

Student-Created Podcasts in the Engineering Communication Classroom

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Abstract

In most early research on the use of podcasts in advanced education, students are consumers of podcasts that are often recorded lectures. However, recent scholarship analyzes the educational value of student-generated podcasts and this paper contributes to that emerging effort, in particular in the context of engineering education. This paper presents the author's implementation of a team assignment to create a podcast about a topic related to one of the Grand Challenges of Engineering. Student teams researched a chosen aspect of a Grand Challenge; they collaborated to ensure a cohesive vision for the podcast; they prepared questions and recorded interviews with guests; they assembled their individual segments into a cogent structure depending upon the podcast genre selected by the team. The paper addresses both pedagogical and practical aspects of the assignment and presents learning objectives and assessments. Additionally, ABET outcomes are considered. Finally, additional research is recommended with a larger sample size, multiple classes, and multiple instructors.

Background: The Evolving Use of Podcasts in Higher Education

The body of scholarship addressing the use of podcasts in higher education is growing. Generally, articles from the early 2000's on the use of podcasts in higher education consider students as consumers of podcasts that deliver course content, such as recorded lectures and supplemental material. Research demonstrates that students view podcast content-delivery as a useful, enjoyable, and advantageous learning tool in traditional, distance learning, and m-learning (using portable, handheld devices to access content) contexts.^{1, 2, 3, 4} Student appreciation for podcast-delivered material is hardly surprising, given the new medium's increasing cultural presence. According to a recent article in Forbes, general long-form podcast consumption is experiencing "explosive growth," tallying 67 million listeners in 2017, which is a 45% increase from 2015 and a 180% increase from 2009 listening levels. Additionally, podcast usage is greatest among the 18-34 age group, which includes most higher education students.⁵ For many students, then, podcasts have become a common medium for receiving information and the use for educational purposes is a logical extension.

More recent scholarship marks a significant shift and is beginning to address the educational value of student-generated podcasts: in this research, students move from consumers of podcasts to producers of podcasts. In short, rather than listening to podcasts to receive course material, students create their own podcasts as part of an active educational experience. Recent articles address student-created podcasts for a diverse range of majors, including business,⁶ literature,⁷ language-learning,⁸ information technology,⁹ and general engineering.¹⁰ The level of technical assistance with the recording and editing aspects of the assignments varied greatly, from no assistance to dedicated class sessions and expert assistance. Podcasts were assigned as both team and individual assignments. Most, but not all, podcast assignments required interviews. Overall, the student assessment of the assignments ranged from mixed to positive. The variety of course content and the differences between the assignments attest to the adaptability of the medium.

This paper's goal is to contribute to the emerging scholarship on student-generated podcasts, specifically in the context of engineering education. This paper examines the author's implementation of a student-generated podcast assignment, and it will consider the following questions:

- Which, if any, of the ABET student outcomes were achieved by this particular assignment for student-created podcasts?
- What educational value, if any, did this particular student-created podcast assignment add?

The paper presents the context of the assignment, describes the assignment, and lists the intended learning outcomes. Then, it provides assessment data, discusses the research questions, explores the limitations of the research, and considers the potential for future research.

The Assignment: Context and Details

All students at the University of Southern California Viterbi School of Engineering are required to take an upper-division general education writing course; a dedicated version of the course is designed specifically for engineering majors, but students of any major are allowed to enroll. The course is 3 units and has a prerequisite of a lower-division writing course. Additionally, the course for which this assignment was created had a special focus of Disciplinary Grand Challenges, meaning students would consider the Engineering Grand Challenges or wicked problems in their non-engineering fields in a sustained manner. A team project is required for the course. This particular class had 17 students enrolled, and 10 were engineering majors; one non-engineering did not complete the podcast assignment.

