ICU, UC ME!

Amy Barnsley, Ph.D., Associate Professor, Mathematics
Stacey DeLoose, Instructional Technologist
Northern Michigan University
1401 Presque Isle
Marquette, MI 49855
abarnsle@nmu.edu
sdeloose@nmu.edu

31st International Conference on Technology in Collegiate Mathematics
Contributed Paper Title: ICU, UC Me!

ABSTRACT

A lightboard is a glass board that is internally lit and recorded through so that instructors can write on it while making 'eye contact' with their audience. Using this technology, mathematics instructors can record mini-lectures for their online students while demonstrating the step-by-step process for solving math problems. The added benefit for students is the allowance for virtual eye contact and not having to stare at the back of the instructor's head. A review of related literature, details on the lightboard set up, the workflow to create videos, and sample end products will be presented.

INTRODUCTION

Students today are engaging with online content by watching short, highly edited, bite-sized videos. With this in mind, the lightboard project at this institution sought to make short, high-quality videos for online mathematics courses. At this mid-sized public university, the lightboard is a 4x6 foot piece of glass that is internally lit and recorded through while the instructor writes on the glass. Using this technology, mathematics instructors can record engaging mini-lectures for asynchronous presentation. Since the instructor is facing the camera at all times, they maintain virtual eye contact with students. The students see the instructor and the instructor "sees" the students. The instructor can emphasize details of their board work with hand gestures and students' eyes track instructor's eyes as they write on the glass board.

A review of related literature, details on the lightboard set up, the workflow to create videos, and sample end products will be shared.

RELATED WORK

Two themes emerged after reviewing literature related to the lightboard. First, quality online education must provide more than text-only materials. It must present content in a variety of methods, including videos that use engaging techniques such as the lightboard. Second, to avoid student isolation and a sense of "teaching oneself" instructors must be present in the course, as they are the "value added" in any class. Using the lightboard addresses both of these issues.

Educational video has been around almost as long a video has been in production. Putting these valuable tools in the hands of instructors allows for a more personalized, true-to-life experience for online students. Online courses tend to be very text centered. Readings, articles, PowerPoint, and other textual elements often make up large parts of online courses. Even when trying to engage students in an online discussion, forums are primarily text-based. According to the Community College Research Center (2013), "infusing audio and video throughout lectures provides multiple ways for students to engage with content and creates a strong instructor presence." Using the glass lightboard to create the feeling of eye contact shows enthusiasm for the content and investment in students. Following findings by Guo, Kim, and Rubin (2014), pre-made videos, like those made with the lightboard, are more engaging than lecture style videos. Furthermore, with the lightboard students feel like instructors are talking to them, not at them, or just talking. This leads to a more conversational tone that is more understandable for students.

Fioella, Stull, Kuhlmann, and Mayer (2018) found that "students learned better from an instructional video about the human kidney when they could see the illustrations being drawn by the instructor rather than seeing already drawn illustrations, and when they could see the instructor's eyes looking at them rather than having the instructor not directly face" the students. The videos made with the lightboard follow this best practice.

Unlike the classroom face to face setting, online students and instructors often feel disconnected since they are in different times and places. However, according to Borup, West, Graham (2012) "a large majority of students indicated feeling that the video-based communication made their instructors seem more real, present, and familiar, and that these relationships were similar to face-to-face instruction." Haneef, Faisal, Alvi, and Zulfiqar (2014) found that student learn easier when the teachers use their body language, gesture, posture and eye contact. As an added improvement to basic video, the lightboard videos give students a feeling of eye contact as the instructor writes on a board while looking at them through the glass.

The lightboard specifically adds the element of instructor presence to the videos. Students feel as if a real person is talking specifically to them. The videos take on a more conversational tone, as if the student and instructor were sharing a 'bar napkin' idea, compared to a standard lecture or structured PowerPoint. Guo, Kim, and Rubin (2014) posit students have expressed that "Khan-style" tutorials are more engaging than PowerPoint slides or screencasts. The lightboard videos have the handwritten appeal of the "Khan-style" videos, but are improved by the instructor's presence.

PROJECT DESCRIPTION
To visualize the lightboard a photo of the setup is provided below. The instructor writes on a piece of glass with dry erase chalk markers. The glass is lit along the edges with LED strip lights or built to be internally lit. A video camera is set up on the other side of the glass, which means the writing does appear reversed in the unedited footage. Spotlights are on the instructor and overhead lights are off. The instructor has a wireless lapel microphone. A small table holds additional pens and erasers.

