Opening Up Higher Education with Screencasts

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Editors' Commentary

In this chapter, authors David Miller and Addison Zhao discuss opening the classroom with the use of screencasts. Screencasts are, in essence, video lectures. Their digital format carries all the benefits of that medium: the ability of students to learn from distance, the ability of students to learn asynchronously, and the ability to scale the classroom. In this sense, the authors are using the word 'open' in a somewhat different fashion than it is used elsewhere in this volume. Rather than speaking about open licensing or remixing of materials he is specifically referring to a process of expanding the boundaries of the classroom. Embedded within this, however, is a sentiment that is not far from the heart of open education: a lack of protectionist attitude. While the authors honestly and responsibly address the legal use of copyrighted information in screencasts they also directly acknowledge more open alternatives and their potential benefits.

What will a technologically-based classroom look like in 100 years? This is a question that was addressed by Jean Marc Cote in 1901 in a painting entitled, 'At School'.[1] This painting depicts a teacher grinding up books, with the aid of an assistant (possibly what might today be a Teaching Assistant), while six male students sit at tables wearing audio headphones that are connected by wires to

How to cite this book chapter:
Miller, D B and Zhao A. 2017. Opening Up Higher Education with Screencasts. In: Jhangiani, R S and Biswas-Diener, R. (eds.) *Open: The Philosophy and Practices that are Revolutionizing Education and Science.* Pp. 125–138. London: Ubiquity Press. DOI: https://doi.org/10.5334/bbc.j.

the ceiling running off toward a wall with allegedly some means of transmitting audio information. One student, like some of today's students, is even staring out the window. This painting is rather prophetic in several ways in as much as the iPod was invented in 2001, and, with the ever-increasing costs of textbooks, professors have been examining alternative means of content delivery, such as electronic books, podcasts, and online interactive software.

In this chapter, we discuss issues concerning effective multimedia design and how to incorporate that into the creation and distribution of screencasts, which are movies often distributed as 'video podcasts' composed of narrated Microsoft PowerPoint or Apple Keynote presentations. My (DMB) own motivation in creating screencasts as a means of content delivery stems from my concern that information presented in a classroom is a momentary event. Students are unable to 'rewind' and easily revisit content that they were unable to grasp initially without asking the instructor to repeat the information. While such interruption and repetition does sometimes occur, it can interrupt the flow of content delivery and lead to disengagement by students who grasped the material initially. Screencasts enable students to control the pace of content delivery because movies can be made available throughout the semester for each student to watch at his/her own pace. Openly sharing course content throughout the semester can improve pedagogy by facilitating better note-taking for those students who 'rewind' the content delivery, as well as better understanding of material by enabling students to revisit those portions of the screencasts that may have been unclear upon initial viewing. Of course, sharing such materials in an open market beyond one's classroom can sometimes be challenging if materials are included that are copyright-protected, as we discuss later in this chapter. But, at least the materials are available at all times to students enrolled in the course.

The ability and ease of being able to share content either openly or in partially-open markets has coevolved with technological innovations that have been incorporated into classrooms throughout the century, but mostly in recent decades. While the future coevolution of such innovations is a matter of speculation, it might be informative to visit where it all began up to the present time.

Classroom Technology

Early forms of classroom technology were in analog format and not easily disseminated. Most likely, the earliest form was the chalkboard, which was considered to be a technological innovation when it began to appear in classrooms around the early 19th century.[2] Their popularity and enduring addition to classrooms might be attributed to the fact that they are inexpensive and relatively-low maintenance.

Electricity opened up new technological options, such as the overhead transparency projector, which evolved from non-electric 'magic lanterns' that were

invented in the 15th century.[3] The modern version of the overhead transparency projector appeared in the mid-1940s, followed by the Kodak Carousel slide projector in 1961.[4]

Rapid advancements were made in classroom technology in the second half of the 20th century and in the early 21st century. Slide projectors were increasingly incorporated into teaching from the 1960s to the 1990s and were gradually replaced with computers and video projectors. By the 1990s, overhead transparency projects evolved into document cameras. Personal computers began to appear in the 1980s, which opened up new avenues of media creation and ease of distribution.

Every advancement in hardware has been closely followed by corresponding advancements in software. What has lagged behind, until recently, is research on the effective use of such technological innovations for the enhancement of teaching and learning. Digital technology has enabled us to share video, audio, and image creations almost seamlessly, which has empowered educators to incorporate varied multimedia formats into their classrooms. But, with great power comes great responsibility, especially when using presentation software.

