ARTICLE

Supporting Faculty's Instructional Video Creation Needs for Remote Teaching

A Case Study on Implementing eGlass Technology in a Library Multimedia Studio Space

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ABSTRACT

In 2021, alongside seven colleges at the University of Idaho campus, the University of Idaho Library received an eGlass system (https://eglass.io) with funding from the Governor's Emergency Education Relief Grant to expand faculty's capacity to create instructional videos. The eGlass is a transparent glass whiteboard that allows instructors to write, draw, and annotate. It comes with a built-in camera that can capture instructors' facial expressions and gestures while facing their remote students and allow better engagement. The eGlass is suitable for creating asynchronous instructional videos for flipped classrooms and integrating Zoom for synchronous online classes. This article details the eGlass equipment setup, studio space optimization, outreach efforts and initiatives, usage examples of early adopters, lessons learned during the first year of the eGlass deployment, and future considerations.

INTRODUCTION

In 2021, the University of Idaho Library (Library) received a transparent glass whiteboard called the eGlass for faculty to record video-based lectures. The eGlass was based on a similar glass whiteboard technology, called the lightboard, that the Library already owned. Initially built by University of Idaho engineering students and later gifted to the Library, the lightboard presented challenges to library staff as properly supporting the technology required spending a significant amount of time. Offering similar functionalities, the eGlass had the potential to also address the issues that the lightboard presented.

Similar to the lightboard, the eGlass allowed instructors to write and draw on the glass while facing their audience, typically students who would be watching the recorded videos later, to provide better engagement. The eGlass could also be used for creating asynchronous instructional videos for flipped classrooms and integrating Zoom for synchronous online classes. To implement the eGlass, it was necessary to consider factors such as the functionality, the space to be occupied, and faculty interest. A year after the original deployment of this tool, the author reports on the lessons learned in this article. Lessons including the eGlass equipment setup, multimedia studio space optimization, outreach efforts and initiatives, usage examples of early adopters, lessons learned, and future considerations are explored later in this article.

BACKGROUND

The Studio in the University of Idaho Library provides space and audiovisual equipment to students, faculty, and staff to pursue curricular, personal, and creative multimedia projects.

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Originally converted from a 200-square-foot meeting room, the Studio is equipped with a 27-inch iMac, a 32-inch full-HD VicTek monitor, a Scarlett 18i20 audio interface, a dbx 266xs 2-channel compressor/gate, two KRK's Rokit 5 G3 powered studio monitors, two Shure SM58 dynamic vocal microphones with microphone arm stands and pop filters, several portable lights, a green screen, and more. Software installed on the iMac includes Audacity, Camtasia, and the essential Adobe Creative Cloud applications such as Photoshop, Premiere Pro, InDesign, etc. Patrons can use the Studio software and equipment to record voice-over narrations and podcasts as well as to edit multitrack audio clips and videos. In addition to using the Studio equipment, patrons can also borrow other multimedia equipment, such as video camcorders, audio recorders, tripods, a USB microphone, and a DSLR camera, at the circulation desk.

Initially managed by two library support staff, both of whom left the organization to pursue other opportunities, the Studio operations were taken over by the author in 2020. Due to the COVID-19 pandemic and the lack of air ventilation in the space, the Studio was closed in March 2020 and did not reopen until August 2021. While any university-affiliated patron is welcome to use the Studio, first-time users were expected to complete an orientation with the author to become familiar with the equipment setup and the audio workflow. To use the Studio, patrons had to make reservations, up to two weeks in advance, for up to two hours per day. Reservations were made from the Studio's webpage and managed through Springshare's LibCal product. Patrons who frequented the Studio pursued various personal, creative, instructional, and curriculum-related projects, including video recording with the green screen, video editing, podcast recording, voice-over narration recording, etc.

