Using a Podcast to Increase Student Motivation, Desire, and Commitment to Engineering

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Abstract:

This "Complete Evidence-Based Practice" paper explores using an engineering podcast to increase college student motivation, desire, and commitment to the field of engineering. Many engineering students enter their majors with minimal knowledge of the discipline. Additionally, many current high school students report being interested in STEM-related fields, but are unprepared for this endeavor [1]. To help address this issue, the authors launched "The Engineering Student Experience Podcast" in 2019 to enhance awareness of engineering as a major and a career option. In a study conducted by Nissenson et al. (2020), the first five episodes were evaluated by engineering students enrolled in California State Polytechnic University Pomona's College of Engineering's First Year Experience course, "EGR 1000: Engineering, Society, and You" [2]. After listening to the episodes, students completed surveys that probed their opinions about the podcast's format and the perceived usefulness of the podcast as a current student and future engineer. Most students obtained useful ideas from the episodes and felt more likely to succeed as an engineering student and engineering professional. The first five episodes of the podcast focused primarily on the differences between majors, experiences of current students, and experiences of faculty. Many students requested episodes featuring interviews with professional engineers to learn what day-to-day life is like for engineers in various fields. As a result of the study, several episodes were recorded involving interviews with practicing engineers in both the private sector and public sector. This allowed for different types of engineers to be included on each episode to show how a workplace functions and how different engineering disciplines cooperate.

This study focuses on the potential impact of interviews with practicing engineers on student motivation and commitment to engineering. The students involved in the study were current first-year students in EGR 1000. The course serves approximately 1100 students a semester and focuses on lifelong learning as one of its anticipated student learning outcomes. The course has a lecture and laboratory component, but this study was conducted only in lecture sections of the course to avoid duplication of students. Not every section of the course participated in the study. Students in four sections of EGR 1000 completed an assignment that required them to listen to one podcast episode with an engineer from the private sector (e.g., refrigeration systems manufacturing, amusement park engineering, or large warehouse logistics) and one episode with an engineer from the public sector (e.g., electric utility, water utility, air quality agency). We chose to compare a private sector with a public agency as prior research points to first generation female students gravitating towards public sector employment [3]. Students then completed surveys that probed the impact of the episode on their motivation to study engineering, level of knowledge about what engineers do, desire to be an engineer, commitment to the field of engineering, commitment to being a student, and motivation to pursue a career in engineering. Each question used a five-point Likert scale that ranged from 1 (strong negative impact) to 5 (strong positive impact). The results showed that most students reported the episodes had a positive impact in all categories (motivation, knowledge, desire, etc.), suggesting podcasts may be a useful medium for helping new engineering students become better prepared for their major and future career. When comparing the ratings for private sector episodes to the ratings for the

public sector episodes, both types of episodes received similarly high rates of positive responses. However, the public sector episodes received slightly more negative responses.

Students also provided open-ended feedback about why they selected a particular episode. The feedback indicated students' main motivations for selecting an episode was a general interest in topic, the topic was related to their major or future job, they wanted to learn something new, and it was the most interesting of the episodes available.

1. Introduction

This study is an ongoing effort to connect first-year students entering the College of Engineering at Cal Poly Pomona to the field of engineering and the university, and to help them begin thinking about their future career path. The first-year experience course at Cal Poly Pomona (EGR 1000) is designed to serve over 1100 students entering as freshmen into the College while fulfilling general education credit under the area of life-long learning. "The Engineering Student Experience Podcast" was started by a professor in the Department of Mechanical Engineering in 2018 and has since created 37 episodes at the time of publication [4]. Topics of these episodes range from discipline specific (e.g., what is mechanical engineering), to student experiences (e.g., what it's like to be a first-generation student), to different types of career paths that require an engineering degree (e.g., what is it like to work in the themed entertainment industry). The podcast has become a staple in EGR 1000 to help students explore career opportunities and the field of engineering at their own pace.

This study looked at two sections of EGR 1000 in Fall 2022 and two sections of EGR 1000 in Spring 2023. Students were asked to listen to one episode (out of three options) that focused on working in the private sector and one episode (out of three options) that focused on working in the public sector. Although most episodes of the podcast were not used in this study, students had listened to other episodes for other assignments in the course. The episodes used in this study were chosen intentionally, as previous research [2,5] shows that first generation students, in particular women, seek out employment at public agencies. This allows the first-generation students to connect with their community and preserve their work-life balance. However, many of the same students often do not know that employment for engineers exist in these agencies [3].