Multimedia Design

The advent of presentation software, such as Microsoft PowerPoint, starting around 1990, gradually led to a decline in the use of slides and overhead transparencies in the classroom. Currently, high-tech classrooms rarely incorporate carousel-type slide projectors, and overhead transparency projectors have been replaced by document cameras. Apple Keynote, originally created for Apple's CEO Steve Jobs' own presentations, became publically available in 2003. Once Keynote had been upgraded in 2006, and especially in 2009, it became an ideal alternative to PowerPoint for reliably incorporating multimedia into presentations by Mac users.

The ease of use of PowerPoint and Keynote brought with it a means of misuse and outright abuse. Needless templates with distracting background designs and images decreased available screen space for important information. Easy-to-implement, distracting animations within and between slides became prevalent and, in most cases, unnecessary. But, most notable has been the tendency of presenters to convert what used to be lecture notes into endless lists of bulleted text. Some presenters have the tendency to simply read such bullet points line by line off the screen to their increasingly disengaged students. A 2009 study found that, 'the most important teaching factor contributing to student boredom is the use of PowerPoint slides'.[5] But, it is not so much the 'use' of presentation software that leads to student disengagement and, therefore, ineffective teaching and learning, but rather the 'misuse' of such software.

Fortunately, abusing presentation software in this manner can be remedied with some time and effort.[6] One approach is replacing bulleted text with

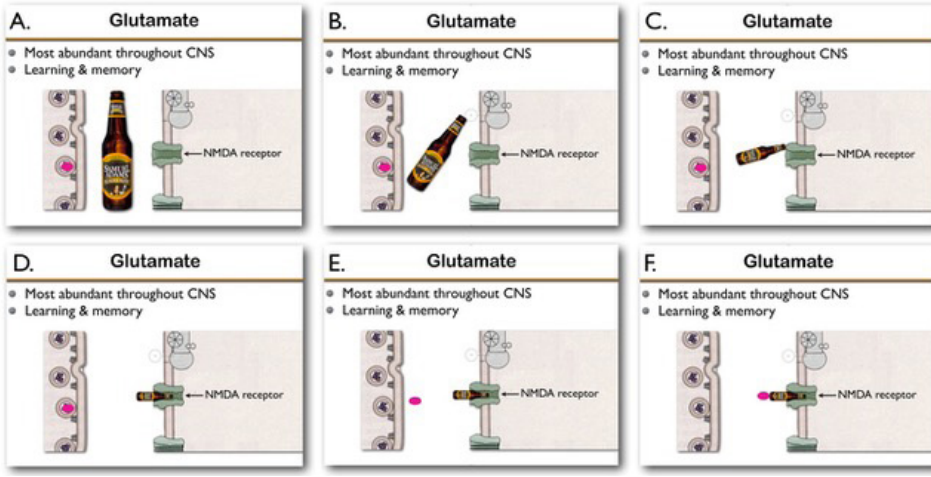

Fig. 1: Sequence of actual animation showing how alcohol blocks the action of the neurotransmitter, glutamate. 'CNS' is an abbreviation for central nervous system. (A.) Alcohol is portrayed as a beer bottle occupying the synaptic cleft between two neurons. (B.) Beer bottle shrinks and repositions as it moves toward NMDA receptor in neuron. (C.) Beer bottle continues to shrink and orients toward blocking NMDA receptor. (D) Beer bottle now totally blocks NMDA receptor. (E.) Glutamate, shown as a purple oval, is released from presynaptic neuron on the right and moves into the synaptic cleft toward so that it can lock into the NMDA receptor site. (F.) Glutamate cannot move into the NMDA receptor site because it is blocked by the beer bottle. The result is that learning and memory is disrupted because of disrupted communication in the hippocampus, which is a structure in each hemisphere of the central nervous system and is hugely involved in regulating learning and memory.

multimedia, typically with images and/or video clips. This replacement necessitates thinking about concepts and terms visually. For example, instead of a bullet point indicating that the amygdala is an area of the brain involved in emotion, show a sketch of the brain, highlighting the amygdala, surrounded by faces expressing various emotions. Or, instead of using bullet points to indicate that alcohol blocks the action of the neurotransmitter glutamate in the hippocampus, use shapes to draw a prototype receptor site, have an image of a bottle of beer, animate the beer image to reorient and move into the receptor site, preventing an image of glutamate from locking into this receptor site now blocked by the beer, and concluding to students how it disrupts the hippocampal regulation of learning and memory (see Figure 1).