The Studio was used by patrons several times a week. According to the LibCal space statistics, in fall semester 2021, the Studio had 48 unique users, 147 total bookings, 211 hours booked, and the average reserved time block was 86 minutes. In spring semester 2022, the Studio had 30 unique users, 64 total bookings, 103 hours booked, and the average reserved time block was 97 minutes. A noticeable usage drop in the spring semester was likely due to a reduced number of advertised Studio orientations provided to the campus community and fewer classroom assignments that required or promoted Studio use.

For several years, the Studio was home to a lightboard for faculty to record class lectures. Designed as open-source hardware by Dr. Michael Peshkin from the McCormick School of Engineering at Northwestern University, the lightboard was a transparent glass whiteboard illuminated with a built-in light, and the ink would glow in low-light environments. Instructors could write and draw on the glass with neon markers while facing the viewers, and the writings and drawings along with the instructor could all be captured in the same frame using a separate camera.[1]

Dr. Peshkin provided two solutions for those who were interested in acquiring a lightboard: buying a commercially-produced one or building one from scratch. The lightboard in the Studio was built by a group of students in a mechanical engineering class for a senior capstone project as part of a design challenge in partnership with the Center for Excellence in Teaching and Learning (CETL), and the students later gifted the lightboard to the Library. The lightboard that the Studio received came with a steel frame and wheels. The unit's overall dimensions were 75 inches long, 45 inches wide, and 78 inches high. The glass board itself measured 71.5 by 47.5 inches (see figure 1).

Figure 1. The lightboard that the Library received.

The lightboard was used by a few instructors who frequented the Studio over the years. During fall 2019, one faculty member from the College of Natural Resources regularly used the lightboard two to three times per week for about 45 minutes to an hour per session. Another engineering faculty member, whose students built the lightboard, also used the lightboard several times but did not have a regularly scheduled appointment. There had not been any regular users since then.

Recording videos using the lightboard required a complicated setup. First, instructors would need to gather several pieces of equipment. For instance, they would need to check out a video camera and a tripod at the circulation desk downstairs and a lavalier microphone at the room adjacent to the Studio. The setup required the lightboard to be positioned between the instructor and the camera. It was necessary to change the camera setting to flip the video horizontally; otherwise, any writings or drawings in the final recording would be displayed backward. Additional steps included starting and stopping the camera recordings, checking throughout the recording process to ensure the instructor's writing on the lightboard stayed within the camera's frame of capture, and transferring the media from the camera's SD card to an external hard drive or to cloud storage. As a result, recording a session using the lightboard required assistance from at least one other individual, usually a library staff or faculty member, from start to finish. The many different

moving parts made the whole experience time-consuming and labor-intensive both for the library staff and the lightboard users.

LITERATURE REVIEW

Lightboard technology has been implemented at various higher education institutions since 2014. Thanks to Dr. Peshkin, who made the lightboard an open-source technology and provided the building instructions on his website, many institutions built their own versions of lightboards with variable setups. Due to the nature of the lightboard requiring a controlled lighting environment and the writing being backwards from the perspective of those facing the glass (including the camera), the lightboards were used almost exclusively in dedicated studio spaces where the videos were to be recorded. For instance, similar to the University of Idaho Library Studio setup, the complete setup at the University of Western Australia consists of a lightboard, a camera, lights, markers, a lapel microphone, and a black canvas.[2] A budget setup that cost as little as $100 as a removable, tabletop version was also developed.[3] Cornell University came up with a lightboard and projector setup that can be used in a live 500-person auditorium.[4] Needless to say, the lightboard technology was adaptable enough to meet various needs on many campuses.