The assignment was inspired by an activity at the 2017 Grand Challenges Summit Student Workshop, which tasked teams of students to create podcasts for judging by a panel of experts (the podcasts are available at <https://soundcloud.com/user-714723782>). In class and for homework, students listened to several of the podcasts from the Workshop, and class discussion focused on various elements of the podcasts, such as narrative strategy, audience engagement, interview techniques, and depth of research. One striking feature of the Workshop podcasts was their diversity: a variety of engineering fields and several different countries were represented; additionally, some teams included both undergraduate and graduate students. Interviews with experts featured prominently in most of the podcasts; student podcasters had access to engineering professionals and professors at the Summit, and these interviews added depth to the podcasts. In short, from listening to several of the podcasts, the parameters seemed flexible and varied, with common elements being interdisciplinary teams and the inclusion of interviews and researched material.

Similarly, the assignment's requirements were flexible to encourage student creativity. First, students were allowed to form their own teams based on topic interest: teams ranged from 2-5 students and mixed engineering majors with non-engineering majors. Second, the length requirement was undetermined with a minimum expectation of 4 minutes speaking per team member. Required parameters included: the podcast must examine an aspect of a Grand Challenge or a wicked problem in a non-engineering discipline; research must be incorporated into the content; at least one interview should be included (but the subject could be a student if a

professor or expert in the field was unavailable); all team members should speak on the podcast for a roughly equal time. The deliverable podcast needed to be submitted in an mp3 format.

The assignment was created to require only a smartphone and free applications, with the assumption that at least one team member would have a smartphone (in fact, every student in class had a smartphone). The free app Anchor was recommended to the students: it has drag and drop editing, simple splicing, and insertion of introduction and bump music. It also has a feature allowing another user to join in a recorded conversation; this ability would be helpful for recording the required interview, foregoing the need for in person interviewing. The Anchor app has an average rating of 4.5 out of 5 stars on iTunes with over 40,000 reviews. Class time was provided for students to familiarize themselves with the app and ask questions. Additionally, the instructor created two podcasts with the app and shared them with the class to acquaint them with its features. At this beginning stage of the assignment, students familiar with Mac's GarageBand noted its capabilities and ease of use as well. SoundCloud was considered as a free platform for distributing the podcasts; instead, teams submitted their audio file by email as the intent was not public distribution. The technology bar, then, was kept low, valuing simplicity and inexpensiveness; if students were to want to create a personal or professional podcast in the future, they would have all the tools necessary.

To help promote structure and cogency for the students' podcasts, the class discussed an article about genre conventions in podcasts, "Educational Podcasts: A Genre Analysis," by Christopher Drew.¹¹ Drew designates multiple podcast genres and provides lists of conventional "moves"—expected elements—in each genre. Awareness of these categories and their conventions was useful for students in analyzing podcasts they listened to and in creating their own podcasts, particularly when assembling individually voiced segments into a cogent structure. The students primarily used two genres, "narrative" or "chat show" or a blend of the two (Drew notes a third category for shorter podcasts, the "quick burst" which did not lend itself to this assignment). Below, one student reflects upon the process of deciding which format to employ for his team's podcast:

Reading this article has made me more aware of the different styles of podcasts and the varying advantages different styles bring. When taking to account our topic, personalized learning using AI, I believe that we would benefit from a more Chat show style of podcast [sic]. Not only would a narrative about what essentially is school be extremely boring, but since a central motive of personalized learning is that it varies from person to person, composing a narrative about a singular, or even multiple, person(s) may not do it justice.... Furthermore, there is a surplus of potential ramifications and impacts this technology may bring, and since our group has a lot of different people from different backgrounds a chat show style of podcast could prove to have stronger content than a narrative.

Here the student astutely considers whether a genre's structure would complement the chosen topic; the student also expresses a connection between voice and perspective, wanting to use the chat show format so that each speaker could express a distinct contribution.