Constructing slides in this manner helps the instructor think about visual means of portraying what otherwise would be expressed in bulleted text. Adding animation of objects wherever appropriate, and even sound effects, helps to convey the message.[7]

Screencasting

Following the popularity of the iPod and Apple's iTunes Store in the early 2000s, a new form of transmitting information began to gain popularity. Podcasting, as it was called when it emerged in 2004, was designated the 'word of the year' in the New Oxford American Dictionary in December 2005. Podcasting, defined as, 'A digital audio file made available on the Internet for downloading to a computer or portable media player, typically available as a series, new installments of which can be received by subscribers automatically,' changed the information delivery paradigm. Soon, some instructors began using audio podcasts as part of classroom assignments, but studies have shown that transmitting information via audio-only forms of communication is not very effective. For example, a 2010 study found that students who only receive instruction via podcasts perform more poorly than students who receive equivalent instruction via reading a text.[8] The researchers further suggest that podcasts might be useful as a course supplement or enrichment, but not as a means of primary content delivery. As prophetic as Jean Marc Cote (1901) was, the future does not lie in transforming the delivery of information from one source (reading) to another (audio).

In Fall 2005, I (DBM) began a podcast series called *iCube: General Psychology at The University of Connecticut*. (I shortened the name in 2014 to *iCube: UConn Psychology*.) The main component of that series was a weekly discussion with students from my large (n = 300–400 students) General Psychology course who chose to show up at a preset weekly time to ask questions and/or discuss topics related to what I had been covering in class. Unexpectedly, we soon had an international audience that resulted in interesting emails from listeners who wanted to learn more about psychology and, in some cases, coincidentally improve their English. *iCube* was, however, only a course enhancement. It was never intended as a primary means of content delivery. Even as a supplement, 10 years of anonymous course evaluation data showed that a majority of students (76%) who listened regularly noted that listening to the podcasts helped them learn.

In Fall 2006, I began another audio podcast series for the Honors students in my Animal Behavior course called, *Animal Behavior Podcasts*. That, too, drew listeners from around the world. Like *iCube*, it was a weekly discussion of animal behavior research. As a participant in *Animal Behavior Podcasts,* I (AZ) found the required discussions to be a meaningful avenue for expanding research ideas or questions that I had while learning the course content. In many ways, this discussion group resembled a community of learners who actively sought to take their understanding from remembering to analysis and future implications. For students interested in research, this discussion group allowed them to practice the scientific method of exploring the problem, finding the variables, and coming up with viable research approaches.

From Podcasts to Screencasts

Beginning in the Fall of 2009, I decided to explore ways of incorporating video into my Animal Behavior course. Not long before that, I became aware of screencasting as a means of recording everything on a computer screen (such as PowerPoint or Keynote presentations) while simultaneously recording narration over those screens, followed by using powerful tools for post-production editing. I was intrigued by the idea of converting my multimedia lectures into a video format that allowed students to access them day and night, seven days a week, while being able to pause, take detailed notes, replay any portions they were unclear about, and so on. Screencasting seemed like an ideal means of doing this, and I soon discovered software that was both easy to use and offered powerful editing capabilities–ScreenFlow.[9] An alternative for PCs is Camtasia (https://www.techsmith.com/camtasia.html), which also offers a version for Macintosh. Free alternatives exist, like RecordIt,[10] but they lack the powerful editing features found in ScreenFlow and Camtasia. Strictly for screen recording, Open Broadcaster Software on the PC allows users to record their computer's screen, computer audio, and additional audio from a microphone. For anyone who does not need the editing capabilities, this software works well to create videos, and an open-source editor could be OpenShot Video.[11] While I (AZ) have never used OpenShot Video, a quick search can let someone see that open source software for recording and editing exists. In addition to the software, I (DBM) used a Samson C03U USB microphone connected to my MacBook Pro laptop to do the recording. I also recorded the screencasts directly onto an external hard drive because the internal hard drive had limited space. The external hard drive also allowed simple backups and portable transfer when necessary.