Several studies show that, among the various types of instructional videos for asynchronous learning, students favor lightboard videos. One unique feature of the lightboard technology, for example, is that it enables instructors to incorporate their gaze and gestures into the instruction. According to a 2015 study, combining gaze and gestures with traditional instructional materials proved to be more effective in directing students' attention.[5] In a 2019 study, several researchers analyzed various lightboard cases in the context of learning theories and theoretical frameworks, such as Cognitive Load Theory, Cognitive Theory of Multimedia Learning, and Social Learning Theory. The researchers concluded that while more empirical research was needed, the lightboard videos could improve student learning and engagement.[6] In another study conducted by researchers at the University of Illinois Urbana-Champaign, students watched two types of recorded lectures—picture-in-picture with the instructor appearing in a corner of the video, or an overlay of the instructor without the background. Study results showed that the overlay videos where the instructor interacted with the content had more views and were preferred by the students, likely thanks to the gaze and gestures of the instructor increasing accessibility.[7]

In classes in which the instructors opted to use the lightboard, students generally responded positively to the lightboard videos. For example, in two online classes at Clayton State University, most students preferred the lightboard lecture over the traditional narrated PowerPoint lecture, and "students described it as engaging, more personable, appealing to visual learners, easier to follow and retain the information, and more similar to a conventional live lecture."[8] At Bond University, in Queensland, Australia, in a chemistry class where the lightboard videos were incorporated as a learning aid, researchers reported that over a four-year period, students scored higher on exams in courses in which lightboard videos were incorporated as instructional materials.[9] In another example, students enrolled in a physics class at San Diego State University were exposed to the Learning Glass, a commercial product that was based on the lightboard technology. Students responded in a post-course assessment that they felt more connected to their instructor when the instructor utilized the Learning Glass, and thus the researchers argued that the Learning Glass could positively impact STEM students' retention rates.[10] Lastly, at Georgia Southern University, two researchers conducted a mixed-method study to assess different groups of students' perceptions of lightboard videos. The findings showed that while performing equally

well when comparing test scores, the students in the class that incorporated lightboard videos had better understanding, engagement, and satisfaction based on the assessment measures.[11]

Lightboards are not without their drawbacks given the requirements and the limitations of the equipment and the recording conditions. In an engineering class where students used lightboard for a problem-solving assignment to demonstrate their learning, researchers identified the various requirements including a room with sufficient size, the need for filming equipment, and long post-production processing time.[12] Other disadvantages of the lightboard included immobility, limited writing surface, and a more rigorous cleaning process.[13]

The type of content being presented in lightboard videos also required consideration. In a study comparing different types of lecture videos, students showed a strong preference to the Learning Glass videos and "suggested that this style be used to supplement lecture videos (in the form of practice problems and follow-up videos)."[14] This conclusion corroborated another study that a lightboard was useful for step-by-step problem-solving explanations.[15] Lastly, in a study that examined three different styles of lightboard videos (interview style, multipresenter, and multimedia-enriched), the researchers identified the benefits along with the drawbacks of each style.[16] For example, while interview videos highlighted interactions between the presenter and the interviewer, the presenter experienced "difficulty in multitasking between writing notes on the lightboard and attending to the interviewer's questions." Having several presenters could also limit the amount of space for them to move around and write on the glass while remaining in frame and created possible distractions of having too many people as well as too much writing on the glass. Another potential issue is that not all presenters could be wearing darker-colored clothing for better contrast with the writing.