The episodes selected for this study were chosen to expose students to opportunities they might not have considered and to give them a broader perspective of what engineering looks like at different types of organizations. The university in the study has a diverse population. The student body is 44% Latinx, 18% white, 26% Asian, 2% Black, and 10% other. The current cohort is also 54% First Generation College student, about 40% are eligible for Pell grants. The enrollment in the cohort is 19% women. When intersectionality is considered, 15% of the population are first generation, URM and Pell recipients. Prior research has shown first generation students, in particular women, are likely to stay in engineering and seek out employment in public agencies [3]. It is also known that students are less likely to be aware of careers in a public agency [3]. It is hoped that exposing students to episodes on public agencies in particular will engage more students who might have previously left the field.

2. Experimental Methods/Materials/Project Approach

Students in the first-year experience course were asked to listen to and reflect upon several episodes of The Engineering Student Experience Podcast throughout the semester for various assignments. For example, students listened to podcast episodes about their particular major, student clubs, and student-related issues like being a first-generation student, failing a class or what it's like to be a freshman engineering student. The podcast episodes selected for this study were part of one of those assignments that allowed students to explore different paths in engineering including where you can work as an engineer. After listening to a podcast episode, students were given an opportunity to complete the survey (part of this evaluation) or write a reflection on the episode. Those who opted out of the survey were excluded from the group and asked to write a reflection for the assignment. The evaluation was done independently by students outside of the classroom as a part of a regular assignment.

For each assignment, students selected and listened to one of three podcast episodes according to their interest. Each episode is focused on a particular field and consists of the host (one of the authors) interviewing one or two practicing engineers in that field. Students selected one episode that involved engineers in private sector (themed entertainment, large warehouses, food retailing), then completed the survey. The next week students selected one episode that involved engineers at a public agency (water utility, electric utility, and air quality agency), then completed the survey. The length of the episodes ranged from 43 minutes to 71 minutes and are available through all popular podcast apps (e.g., Apple Podcasts, Spotify, Stitcher, etc.), the podcast's website [4], and on YouTube [5]. The episodes hosted on YouTube are captioned for accessibility.

3. Results and Discussion

Students were required to select one episode that featured engineers who work at a public agency and one episode that featured engineers who work in private sector. Table 1 lists the episode titles, length of each episode, and percentage of students selecting each episode.

Table 1: List of episodes students could select for this study, episode runtimes, and percentage of students selecting each episode.

Public agency episode (n = 35)	Percentage selecting episode
Engineers at a Water Utility Agency (67 min)	49%
Engineers at an Electric Utility Agency (71 min)	34%
Engineering at an Air Quality Agency (47 min)	17%
Private sector episode (n = 32)	
Engineers in the Themed Entertainment Industry (49 min)	47%
Engineering in Large Warehouses (43 min)	28%
Engineering in the Food Retailing Industry (51 min)	25%

After listening to each episode, students completed a survey that probed how the episode impacted their knowledge of engineering, motivation to pursue engineering studies, commitment to being a student, and other factors. Figures 1-6 show both types of episodes (public agency and private sector) received similarly high rates of positive responses. However, the public agency episodes typically received slightly more negative responses, resulting in the mean rating of public agency episodes being a bit lower than the private sector episodes for most questions.

Both types of podcast episodes increased students' awareness of the work engineers do. Figure 1 shows that 77% of students "somewhat agreed" or "strongly agreed" that the public agency episodes gave them a better understanding of what engineers do, while 91% of students felt similarly about the private sector episodes.
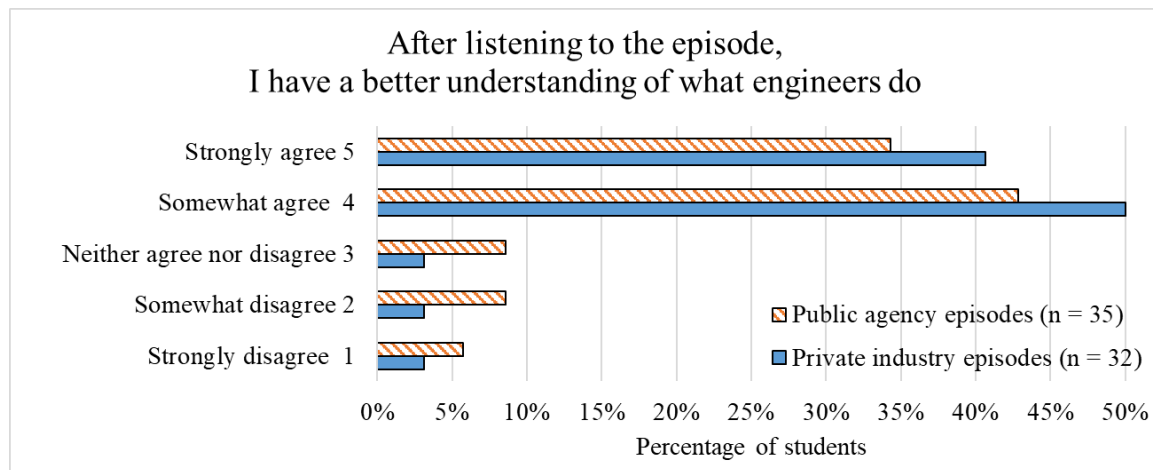

Figure 1: Students' responses to the question, "After listening to the episode, I have a better understanding of what engineers do." Results for the public agency episodes are shown in white bars with orange stripes, and results for the private sector episodes are shown in solid blue bars. The mean rating for public agency episodes is 3.9 (out of 5.0) and the mean rating for private sector episodes is 4.2.

