Using lecture podcasts in the COVID-19 transition to virtual post-secondary education in agriculture

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Abstract
In the spring 2020 semester, Stephen F. Austin State University (SFASU), located in Nacogdoches, TX, transitioned face-to-face classes to online instruction because of the COVID-19 pandemic. The east Texas region suffers from some of the poorest internet availability in the nation. Thus, limitations exist for streaming lectures or having students download large files. Podcasts are small audio files that can be downloaded from the internet for learning. Research has shown that the use of lecture podcasts have a variety of benefits for both faculty and students. Lecture podcasts provide students small file sizes to download and access and allow them to engage with the course material asynchronously. Therefore, the decision was made to record lecture podcasts for Cultivating Plants, Plant Propagation, and Plant Breeding to deliver educational content for the class. An end of semester survey conducted by the SFASU Agriculture Department indicated that 59% of students who engaged with this type of learning felt it was extremely effective. Additional student comments and semester reflections also provided feedback. This example provides further evidence that lecture podcasts can be a useful tool for educators in an ever-changing world.

1 | THE CASE

The method of delivery of information to students is a question that educators wrestle with when teaching in higher education classes. With the arrival of the COVID pandemic forcing many faculty and students to transition from the face-to-face delivery in a classroom to online instruction, this issue became forefront. How do educators try to mimic the classroom as best as possible in a remote setting while also considering the limitations of online education?

While there are many logistics to consider when shifting to an online format, one is internet availability. To be able to remotely teach students, reliable, high speed internet is necessary for faculty and students. However, across the United States internet access and reliability varies widely (Flaherty, 2020). For example, the east Texas region has one of the weakest broadband internet infrastructures in the United States. In 2020 Deep East Texas Council of Governments and Economic Development District (DETCOG) released a report assessing the broadband capacity of the region (DETCOG, 2020). Approximately half of the zip codes in the 12-county area of southeast Texas experienced download speeds of 10 megabits per second (MBps) or less with some areas near 0 MBps. Broadband access as defined by the Federal Communications Commission (FCC) is the “percentage of population with fixed access to the internet at speeds of 25 MBps download and 3 MBps upload or higher.” While some counties like Nacogdoches county have better broadband...
access of 72%, neighboring Shelby and San Augustine counties have only 7% and 8%, respectively (FCC, 2021).

This creates issues for students downloading course materials, engaging with course lectures whether they be live-streamed or recorded, participating in discussions, and uploading required activities like homework, presentations, and projects to complete the requirements of their courses. For example, Zoom, a popular video communication app, requires 2–6 MBps for bandwidth (2020); however, in the southeast Texas area, such speeds can be unreliable for a stable connection. Therefore, if students are going to be taught remotely, there needs to be materials that are easy to download for the students to use. Rapanta et al. (2020) indicated that such considerations help to aid student online learning.

One type of technology that has emerged in the world of education over the past decade is podcasts (Aristizabal, 2009). Podcasts are audio files downloaded from the internet that users can then listen to on computers, smart phones, and MP3 players (Nataatmadja & Dyson, 2008). While many aspects of virtual learning require streaming service, these files must be fully downloaded for user engagement; however, they are small in size when compared with a live-streamed lecture or video recording (Hew, 2009). These recordings create opportunities for m-learning, a variation of e-learning where users can utilize their mobile devices to learn on the go (Rajic, 2013). Hew (2009) stated there are two different types of teacher-created podcasts—lecture podcasts that consist of an educator covering learning material in depth and supplementary podcasts that help students’ learning. Because podcasts resemble a version of the teacher-centered lecture, they are best for laying the learning groundwork for students’ learning that can then be built upon by other activities in the class. They allow convenient asynchronous education apart from the lecturer (Nataatmadja & Dyson, 2008; Jalali et al., 2011). The information in these podcasts can then be built upon by students using other pedagogical methods like self-quizzing, interleaving, and spaced retrieval (Agarwal & Bain, 2019). Rajic (2013) noted that podcasts are helpful for recording lectures for those not in attendance or those who wish to reinforce learning by listening to the lecture again. Frydenberg (2008) analyzed the number of podcasts downloaded for a particular class throughout the semester and found that as the semester progressed the number of downloads per lecture decreased. Student input indicated as the semester progressed the students would only download podcasts of lectures they missed because they were not going to take time to listen to a 60-minute podcast of a lecture they already heard. This research highlighted a limitation of podcasts being the inability to search the podcast for key terms. Others have had similar findings and suggest that “chunking” the material being taught in the podcasts, thus creating shorter more focused podcasts would allow the students to find and listen to the topics they need to more easily (Chester et al., 2011). Pedagogically, podcasts have been shown to support a constructivist mindset to teaching as they allow for student reflection and independent, self-paced learning (Ng’ambi & Lombre, 2012).