EGLASS

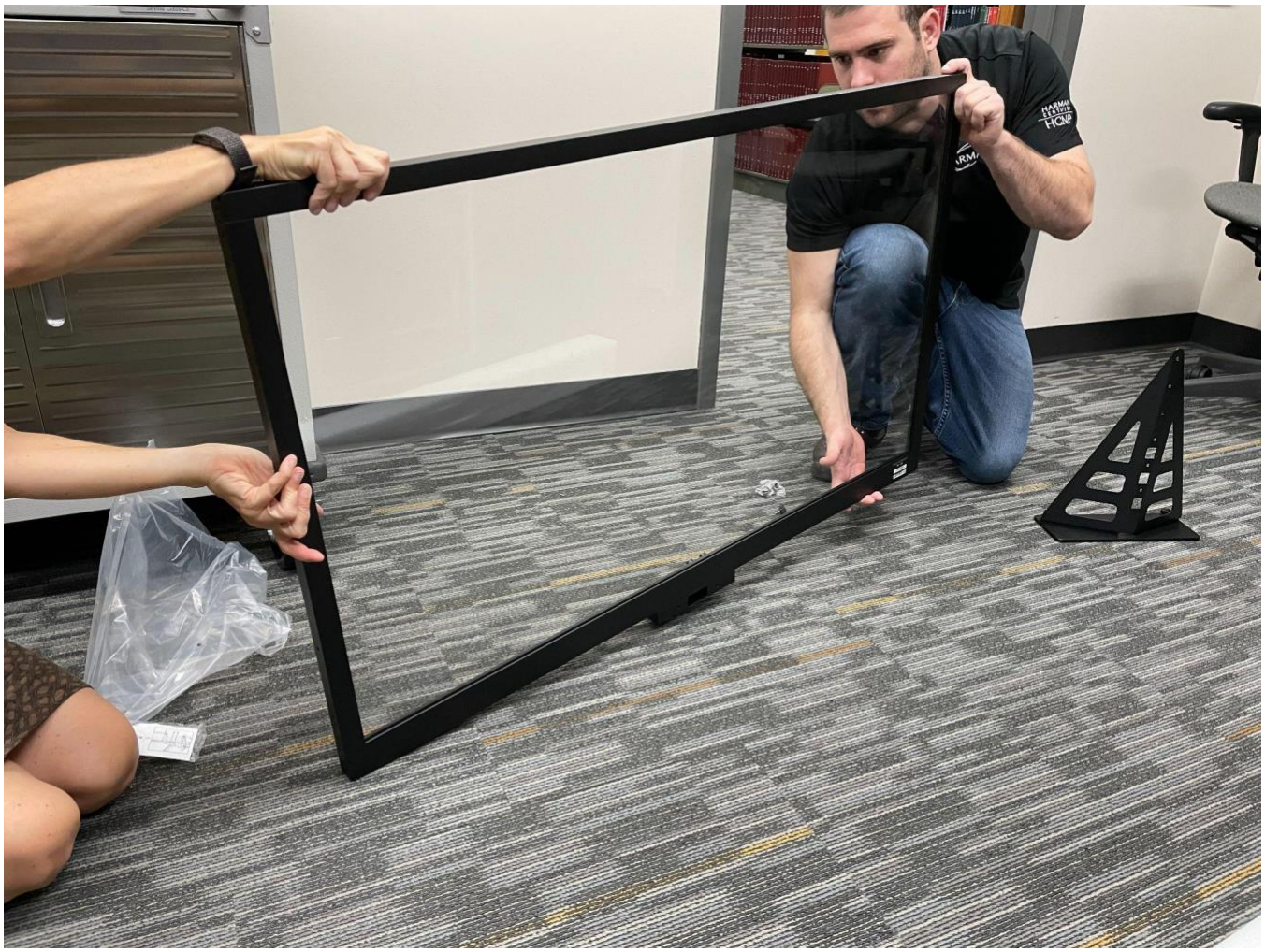
Context

In spring 2021, the manager at the Collaboration & Classroom Technology Services (CCTS) department at the University of Idaho informed the author that they were planning on purchasing several eGlass units for the campus to support faculty's instructional video creation. The funds came from the Governor's Emergency Education Relief (GEER) Grant to address the COVID-19 pandemic's impact on higher education. Initially, the grant was written by several individuals who intended to purchase commercially-made lightboards to enhance distance teaching options. While researching for the grant, the team stumbled upon the eGlass, which seemed to be easier to use than the lightboard. The pricing was reasonable, so the team decided to purchase several of these devices instead of the original two lightboards that were originally recommended.

