<th>College of Design</th>
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<tbody>
<tr>
<td>LG 55 Inch 4K Ultra HD 55UH6030 UHD TV</td>
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<td>Flexible Security Lock for Remotes</td>
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<td>Kensington Desktop and Peripherals Locking Kit (locks for Chromecast)</td>
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NOTE: All items verified available through CyBuy vendors CDW, B&H Photo, and SKC. * Added 1.75% surcharge for hardware hazardous materials.

**Budget Justification**

**LG 55 Inch LCD 4K TV** – These screens will enable students and instructors to create and display high-resolution digital work in under a variety of conditions (e.g. high light levels, low “throw-distance” situations, etc.) 4K resolution is important for showing more detailed images – particularly text rendering and linework on drawings.

**H. Wilson WPSMS51 Universal Mobile Flat Panel Display Stand** – This is a movable cart that will allow students and instructors to relocate the screens to locations around the studio for the best presentation conditions.

**Chromecast** – These peripherals offer a low-cost way to wirelessly broadcast images, videos, and live software demonstrations from laptops and phones to the HD screens.

**Kensington Desktop and Peripherals Locking Kit (adhesive locks for Chromecast)** – TV peripherals will be securely locked to the screen carts with strong plates and lockable cables.

**CODi Adjustable Loop Key Cable Lock** – This is a heavy-duty locking cable, secured between the TV cart and an immobile / large object in each studio to prevent it from being removed.

**Flexible Security Lock for Remotes** – This is a stretchy cable, secured between the TV cart and the TV remote control to prevent it from being removed.
**HDMI Cable 15 FT - Braided Cord - 4K Ready** – For connecting student laptops and other devices to displays, up to 4K standard. HDMI is the most common cable type today and carries both audio and visual information, which should reduce the need for additional adapters (in addition to the use of wireless Chromecasts). Braided cables are much more durable than standard cables.