Logistically, podcasts are easy for user creation and engagement. Most of these audio files are small in size, which reduces their upload and download size for those with poor internet and limits their space on the user’s device (Nataatmadja & Dyson, 2008). Students can download content to listen to on own time and can back up or speed up as needed. Podcasts are easy to create using existing technology for both faculty and students. A smartphone recording application on it can be used, and podcast content creators can also utilize headphones and laptops for more robust file quality. Additionally, editing software is often built into the recording app, or free, user-friendly applications like Audacity can be used to edit and produce audio files. Like other technology that replaces face-to-face interaction, there are also drawbacks to podcasts, including limited visuals (Hew, 2009), download issues, limits on the hearing-impaired, a lack of interaction between students, and voice training requirements that content-creators may need (Nataatmadja & Dyson, 2008). Thus, educators who wish to use this technology may need to address these issues to use lecture podcasts in their classes.

2 | THE DECISION

In the 2020 spring semester at Stephen F. Austin State University (SFASU), the lead author taught three courses face-to-face. Cultivating Plants was an introductory level lecture and lab featuring an introduction to horticulture that is taught every semester. It is a required course for all agriculture majors, and it is a core science for other majors on campus to complete their general education requirements. Plant Propagation was an upper level, required lecture and lab for horticulture majors where students learned about sexual and asexual plant propagation practices. Plant Breeding was
an agriculture elective lecture course that covered topics like plant genetics, qualitative and quantitative traits, and genetic engineering. Plant Propagation and Plant Breeding are taught once every two years. Enrollment in the courses were 80, 12, and 13 students respectively.

In mid-March with the arrival of COVID, SFASU announced plans for all instruction to go online for the remainder of the semester. Many discussions amongst faculty revolved around live-streaming course material to students through Zoom and other streaming technologies. However, since SFASU is located in rural east Texas, concerns were raised about students with poor internet having access to streaming education. Thus, the lead author made the decision to continue the courses asynchronously and create lecture podcasts to instruct students in the three courses aforementioned since he had prior experience with podcasting. This approach was a unique teaching method used in the SFASU agriculture department.

3  TEACHING NOTES

Prior to moving the course online, face-to-face lecture in these courses involved a PowerPoint slide presentation with the lecturer narrating through it and interjecting stories, questions, and discussion topics to the class. After classes were moved online in mid-March, this approach was modified into creating lecture podcasts that included both more detailed PowerPoint slides and the narrated podcast audio file. These complementary materials were uploaded to D2L, SFASU’s online learning platform. The PowerPoint presentation was saved as a reduced size PDF. For Cultivating Plants, Plant Propagation, and Plant Breeding, the average audio and PDF file sizes were 29.8 and 2.8 MB, 50.1 and 1.5 MB, and 25.0 and 2.2 MB, respectively. For the podcasts, initially, the voice memos app on an iPhone (Apple, Cupertino, CA) was used to record with the complimentary headphones. However, later recordings occurred using MPOW recording headphones (MPOW Technology Co., Ltd., Hong Kong) and Audacity (version 2.4), a free, open-source recording platform that allows users to pause, edit, and splice recordings together. Additionally, one can adjust the recording volume to to make sure the level is good for listening; their built-in user manual recommends recordings have a maximum volume of -12 to -6 dB as anything above that may result in poor audio quality. During the recording, the lead author narrated over the PowerPoint slides expounding on relevant information and prompting questions to help students think more deeply about material. To help students follow along with the recording and PDF file, the narrator would also state the page number with the advancement of each slide. Once finished, the recording was exported as an MP3 file. Along with these podcast and PDF files, additional supplementary lab handouts, calculation sheets, and tests were uploaded online. Students in Plant Breeding were required to create podcasts for their end of semester presentations, and then listen to each other’s podcasts and provide reflections. However, no data or feedback was collected about their presentation podcasts for this paper. Along with this lecture podcast approach was the continual communication with students about expectations. Emails were sent out multiple times a week and a to-do list was posted each week in the content section of D2L for students.

Since enrollment was highest in the Cultivating Plants class, we provided the data of visits to the course material. Prior to the introduction of podcasts, PDF files that accompanied face-to-face lectures 1–8 were viewed by 55% of the students in class. PDF files that supported the podcast lectures 9–18 were viewed by 67% of students, and the podcasts for lectures 9–18 were visited by 44% of students. We observed the same trend that Frydenberg (2008) reported of a decreasing number of students accessing the podcast as the semester progressed (Figure 1).

Towards the end of the semester, the SFASU agriculture department sent out a survey consisting of 22 questions to approximately 360 agriculture students to assess student learning during the pandemic. Some questions allowed students to choose the best answer or rate the instruction method using a Likert-type scale, while other questions were open ended. A panel of experts confirmed face and content validity of this instrument which was approved by the IRB board at SFASU. For this particular paper, the following questions are relevant to the lecture podcasts and were asked about instructor delivery method and internet availability:

- Regarding the online teaching methods your agriculture professors used after classes were moved to an online format (not including classes that were already online), rate the method’s effectiveness as extremely effective, somewhat effective, not effective, or indicate the method was not used.