If interested, the library could receive one unit alongside eight other colleges on campus. The author checked out the demo unit at CCTS and reported the first impressions as a user to the Dean of University of Idaho Libraries. The latter reasoned that due to the lightboard and eGlass's duplicating functionalities and the fact that the eGlass had more perceived ease of use given its all-in-one package without the lighting and camera being separate, it would be best to replace the lightboard with the eGlass. The author contacted the lightboard capstone project faculty member, who chose to rehome the lightboard to the Engineering Outreach department at the College of Engineering. Removing the lightboard paved the way for welcoming the eGlass to the Studio by reclaiming needed room space.

The eGlass came in two sizes—a 35-inch and a 50-inch diagonal writing surface. The Library received a 50-inch unit with the writing surface measured at 45.64 inches long and 27.40 inches tall. The height of the overall unit could be adjusted to 29.37 inches, 31.33 inches, or 33.31 inches. Additional accessories that the Library received included a desktop computer, two height-adjustable desks, a touchscreen monitor, a webcam, a ring light, peripherals, neon pens, and white clothes for wiping down the writings. Once the order of the eGlass came through, a CCTS team that consisted of several individuals brought the eGlass along with two height-adjustable tables to assemble (see figure 2). The assembling of all the equipment took about an hour.

Figure 2. CCTS team assembling the eGlass; disclosure: the shirt logo does not represent any affiliations.



Description

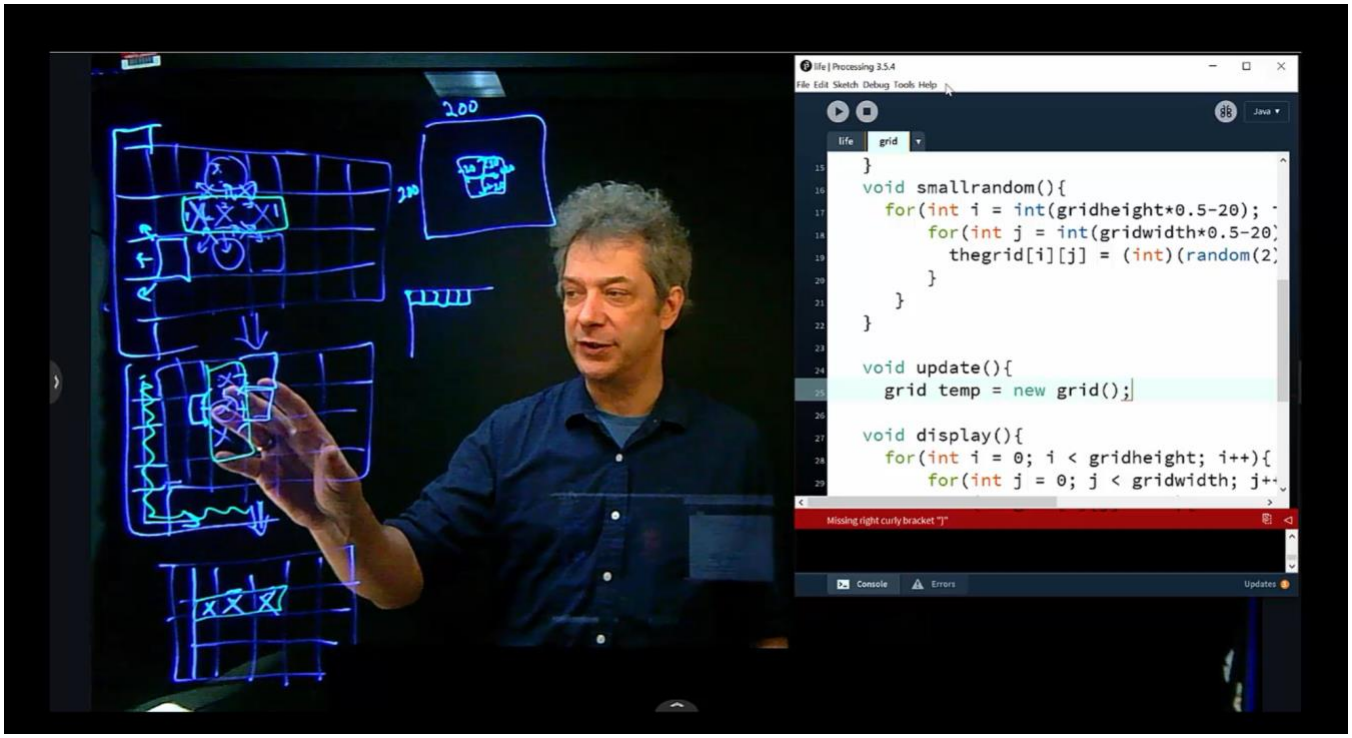
Similar to the lightboard, the eGlass was made of a sheet of glass and a frame, and the instructors could write on the glass using neon markers. However, the eGlass had several distinct features and advantages over the lightboard. First and foremost, the eGlass had a built-in camera and the recording function that enabled the instructors to start, pause, and stop the recording on their own with a touch of a button. In addition, the eGlass internal system flipped the image automatically in real time so that instructors did not need to write backward. Therefore, using the