Additionally, the students were provided with two podcasts of the instructor interviewing experts. These podcasts were primarily intended for instructional content, with the secondary benefits of modeling interview techniques and demonstrating the simplicity and capability of the editing technology. For the first podcast, the instructor recorded an interview with a professional journalist who also teaches Advanced Communication for Engineers at the University of Southern California, Marc Ballon. Ballon shared professional tips and engaged the listeners with memorable stories of his own interviewing experiences. After listening to this interview, students submitted questions for the instructor to present to the creator of the podcast Viterbi Voices, Paul Ledesma, who was an early adopter of podcast technology. The student questions were thoughtful and ranged from practical (How do you find balance between multiple voices? How many voices are too many? How much content should be scripted?) to conceptual (What drew you to the medium of podcasts? How is a podcast different from an interview? Should interviews embedded in a podcast have a different style than normal interviews?). The open-ended and thoughtful nature of their questions demonstrated understanding of the interview techniques presented by Ballon. The instructor recorded an interview with Ledesma using the student questions, and students listened to the podcast for homework before class discussion. Overall, the two recordings enriched the students' perspective on both the technical and conceptual aspects of podcast creation.

Making the podcast entailed several steps: students selected teams based on the Grand Challenge they wanted to address; they narrowed down their topic and created a podcast outline to ensure a clear vision; they researched their topic; they reached out to experts and prepared questions and recorded interviews; they assembled any individually recorded segments into cohesively structured podcasts; and they edited the recording. Ideally, the process would be collaborative at all steps, but typically one student handled the final editing duties. There were 4 teams, ranging from 2-5 members. The team composition and the topics and they discussed were: 2 non-engineering majors discussed Los Angeles Traffic (Restore and Improve Urban Infrastructure); 4 engineering majors and 1 non-engineering major discussed Urban Heat Islands (Restore and Improve Urban Infrastructure); 1 engineering major and 3 non-engineering majors discussed Personalized Learning in High School (Advance Personalized Learning); and 5 engineering majors discussed Artificial Intelligence to Enhance Personalized Learning in Third World Countries (Reverse Engineer the Brain and Advance Personalized Learning).

The learning objectives assessed included the abilities to: 1) communicate with rhetorical awareness to a multifaceted academic, public, and professional audience (modeled upon the Student Summit podcasts); 2) demonstrate upper-division level research abilities, including interviewing skills; 3) identify and analyze pressing ethical issues within their discipline; 4) prepare and give professional oral presentations; 5) articulate the impact their discipline has on everyday life; and 6) work collaboratively to research, write, and present information and ideas. Students were surveyed about their learning experience after submitting their podcasts and before receiving their grades; surveys were anonymous.

Results: Learning Objectives Assessment Data

Given the prominence of teamwork for the assignment, indirect student assessment is particularly valuable to provide insight into the collaborative process. Sixteen students completed the podcast assignment and were sent an anonymous survey link. Fourteen students responded, and all fourteen answered the first set of questions. The first set of questions asked

the students to assess the assignment’s success in meeting its learning objectives (a second set of open-ended questions will be discussed below). The results of this first set of questions (with answers based on a 5-point Likert scale) are shown in Table 1 below. All the scores are 4.0 or above, indicating a strong positive assessment by the students of their learning experience.

Assessment questions	Average score	Standard deviation
Question 1: The Podcast Assignment met the following objective: to communicate with rhetorical awareness to a multifaceted academic, public, and professional audience	4.4	.51
Question 2: The Podcast Assignment met the following objective: to demonstrate upper-division level research abilities, including interviewing skills	4.1	.76
Question 3: The Podcast Assignment met the following objective: to identify and analyze pressing ethical issues within your discipline	4.2	1.25
Questions 4: The Podcast Assignment met the following objective: to prepare and give professional oral presentations	4.0	.96
Question 5: The Podcast Assignment met the following objective: to articulate the impact your discipline has on everyday life	4.4	.74
Question 6: The Podcast Assignment met the following objective: to work collaboratively to research, write, and present information and ideas	4.6	.51

Table 1: Data from student survey

Overall, student indirect assessment reflects a positive learning experience and satisfaction with skill mastery.