The podcast episodes also increased students' motivation to be an engineering student. Figure 2 shows 69% of students "somewhat agreed" or "strongly agreed" that the public agency episodes made them more motived to study engineering, while 72% of students felt similarly about the private sector episodes. Figure 3 shows 51% of students "somewhat agreed" or "strongly agreed" that the public agency episodes made them more committed as a student, while 63% of students felt similarly about the private sector episodes.
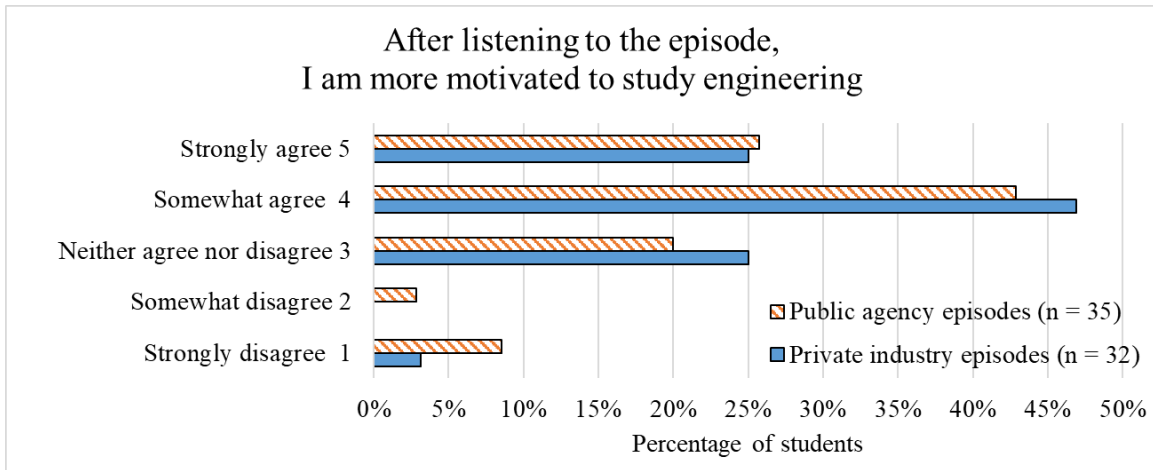
Figure 2: Students' responses to the question, "After listening to the episode, I am more motivated to study engineering." Results for the public agency episodes are shown in white bars with orange stripes, and results for the private sector episodes are shown in solid blue bars. The mean rating for public agency episodes is 3.7 (out of 5.0) and the mean rating for private sector episodes is 3.9.
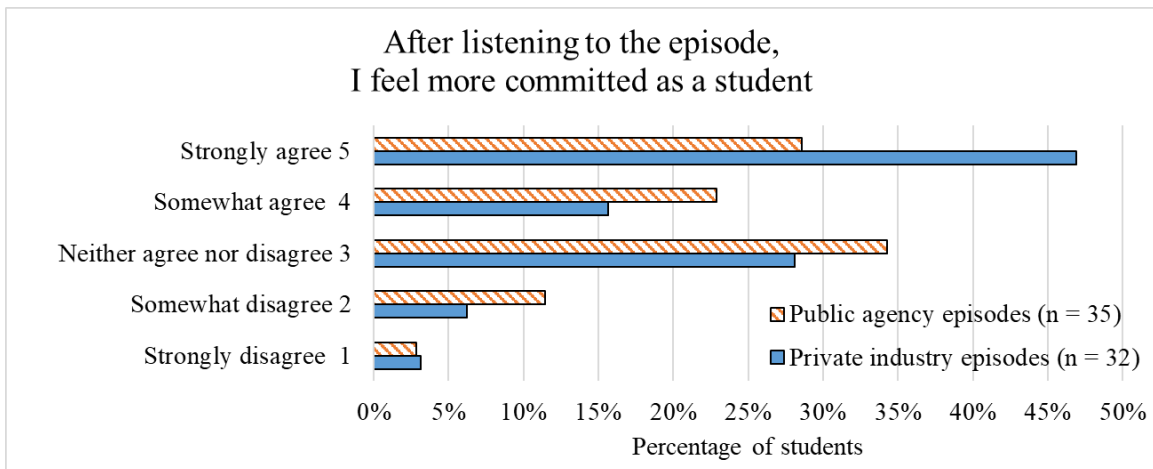

Figure 3: Students' responses to the question, "After listening to the episode, I feel more committed as a student." Results for the public agency episodes are shown in white bars with orange stripes, and results for the private sector episodes are shown in solid blue bars. The mean rating for public agency episodes is 3.6 (out of 5.0) and the mean rating for private sector episodes is 4.0.