eGlass would not require additional support from library personnel since the separate camera setup was no longer needed.

The eGlass's built-in lights were also an improvement over the lightboard's lights. The lightboard came with one set of lights on the frame that illuminated the writings on the glass, but it was necessary to set up additional portable lights to ensure the instructors were illuminated as well. The eGlass came with two sets of lights—the instructor light illuminated the instructor, and the blue glass lights ensured the ink on the glass would glow for better visibility. Each set of lights was controlled by a separate knob to adjust the intensity.

Moreover, the eGlass could be used as a standalone unit for simple tasks that involved writing and drawing on the glass. For example, instructors could start, pause, and stop the recording using the touch buttons located below the writing surface on the frame. Instructors could also use the free-to-download eGlassFusion software to access additional features, such as taking snapshots; importing PowerPoint slides, Word documents, PDFs, and other types of media files; removing the imported media's background color; zooming in and out; and annotating by typing texts and drawing rectangles or arrows.

Figure 3. A faculty member recording a video with an application overlay.



While the eGlass was connected to a desktop computer via a USB cable, instructors could bring their own devices to connect to the eGlass, which supports Windows, MacOS, and Chromebook operating systems. With a laptop connected to the eGlass, instructors could use the downloaded and installed eGlassFusion software to control what they were sharing on their screens. For instance, on their devices, instructors could use video conference software such as Zoom and Microsoft Teams for synchronous online instruction via screen sharing and could switch from their laptops' camera to the eGlass camera as the output video. In addition, students could see the

writings and drawings on the glass, the instructor's face, body, gestures, and any programs opened on the instructor's laptop on the same screen (see example in figure 3).

Lastly, instructors could choose to use the eGlass while sitting down or standing up as the eGlass was placed on a height-adjustable desk. The desktop computer, touchscreen monitor, webcam, and ring light enabled a One-button Studio setup. Instructors could open any video recording software when pressing the button to start a recording and use the touchscreen monitor for Zoom whiteboard and Camtasia for screencast recording with annotating.

Outreach

The new equipment setup was completed a few weeks before the start of fall semester 2021. CCTS sent out an announcement to the university daily newsletter targeted to faculty and staff to advertise that the eGlass had been set up at various locations on campus. The author also provided 20 in-person studio orientations sessions, scheduled at 10:00 a.m. and 2:00 p.m. Monday–Friday during the first two weeks of classes, to campus students, faculty, and staff. Prior sign-ups were not necessary, so patrons could simply show up at the orientation time. These orientations provided an overview to patrons unfamiliar with the Studio or any pieces of the existing or new equipment. Among the 36 patrons who showed up to the orientations, three faculty members were introduced to the eGlass and One-button Studio.