Instructor evaluation noted common strengths and weaknesses across the submissions. The most common strength, exhibited by all the podcasts, was the collaborative presentation of the material (Objective 6). The chat show format prompted the students to explore multiple aspects of their chosen issue from different perspectives, engaging in what Chris Forester terms the “heightened conversation” nature of a podcast.¹² While on the one hand, having each student express one particular point of view encourages an interaction of distinct perspectives, it is less synthetic than the unified voice of a written team report. While this may seem potentially reductive with students expressing one perspective each, the decision demonstrates a rhetorical awareness of the conventions of the chat show genre, choosing an audio format that makes it easier for audiences to process the information. More than just a “heightened conversation,” students are creating an “institutionalised [sic] conversation” according to the article they read about genre conventions.¹¹ Students are speaking from a co-host role with authority and with individual voices but within a larger vision of a cogent podcast episode on the topic.

Interestingly, the meeting of this Objective (collaboration) was also scored the highest by the students and with the lowest standard deviation.

The second notable strength was the incorporation of research for support, including effective interviewing techniques. An example of strong interviewing skills (asking a question, obtaining information, connecting information to previously learned information, and transitioning to a new point) is the following student exchange with an architect who incorporates biomimetic principles and smart materials into her designs:

Student: Ok, and so when [the material] heats up, what exactly does it do that helps to keep the heat out?

Expert: So when the material moves it can entirely open up...the pieces will curl relative to the interior temperature of it being just warm so when the material moves it can actually open up...so it will allow... the hot air to release and escape.

Student: Ok, so it's like the pangolin scales [mentioned earlier by the expert], where when it's too hot they lift up to ventilate?

Expert: Yes.

Student: How do these kinds of technologies compare to the other energy saving technologies?

The student also demonstrated mastery of Objective 1, recapping and connecting the expert's points for the benefit of the audience and in accordance with genre conventions fulfilling the role of interviewer and host. Interviews with experts, however, proved challenging for all teams as they often allowed the interviewee to speak too long without engagement (even the very skilled student in the above exchange falls into a passive mode later with this expert): in these instances, the students broke from the genre conventions and in essence resigned their "host" position. Teams had the ability to edit the interviews, but either students didn't recognize these lapses or they intentionally chose to let the monologues remain: if the former, this shortcoming reflects incomplete understanding of the genre; if the latter, this shortcoming connects to the students' frustration with the final editing process.

The most common shortcoming, according to the qualitative direct assessment of instructor grading commentary and quantitative assessment of negatively affecting team grades, was related to Objective 4, giving oral presentations: some students would clearly be reading a script instead of speaking in a natural, conversational voice. Johnson notes the dilemma of evaluating students based on the form, or delivery, of the podcast material.⁹ However, in the Advanced Communication for Engineers course at the University of Southern California, student oral presentations are routinely videotaped and provided on Blackboard for their review; students are graded on their delivery of the presentation separately from the content. For the podcast assignment, students learned the genre conventions of the podcasts that emphasized a conversational presentation of material, so this common shortcoming was unexpected.

In addition to the Likert-scale questions on the survey, students were asked open-ended qualitative questions. The first question asked the students, “What was the most valuable aspect of the Podcast Assignment?” There were 14 responses and they can be distilled into 5 common categories: new medium/oral format (7 mentions); interviewing experience (4 mentions); team work (4 mentions); relevance to profession or daily life (3 mentions); research experience (3 mentions). Additionally, the students were asked: “What was the least valuable aspect of the Podcast Assignment?” Twelve students responded and 3 repeated categories emerged: editing time (3 mentions); team work and/or team size (2 mentions); lack of defined parameters for assignment (2 mentions). Overall, the students appreciated the use of an innovative medium, but they felt the editing/production time was not valuable; this finding is echoed in other case studies.^{8, 13} Later, one student noted that the Anchor platform crashed on the team when they had almost finished production. One team used Mac’s Garage Band entirely; the student was a music production major who had strong familiarity with the program. Another student noted her team switched to Mac’s Garage Band early in the process. The conflict between enjoying an innovative experience and the learning curve for even basic technology is a double-edged sword. However, frequent comments in the surveys of students completing a written report version of this assignment are similar: even in the days of GoogleDoc, one student often shoulders the burden of compilation and final editing or teams neglect to schedule appropriate time for the task.