It took over 400 hours to create 85 screencasts of varying length for this course, but the effort was well worthwhile. My lecture course now became a hybrid course, in which around 90% of the material was delivered via screencasts, and 10% in weekly live lectures consisting mostly of newer material that was published after the screencasts were recorded.

A notable facet of the Animal Behavior hybrid course was the consistency of the information I (AZ) received. Since the screencasts were produced similarly to the in-class lectures, I was familiar with the content delivery format even if I did not have logistical control (e.g., pausing, rewinding) over the material received in the lecture version. This consistency led me to assimilate information from the screencasts and the lectures without interruption. Often times, instructors look at hybrid courses as ways to deliver information one way online, and then use the class time for a separate instructional strategy (e.g., group work, presentations, etc.) but the Animal Behavior course was effective because the content delivery format was high quality, online, and in person. This method indicates that not all technology needs to be integrated in a special or unique way to be effective.

Distribution of Screencasts

Before implementing the Animal Behavior screencasts, I had to negotiate a means of secure distribution because of the large amount of copyrighted material. Such material included video clips from nature television programs, as well as videos and images from various online sources and publisher-supplied materials. It had been safe to project that material in a lecture because it had not been distributed to the students, but that would not be the case with screencasts. After a month of working with my university's Attorney General Office to get official permission to post these screencasts online, all parties agreed that this could be done by hosting the screencasts on my university's password-protected server after converting the videos to stream-only, rather than downloadable, and putting a notice on the website where the videos would (a) only be accessed by students enrolled in the course, (b) intended only for use in the course, and (c) could not be copied.

The conversion process was simple. I (DMB) used ScreenFlow to export the edited screencasts as QuickTime movies in .mp4 format. Then, our information technology staff converted those videos to streaming videos as reference movies that were linked to the actual videos on a streaming server. Students only had access to these streamed videos, and downloading them would lead to a reference link that would not be the actual videos. Thus, in this manner, the videos were protected from direct downloading.

Students' Responses to Screencasts

Student responses to questions that I added to our anonymous course evaluations revealed that most of the students favored this method of content delivery. Bear in mind that my screencasts had little in the way of bulleted text. Also, my narration was simply talking about what was onscreen rather than reading from a prepared script. I chose this format in order avoid the lack of spontaneity and boredom that might come from being read a script.

Figure 2 shows students' responses on a scale from 1 (Strongly Disagree) to 10 (Strongly Agree) to the statement, 'The online method of content delivery helped me learn.' Figure 3 shows their responses to the statement, 'If given a choice between two sections of this course, both taught by Dr. Miller, I would prefer this online version instead of a regular in-class version.' For each of these figures, the number of respondents ranged from 126 to 176 each year (see legend insert in Figure 4 for exact numbers).

Finally, Figure 4 shows the course grades for the hybrid course (2009 through 2014) compared to the last time I taught the in-class lecture course (2008). Exams were kept the same between 2008 and 2009, and similar each year thereafter. Course grades were based on two mid-term exams and a non-cumulative final exam.

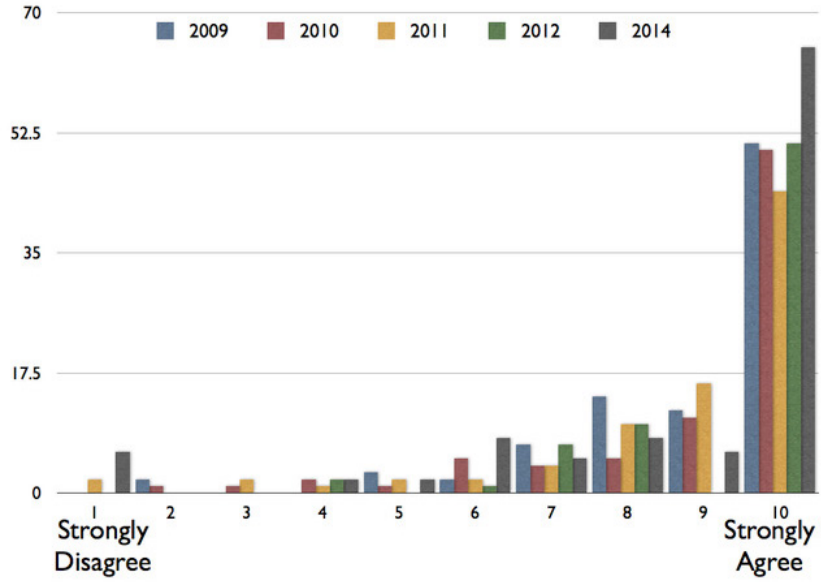

Fig. 2: End-of-semester, anonymous responses of Animal Behavior students to the statement, 'The online method of content delivery helped me learn.'