Several additional informational and educational workshops were conducted to promote awareness of the eGlass. In the fall semester, CCTS hosted a workshop introducing the eGlass. Due to the limited physical space in the Studio that could only comfortably accommodate less than five people, the workshop was hosted in a hybrid format with the in-person location in a room adjacent to the Studio. Participants could choose to attend either via Zoom or in person. If attending in person, participants could visit the Studio after the workshop to check out the eGlass setup and try out the equipment. Workshop attendees noticed that the writing on the eGlass was difficult to differentiate from the white wall, which served as the background. After the workshop, the author ordered some black wallpaper and applied it to the wall facing the eGlass to help improve the contrast. In the 2022 spring semester, the author facilitated an online library workshop to introduce the eGlass, its core features, advantages over the traditional white/blackboard or Zoom instructions, examples of applicable disciplines to use eGlass for instruction, and best practices to five faculty and two staff attendees.

Another event to promote the eGlass was the Engineering Design EXPO at the University of Idaho College of Engineering, an annual event that showcases design projects created by students. This event attracted regional K–12 students, community college students, industry partners, and community partners. The Makerfaire, an event that featured makerspace technologies and a drone demonstration, took place on the same day as the EXPO. Due to the perceived impact of eGlass and its application to STEM instructions, marketing eGlass to the STEM audience seemed to be a natural fit. Thanks to the assembling ease, the author staffed a table at the Makerfaire with a smaller eGlass unit loaned from another campus location. The author demoed the eGlass to passersby, including students, faculty, and community members.

Lastly, the Active Learning Symposium is an annual event hosted by CCTS and CETL at the University of Idaho. In 50-minute presentations, instructors shared their teaching strategies to promote active learning in their classrooms. The author reached out to one eGlass regular user,

the Computer Science department chair, to co-present at the symposium to introduce the eGlass and showcase some eGlass videos created for a computer science class.

Usage

In the 2021–2022 academic year, two faculty members regularly reserved the Studio to use the eGlass. One faculty member was the chair of the Computer Science department, and the other person was in the Animal, Veterinary and Food Sciences department. After attending an orientation to the equipment, setup, and software, the faculty members reserved the space and recorded on their own a few more times without the need for support from the author or a staff member. One of the initial goals of replacing the lightboard with the eGlass was to free up library staff time to support faculty recording lectures, and the author believed that having this new equipment reached this goal.

About halfway through the fall semester in 2021, the author added a checkbox for patrons to indicate their intended Studio usage when making a reservation on the library website. Based on the statistics generated by LibCal, in addition to the two faculty members, five students booked the Studio to create instructional videos. However, since none of the students reached out to the author directly and the Studio was not staffed, it was not possible to confirm if the students used the eGlass or any other pieces of equipment in the Studio for video creation.

Regardless, the overall usage of eGlass was lower than anticipated, and the author believed that there were several contributing factors. First, the equipment was not properly set up until the end of summer. Several faculty who heard of the eGlass expressed interest in using it to prepare for fall instruction, but shipping delays prevented the equipment from being delivered and set up in time. Moreover, since several other colleges also received the eGlass, faculty members who could access a unit at their colleges chose not to check out the Library Studio location despite the additional equipment and the optimized space to help improve the user experience. Lastly, despite the marketing efforts, the author suspected that the majority of campus was still not aware of the existence of the eGlass technology, so additional outreach was probably still needed.

Lessons Learned

After overseeing the Studio with the new eGlass equipment for two semesters, the author underestimated the amount of work to promote the eGlass—the saying that "if you build it, they will come" does not always ring true. Ensuring that the eGlass was adopted by more faculty members required a lot of dedicated effort. Identifying several early adopters who saw the value of the technology and were willing to advocate for it by spreading the word to their colleagues was key. Even then, the author noticed that the two faculty members who had been using the eGlass had stopped coming to the Studio regularly after several sessions. Keeping faculty engaged despite their diminishing interest in using the equipment was an issue that the author did not anticipate or resolve. In the 2022–2023 academic year, the Library engaged in an organization-wide reorganization that halted several existing and anticipated work priorities, one of which was conducting Studio space and service assessments. In the 2023–2024 academic year, through a collaborative effort with the new department administrator, the author hopes to improve the Studio and eGlass usage by planning promotional initiatives and resuming assessment activities.