Finally, the students were asked, “Do you have any other comments about this assignment?” The question received only 5 comments with 4 of them mentioning the assignment was “fun” “enjoyable” or they “loved doing it with [their] classmates”. The one comment that didn’t specifically say the assignment was enjoyable offered a thoughtful analysis: “It was nice to have a break from intense writing activities. And it was nice to have something somewhat unconventional. However, I’m not sure that I left feeling the same sense of satisfaction that I get when writing a paper. How can we take our podcasts to the next level? What new tools can we add to our tool belt? That’s what I really wish I had more of.” The very valid points raised by this student will be explored later in the paper.

Discussion

In addition to describing the assignment and providing assessment results, this paper set out with two questions:

- Which, if any, of the ABET student outcomes are achieved by this particular assignment for student-created podcasts?
- What educational value, if any, did this particular assignment for student-created podcasts add?

The first question, concerning ABET outcomes is addressed below in Table 2, which maps the assignment’s learning objectives to both ABET’s 2016 Outcomes and the Outcomes effective 2019.^{14, 15} Notably, the assignment accommodates the general intended direction of engineering education development.

Assignment Learning Objectives	2016 ABET Outcome	New Language Approved by the EAD October 20, 2017 Applicable beginning in the 2019-20 cycle
1) to communicate with rhetorical awareness to a multifaceted academic, public, and professional audience 4) to prepare and give professional oral presentations	(g) an ability to communicate effectively	3. an ability to communicate effectively with a range of audiences
2) to demonstrate upper-division level research abilities, including interviewing skills	(i) a recognition of the need for, and an ability to engage in life-long learning	7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies
3) to identify and analyze pressing ethical issues within your discipline 5) articulate the impact their discipline has on everyday life	(f) an understanding of professional and ethical responsibility (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
6) work collaboratively to research, write, and present information and ideas	(d) an ability to function on multidisciplinary teams	5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

Table 2: Mapping assignment objectives to ABET Outcomes

As discussed in the previous section, all of the student-generated podcasts successfully met the assignment’s learning objectives and by extrapolation the assignment supported the desired learning outcomes.

While the first question was answered affirmatively that the team podcast assignment contributes toward achieving ABET outcomes, this alone does not merit an assignment’s place in the curriculum. If an assignment is added to the coursework, it invariably replaces another student learning activity: would this replacement be a positive benefit for the students? The second research question—“What educational value, if any, did this particular assignment for student-

created podcasts add?”—cannot be definitively answered from this one case study or its assessment methods, but key observations can be noted.

Grades as instructor assessment showed minor improvement in student achievement compared to other classes completing a written team report about a similar Grand Challenge topic, but a host of factors (time given for the assignment, greater weighting in overall grade, timing during the semester) and the small sample size minimize the meaningfulness of that observation.