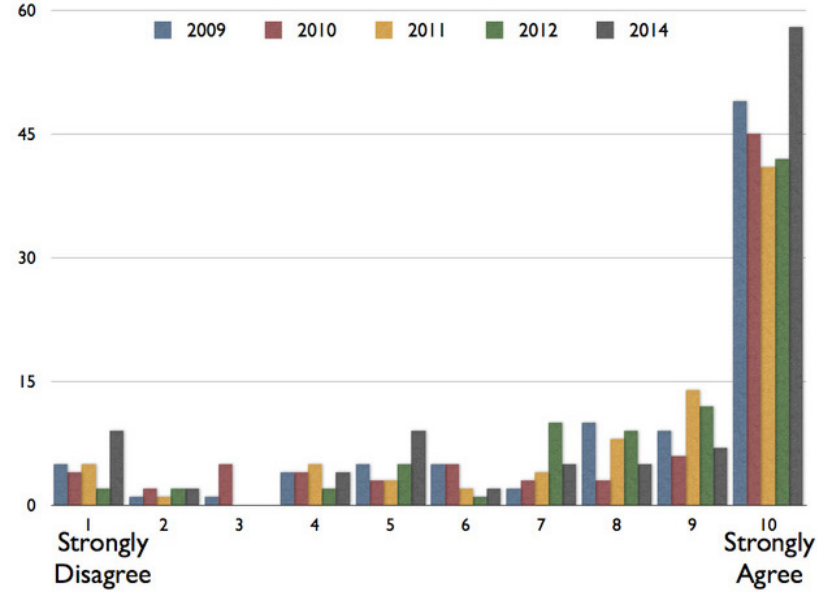

Fig. 3: End-of-semester, anonymous responses of Animal Behavior students to the statement, 'If given a choice between two sections of this course, both taught by Dr. Miller, I would prefer this online version instead of a regular in-class version.'

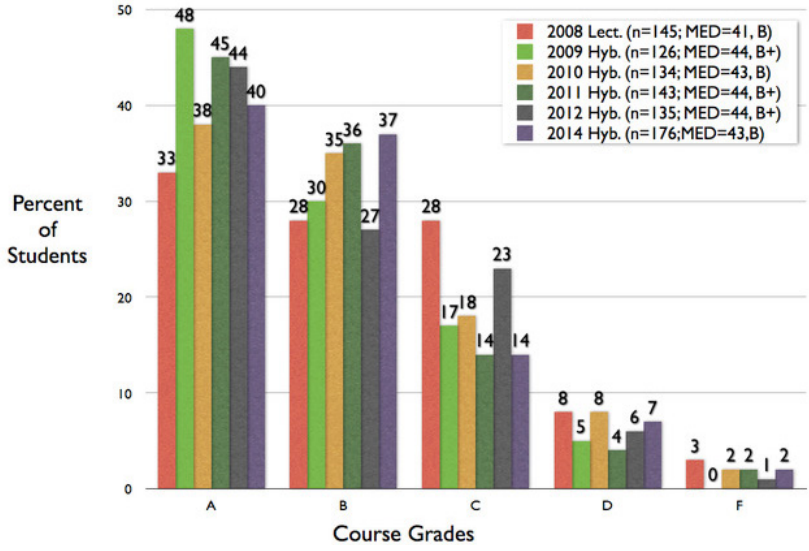

Fig. 4: Course grades based on two mid-terms and one final exam in Animal Behavior. The hybrid versions of the course from 2009 through 2014, which employed screencasts, resulted in better student performance than the 2008 in-class version. (The 2008 data are consistent with the many years prior to that in which the lecture version of the course had been taught.)

It is clear from students' responses as well as their grades that the screencasts were highly effective in student learning. Many anonymous written statements also supported the efficacy of the screencasts.

The success of the 2009 screencasts led me to do a major revision in the Fall of 2014. All of the original 85 screencasts were replaced with 84 newly-created videos for use in the course beginning in Fall 2015 and subsequent semesters.