The space to place the equipment, on the other hand, was another consideration. While it was decided to put the eGlass in the Studio so that the lightboard could be replaced, the physical unit of the 50-inch eGlass took more space than the original lightboard. Occasionally, the author received

requests from patrons who wanted to use the Studio to record videos using a green screen. While it was still manageable to set up a green screen in the remaining space, the lack of room made patrons' recording experience feel cramped and awkward. Overall, for a 200-square-foot Studio that had a computer desks, audio equipment racks, portable lights, housing the eGlass was less ideal than anticipated.

Moreover, in order for the Studio to be optimized for using the eGlass, the lighting, sound, and background required permanent adjustments. For example, after the initial setup, the eGlass was facing a white wall in the Studio. Ideally, the background needs to be dark to help contrasting the lighter neon color writings on the glass. Possible solutions included installing a black backdrop, painting the wall black, or applying black wallpaper. Installing a backdrop with curtains was the most expensive and time-consuming option, and painting the wall would require temporary closure of the Studio. The author opted to order black wallpaper from Amazon.com to minimize the disruption to Studio operations during the regular semester. The wallpaper cost less than a hundred dollars and applying it to the wall only required an hour, but eventually the adhesive started to wear off. The author decided to remove the wallpaper over the summer and contacted the facilities department to paint the wall black, which took time for removing and restoring the equipment in addition to the time for the wall to dry.

Lighting was another challenge since the eGlass required a light-controlled environment. Ideally, all the lights in the room should be turned off for patrons who wanted to use the eGlass so that the writings and drawings on the glass were highly visible. Some fluorescent lights in the Studio were emergency lights that could not be turned off by flipping the light switches. The author had to manually disable some of the lights for the eGlass users.

The last space-related challenge was sound. The eGlass came with a built-in microphone that did not require a separate microphone setup. However, the eGlass was placed close to the walls in the Studio due to a lack of space which caused some reverberations, lowering the overall sound quality. The sound could be improved if patrons used a headset with microphone and connected the headset to the computer dedicated to the eGlass. Installing acoustic wall panels was another viable option, and the author might consider such an approach if the usage of the eGlass grew to justify the equipment purchase.

CONCLUSION

The eGlass technology at the University of Idaho Library offered an improved instructional video creation experience to the campus community. Thanks to the eGlass's easier setup compared to the lightboard and the Studio space improvement in terms of the controlled lighting and the black wall, faculty were greatly benefitted from having access to a tool that enabled them to create engaging videos for classes delivered in online and hybrid modalities.

However, additional dedicated outreach efforts are needed for a wider campus adoption. At the University of Idaho, seven other colleges on campus owned eGlass alongside the Library, and there has not been any coordinated communications to promote the technology among all locations. While marketing emails and newsletters would work well for most new services, it is the author's opinion that potential users would better understand the applicability of the eGlass to their instruction when they are able to see the physical unit in person. More in-person outreach, such as inviting faculty to the Studio or attending departmental faculty meetings to show videos made using eGlass, would be of help.

For other institutions that might be interested in acquiring an eGlass or a similar technology, the author would suggest conducting an environment scan first to determine the campus need. Are there faculty on campus who could benefit from this type of technology to achieve their instructional goals? Are there any existing spaces on campus that offer comparable services or resources? If the library administration was interested in acquiring the technology for the library, is there an existing space that would be suitable for placing the equipment? Would the library invest in the room so that the lights could be fully controlled, sounds could be proofed or dampened, and a background could be darkened? Would there be a staff member to be assigned as the dedicated person to support and maintain the technology? The author hopes that this case study presents a myriad of ideas for those considering adopting a technology similar to an eGlass at their libraries.

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