Nonetheless, this minor improvement is encouraging because students were using a new medium of communication. Other studies on educational podcast use have similar difficulty in providing quantitative data supporting improved student performance. For instance, analyzing content-delivery podcasts, Drew contends that there is “little empirical evidence” for content-delivery podcasts having “tangible effects for improving student grades....Rather than being framed as tools for enhancing student grades, then, podcasts are widely seen as a means for engaging students in ways that might motivate them in learning content and increasing rapport between teacher and student.”¹¹ Another study provided podcast material for two classes: in one class, the podcast was “tightly coupled with pedagogy” through connected assignments, and in the other class it was not.² The authors found that the students accessed the podcasts more when they were integrated with other tasks for the class; the authors considered both teacher-generated and student-generated podcasts, but they did not evaluate student learning with quantitative data of grades or qualitative data of instructor commentary. Both of these points—first, that the value of content-delivery podcasts lay in its engagement of students; second, that this engagement is most pronounced when podcasts connect to other assignments in the course—can be applied to the dynamics of student-generated podcasts as well. In short, the innovative use of the technology promotes student engagement, most particularly when connected with other aspects of the classwork.

Lessons Learned

Based on instructor assessment noted in the Results section, there were two common shortcomings in the students’ podcasts: interviews would lapse into expert monologues; students would read from a script instead of engaging in conversation. These shortcomings are not inherent in the process of student-generated podcasts, so future iterations of this assignment should be able to improve in these areas. In fact, a similar case study reflecting upon student-generated podcasts noted “the opportunity to edit their oral work to truly capture their arguments was unique to this project and contributed to their overall development.”¹⁶ Likewise, the ability to edit interviews should prevent long monologues. However, students considered the editing task as the least valuable aspect of the assignment. Potential solutions include providing recording technology instead of the students’ phones and providing more in-class editing time with supervised technical assistance. These improvements might also address the desire of the student who wondered: “How can we take our podcasts to the next level? What new tools can we add to our tool belt?”

However, “tools” aren’t necessarily technology: in the creation of student-generated podcasts the tools include the rhetorical strategies of the podcast genre and the team-based implementation of them to achieve a cohesive, structured response to the topic. Given the cultural ubiquity of

podcasts, the opportunity for students to create their own podcast should improve their critical listening and critical thinking skills when they are in the position of podcast consumer (whether in an educational or non-educational context). The well documented strengths of podcasts as a content-delivery educational tool (chiefly, its enjoyable format and the convenience of its on-demand availability) differ from potential strengths as an educational experience (found here to be collaboration and interviewing skills). As Cane and Cashmore note, “[S]tudent-developed podcasts can be a useful learning tool both for developing subject-specific understanding and in developing a wide variety of transferable skills,” including team work.¹⁷ More class discussion analyzing a variety of educational podcasts along with team-based scaffolding assignments that contribute to assembling the final podcast product could improve the quality of student-generated podcasts and enhance the educational value of the experience.

Future Work

This student-generated podcast assignment was a pilot study, believed to be the first of its kind in for engineering students at the University of Southern California. Clearly, a limitation of this case study was its small sample size. The assignment will be re-administered by the author and possibly other instructors of Advanced Communication for Engineers. Potentially, a version of the assignment not connected to the Grand Challenges could be incorporated into other courses, including upper division and graduate engineering communication courses. Certainly, implementation by additional instructors would deepen the value of the assessments. To provide comparative data, it would be useful to have a control group engaging a closing aligned non-podcast version of the assignment as a traditional team written report and oral presentation. Additionally, to provide clearer data about the value of the assignment for engineering education, surveys could be coded to indicate whether the respondent was an engineering major or a non-engineering major. In response to student feedback about the editing process, arrangements have been made to provide recording equipment and technological support. Some teams had difficulty finding an expert to interview, so students suggested creating a pool of faculty and engineering professionals who would be willing to be interviewed; this suggestion will be pursued. Also, the author and collaborators Steve Bucher, Sarah Mojarad, and Martha Townsend received a grant to develop student-generated podcasts as dynamic content for the Viterbi School of Engineering’s existing online magazine and journal. It is hoped that these podcasts can function as models for students’ class assignments. Although the current case study is limited, it is a starting point: more research is both merited and necessary to determine the pedagogical effectiveness and value of student-generated podcasts in the context of engineering education.

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