Podcasting Revisited

I discontinued the *iCube: UConn Psychology* podcast series in the summer of 2015 after a successful 10-year run. In its place, I created a new video podcast series called *Psychological Science*.[12] Like *iCube*, the new series is intended primarily for the students in my General Psychology course. But, unlike *iCube*, this series consists only of screencasts that review, topic-by-topic, major points covered in the most recent lecture. These screencasts become available to students within a day after each lecture. To date, I have created 85 screencasts for this course.

A pilot program that I incorporated into *iCube* for several semesters indicated that students greatly valued having access to such screencasts, especially

since I have not used a textbook in this course since around 1995. I never prepared lectures from textbooks, so they were never a meaningful pedagogical enhancement to my course. Moreover, the costs to students began to increase throughout the years, so I eliminated them altogether. Instead of a textbook, I created a student manual containing course policies, graphics that I produced, a detailed course outline, and miniature versions of many of the slides (minus multimedia material) that I used throughout the course so that students could follow along with my lectures if they so choose. Another key to having the slides printed out ahead of time in a 'textbook' format is being able to align the course objectives and content with the material presented. By being on the same page as the professor every step of the way, students (like myself [AZ]) were able to know exactly what was taught, coming, and needed to be reviewed. This clarity helped to ensure that students would not be shuffling through information trying to find out what was necessary for the test, particularly because the printed slides were incomplete and students were the ones to fill in those gaps. Because there is no textbook in my course, the screencasts enabled the students to review the material, revise their notes to include points they might have missed in class, and, for students who were absent, get a better idea of what they missed in class before borrowing notes from other students. By encouraging students to review material in a concise format on a regular basis, they are given additional avenues to assimilate the material instead of simply reviewing all their notes in one session before an exam. At UConn, class attendance is not mandatory, but I've always had very high attendance in my class throughout the semester. The availability of the screencasts did not affect attendance, and I noticed an increase in students earning A's in the course once these became available.

Other Uses for Screencasts

Following the creation of the initial set of Animal Behavior screencasts, I soon discovered other applications of screencasts that did not involve course-flipping, and that have been enormously useful. Because UConn is located in New England, we have many days when, due to weather (usually snow), all classes are cancelled. These cancellations wreak havoc on professors' syllabi as they find themselves getting far behind what they had intended to cover, resulting in continuous revisions of lesson plans, exams, and assignments as the semester proceeds. Fortunately, I've never gotten behind in my lectures. Whenever the university closes due to weather, I record a screencast of that day's lecture, upload it to our server, and send the link to all of my students, alerting them that the next class will pick up where the screencast ends. Students have responded favorably to these screencasts because changes in class schedules can have a negative impact on students' plans. This is because they'd have to attend make-up lectures arranged by professors at times that they might not find convenient

because of other commitments. At my university, the Registrar designates one or more Saturdays as make-up days, and students often have work and/or other responsibilities that would make it impossible to attend such sessions. Also, on the rare occasions when I have to be away from campus, such as giving a talk at a conference on a day that I would otherwise be lecturing, I record a screencast of the missed lecture prior to leaving town and, again, alert the students to view it before the next class.

I have also found it useful to create instructional screencasts for my graduate student course assistants and exam proctors. These screencasts enable me to effectively convey my expectations of their duties. Because of my large classes, I have worked out a somewhat convoluted means of assembling the exams in terms of putting seat numbers on each exam in a specific order such that students entering the room will not end up sitting next to one another. My screencast instructions for my course assistant enables me to show this exam-assembly process without ambiguity, and something he/she can refer to as needed throughout the semester.

Exam proctors often complain about professors not informing them about their duties. My screencast instructions for proctors allow me to explain in detail what I expect of them and how to go about proctoring my exams. I typically have up to 10 proctors for each exam, so being able to centralize the instructions via screencasts has been a huge time-saving mechanism.

I have also created, on request, and free of any Creative Commons or other license, screencasts on teaching tips for graduate-student 'instructors-of-record'.[13] These are graduate students who have been assigned to teach their own courses rather than simply serve as course assistants or teaching assistants. These screencasts have also been useful to newer faculty who have not had a great deal of teaching experience, and sometimes no experience, teaching large courses.