- After spring break which statement best describes your internet access?

For the first question, there were thirteen options for students to choose from since the faculty in the agriculture department used a variety of methods to educate students (Table 1).

There were a total of 80 students that responded to the teaching methods question in the survey. For each teaching method for that question, there were students who indicated the method was not used in their class. Thus, to standardize discussion about the results, percentages of students who responded are used, and the number of students who provided that response is designated in parentheses. Thirty-nine students indicated they had used the lecture podcast method for their class; 59% (23 students) rated this approach as very
TABLE 1  Student responses to the question, “Regarding the online teaching methods your agriculture professors used after classes were moved to an online format (not including classes that were already online), rate the method’s effectiveness,” at Stephen F. Austin State University (SFASU)

| Teaching method                                             | Total responses | Extremely effective | Somewhat effective | Not effective |
|-------------------------------------------------------------|-----------------|---------------------|--------------------|---------------|
|                                                            | Total           |                     |                    |               |
|                                                            | responses       | %                   | %                  | %             |
| Professor demonstrated activity in a recording              | 46              | 32                  | 70                 | 13            |
| Professor recorded Podcasts with slides in PDF              | 39              | 23                  | 59                 | 14            |
| Recording of professor teaching in the classroom just like you were in the class | 41              | 21                  | 51                 | 18            |
| Pre-recordings of classes taught in previous semester       | 27              | 13                  | 48                 | 12            |
| Recording of professor but you mainly or only saw the computer screen | 59              | 26                  | 44                 | 28            |
| Pre-recordings of guest speakers who visited in a previous semester | 37              | 16                  | 43                 | 18            |
| Podcasts recorded by someone other than the professor       | 16              | 6                   | 38                 | 4             |
| Professor had a guest speaker via Zoom and provided the recording | 17              | 6                   | 35                 | 8             |
| An existing online module/class/certification not produced by SFA faculty | 22              | 6                   | 27                 | 11            |
| A video that was not made by SFA faculty that taught or demonstrated content (example would be a video produced by Extension) | 27              | 7                   | 26                 | 15            |
| Class scheduled as normal via Zoom                          | 35              | 8                   | 23                 | 18            |
| Professors provided PowerPoint slides only with no explanations | 44              | 7                   | 16                 | 14            |
| Professor assigned readings                                 | 44              | 6                   | 14                 | 24            |
FIGURE 1 The number of students in Cultivating Plants who accessed lecture PDF files and lecture podcasts during face-to-face and online podcast lectures at Stephen F. Austin State University (SFASU)

effective, 36% (14 students) somewhat effective, and 5% (2 students) not effective. Percentage wise, this approach was the second highest extremely effective method used in our department, behind 70% (32 students)—a professor demonstrating an activity during a recording. These results support the effectiveness of using podcasts in education as previously detailed in other research (Hew, 2009). It should be noted that students provided feedback on professors who had class scheduled as normal via Zoom, and 23% (8 students) rated this as extremely effective, 51% (18 students) somewhat effective, and 26% (9 students) not effective. From open feedback during the survey, 12 comments mentioned the lecture podcast approach. Of these comments, nine students provided praise of the teaching method (“favorite teaching method”, “it works well”, “loved”). Students detailed “this method works best for my schedule, and I am able to pause and replay information if needed,” “[this] style was really helpful because it was like I was in class,” and “it was easy to access, and the small file size made it easy to download.” No negative feedback was mentioned about the lecture podcasts; however, prompting could have elucidated more from those students who indicated that this approach was not effective.

Part of the popularity of this approach could have been the unreliable internet access. From the survey, 87 students answered the question about internet access, and 32 students indicated they had some issues with internet. Of those that had issues, 75% (24 students) said their internet was unreliable and 25% (8 students) said they had to access internet from someone else. These comments reiterate issues about the unreliability of internet for students and the potential challenges that can cause students in the transition to online education.

4 DISCUSSION

From both the survey and personal conversation with students, the lecture podcasts help deliver knowledge and educate students much like a face-to-face lecture environment. In reflections from the spring semester, the lead author realized other activities could have helped to enhance the lecture podcasts like having more discussions online and fostering a group chat through GroupMe, Slack, or another type of instant message platform. Additionally, while no students requested aid through our university disability services office, the use of podcasts for hearing-impaired students is a concern. However, Zoom and Descript do provide the options to record audio and have it transcribed as a premium service. As classes are still being taught in a world of COVID-19, material for fall 2020 classes is still being provided to students using lecture podcasts, and the aforementioned approaches have been added to classes for this fall semester to help foster student creative thinking and build community in the class. And, in an ever-changing world, podcasts provide educators yet another tool to use to help educate students and provide students with content creation tools for their classes.
CONFLICT OF INTEREST
The authors declare no conflict of interest.

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