Professor Barnsley using the lightboard in Studio 102

There are a variety of dry erase pens available, but the liquid chalk type work the best for concepts that needed to be erased quickly during videotaping. Like normal dry erase markers, the fluid tends to pool at the non-writing end when in use, thus causing the writing to get lighter and lighter, but dry erase chalk markers seem to minimize that problem. Other types of dry erase markers have more vibrant colors but leave a residue that is hard to quickly erase. That type of marker would be good to use when a drawing diagram that would stay on the board for the entire lecture.

In an initial proof-of-concept very little money was spent for this setup. An existing interior window was used. The overhead lights were turned off, and rope lighting was taped to the edge of the window. Existing video recording equipment was used. When the concept was deemed viable, space was allocated and studio-quality equipment was installed. The lightboard studio was named Studio 102.

The workflow for creating videos is manageable for faculty, roughly one hour of work to produce a half-hour of video. This institution provides faculty with teaching and technology support. The Instructional Technologists manages Studio 102. Faculty meet the Instructional Technologist at the Studio. The Instructional Technologist adjusts the lighting, checks the microphone, hits record on the camera, and leaves the studio. The instructor then gives their mini-lectures; keeping within the 4-6 minutes if possible as recommended Guo, Kim, and Rubin (2014). Several short mini-lectures can be recorded back to back without stopping the recording. When completed, the instructor turns the recorder off. The Instructional Technologist processes the video in video editing software, in this case Camtasia, and puts it on a shared Google drive for the faculty. The processing includes flipping the image, trimming the ends, and if necessary, cutting it into individual videos files. As faculty learn more and get more comfortable with the technology tools they will be able to process their own videos right in the Studio. The faculty member can use the video with limited editing or can choose to edit as much as they wish. After editing and

producing their desired videos, the videos can be embedded into a website or into the university's learning management system.

These videos can be used for online courses to present content, to explain a particularly difficult concept, or describe a step-by-step process. Students can review, pause, and review a video as many times as they deem necessary. The asynchronous videos can also be used in a flipped classroom environment, for supplementary materials, or to extend the class period by explaining or to recap longer or more complex idea.

This type of educational technology has been useful in various content areas at this institution. Mathematics instruction is enhanced with the use of the lightboard. The instructor can guide students step by step through a process while pausing and using hand gestures to emphasize difficult ideas. By using a lightboard, the instructor hand writes mathematical notation, thus modeling what students will do on the own mathematics homework. Other applications of the lightboard include nursing, where concept maps are diagrammed to talk through a disease – the symptoms, diagnoses, etc. Business professors present finance and tax topics. Evaluating DNA and applying Beer's Law to concentration of Nucleic acid have been demonstrated in Clinical Lab Science courses using the lightboard. It has also been exciting to see Education professors getting their own students ready to use educational technology to meet future student needs.

The following links are some examples of finished videos. As you can see the editing is not perfect, but the faculty member must weigh the benefits of a highly edited video with the costs of time commitment of video production.
>   Transformation of Functions https://youtu.be/ywXKMAisksg
>   Basic Polynomial Division https://youtu.be/ap7O0I05jcY
>   Using Concept Maps in Nursing https://youtu.be/zKXuwLBEZwc

CONCLUSION
In summary, the lightboard project came out of a desire to improve online education. The videos made with the lightboard are engaging the students with gestures, eye contact, and instructor personality. At this institution, the lightboard was a result of collaboration between a mathematics faculty member and an Instructional Technologist. It was financially supported by the institution's Extended Learning and Community Engagement Division, and is available for any faculty wishing to make high quality, asynchronous, instructor infused videos.

REFERENCES

Borup, J., West, R., & Graham, C. (2012). Improving online social presence through asynchronous video. *The Internet and Higher Education, 55*(3), 195-203. Retrieved from (https://www.sciencedirect.com/science/article/pii/S109675161100073X)

Community College Research Center (2013). Creating an effective online instructor presence. Retrieved from https://files.eric.ed.gov/fulltext/ED542146.pdf

Fiorella, L., Stull, A. T., Kuhlmann, S., & Mayer, R. E. (2018, December 10). Instructor presence in video lectures: the role of dynamic drawings, eye contact, and instructor visibility. *Journal of Educational Psychology.* Advance online publication. http://dx.doi.org/10.1037/edu0000325

Guo, P., Kim, J., & Rubin, R. (2014). How video production affects student engagement: an empirical study of MOOC videos. SIGCHI Conference Proceedings. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.714.195&rep=rep1&type=pdf

Haneef, M., Faisal, M., Alvi, A., & Zulfiqar, M. (2014). The role of non-verbal communication in teaching practice. *Scientific International, 26*(1), 513-517. Retrieved from http://www.sci-int.com/pdf/1623286240513-517---Non%20Verbal%20Final%2001-03-14[1].pdf