Others have suggested that professors might consider screencast assignments for students.[14] As Ledonne (2014) indicates, most students are comfortable with technology, and the creation of videos engages a number of learning styles (audio, visual) that would not occur in a traditional culminating assignment such as a term paper; moreover, students are more likely to find such a project more engaging than a term paper and, if successful, shareable in the form of an end-of-semester 'film festival' or, if appropriate, posting on YouTube for viewing by friends and relatives. Of course, it is important that students are trained in the proper use of such technology and that adequate resources are made available by the institution to enable students who might not have their own equipment to create such projects. In terms of training, Young (2011) pointed out that some colleges are considering including courses on video production as part of the curriculum. If an instructor is already creating screencasts for their course, a guide can be easily made showing the process for a course screencast, and the course content would serve as a constant model for producing effective videos.

Distribution of Screencasts in Open Education Commons

For effective consumption of screencasts, it is important that these videos be made available in standard, cross-platform formats. Depending on the software on one's own computer, the usual formats are .mov, .mp4, and .wmv files. In the case of iTunes and iTunes U, the videos are converted automatically for viewing on computers and mobile devices.

Additional to iTunes and iTunes U (for those universities that have contracts with Apple for hosting screencasts on iTunes U), other typical outlets include YouTube, Vimeo (both of which permit the explicit choice of a Creative Commons license), Google Drive, and Facebook. Screencasts can also be uploaded into one's Dropbox 'Public' folder, where the links can be shared with specific viewers. There are also sites that specialize in hosting videos for business, such as Wistia.[15]

Another option for sharing videos (as well as sounds and images) is on Wikimedia Commons,[16] which is licensed under Creative Commons. As such, any uploaded video must be one's own work, which might place certain limitations on distribution.[17]

Of course, the issue of incorporating copyrighted material within screencasts that are hosted on non-password-protected sites remains a problem for open education. Obtaining rights can be very time-consuming and, in some cases, monetarily costly. A workaround for images is to search for content on http://images.google.com, click on 'Search Tools' just above the image thumbnails, then click on 'Usage rights.' For educational markets, the best option to now choose from the dropdown menu is either 'Labeled for noncommericial reuse with modification' if you plan on altering the image, or 'Labeled for noncommercial reuse' if you do not plan on altering the image. The 'Usage rights' option is not available for video. There are, of course, other websites that have Creative Commons search engines such as Flickr,[18] the British Library,[19] and others.

A limited workaround for video in screencasts that will be uploaded to YouTube is to link to a video rather than embedding the actual video into Keynote. Once a screencast has been exported from ScreenFlow and uploaded to YouTube, one can then use YouTube's 'Annotation' feature to link to another video. The one drawback is that you can only link to other YouTube videos. This procedure adds additional steps once you've created your screencast and will most likely result in a screencast that is less attractive than one in which the video is embedded. So, in terms of open markets in education, a password protected site is, for now, the better solution. Models for this solution include open education websites like Khan Academy,[20] where users have to create a login and password in order to access the material.

Further reading on how to use copyrighted material and its rights in open education can be found in the free PDF *Code of Best Practices in Fair Use for Media Literacy Education*.[21]

Conclusion

As technology continues to advance in ways that might enable innovative educators to enhance teaching, it is always important to bear in mind that pedagogy should take precedence over technology. Technology is cool and oftentimes fun, but there must be a reason for incorporating it into one's course to enhance student learning. If that turns out to be the case, as screencasting has for my students, it then becomes a matter of ascertaining the best way of making that material available. Some solutions are already available, such as hosting a course site on Weebly for Education,[22] which has video hosting capabilities as well as password protection. Such distribution is not entirely open, but, hopefully the concept of open education will evolve to the point where distribution of creative endeavors can more easily be accommodated.

Notes

[1] At School, n.d.
[2] Krause, 2000.
[3] Petroski, 2005.
[4] Petroski, 2005.
[5] Mann & Robinson, 2009.
[6] e.g., Schmaltz & Enström, 2014.
[7] Examples, n.d.
[8] Daniel & Woody, 2010.
[9] ScreenFlow, n.d.
[10] RecordIT, n.d.
[11] OpenShot Video, n.d.
[12] Psychological Science, n.d.
[13] iCube, n.d.
[14] e.g., Young, 2011; Ledonne, 2014.
[15] Wistia, n.d.
[16] Wikimedia Commons, n.d.
[17] Wikimedia Commons Own Work Rules, n.d.
[18] Flickr, n.d.
[19] British Library, n.d.
[20] Khan Academy, n.d.
[21] Media Education Lab, n.d.
[22] Weebly for Education, n.d.

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