The podcast episodes boosted students' motivation to pursue a career in engineering. Figure 4 shows 69% of students "somewhat agreed" or "strongly agreed" that the public agency episodes increased their desire to be an engineer, while 59% of students felt similarly about the private sector episodes. Figure 5 shows 71% of students "somewhat agreed" or "strongly agreed" that the public agency episodes and private sector episodes made them more motivated to pursue their career.
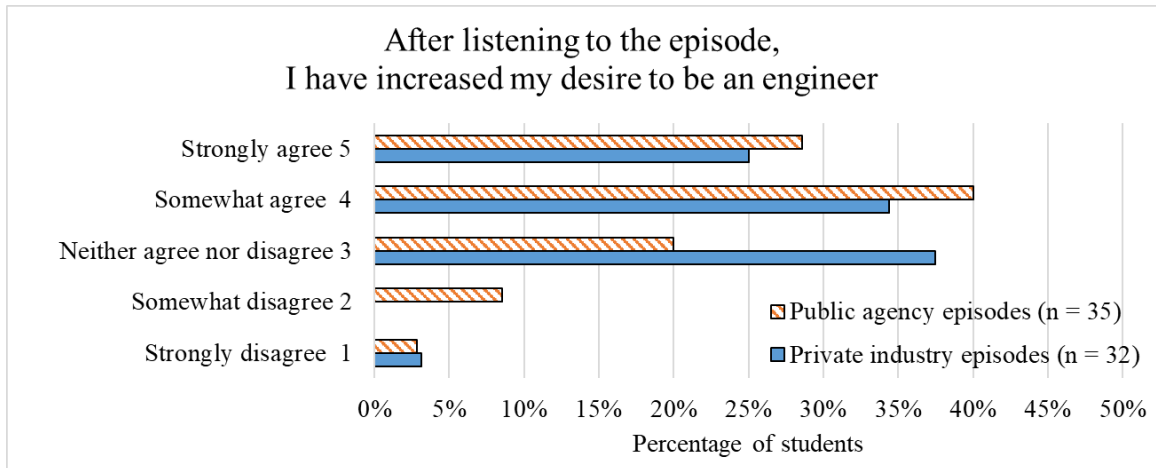
Figure 4: Students' responses to the question, "After listening to the episode, I have increased my desire to be an engineer." Results for the public agency episodes are shown in white bars with orange stripes, and results for the private sector episodes are shown in solid blue bars. The mean ratings for public agency episodes and private sector episodes are both 3.8 (out of 5.0).
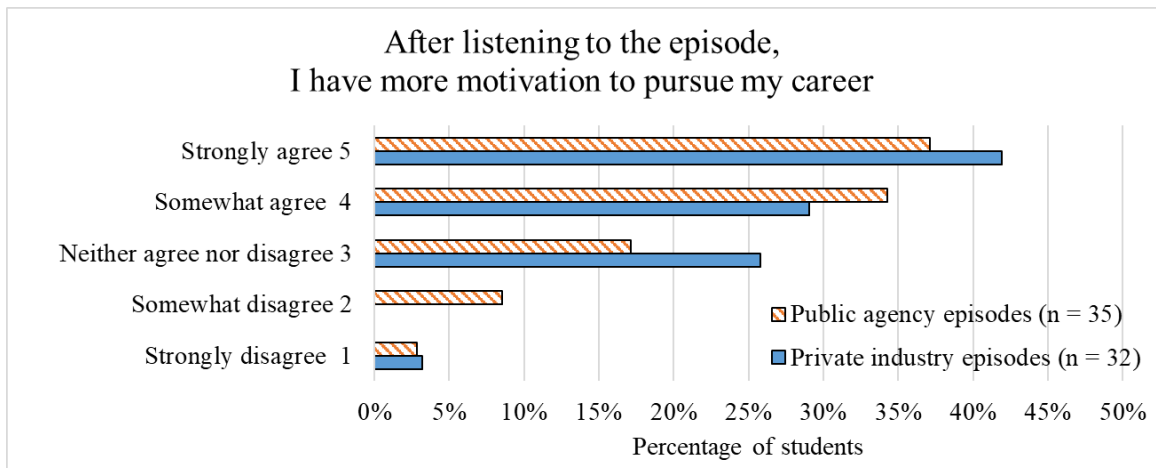

Figure 5: Students' responses to the question, "After listening to the episode, I have more motivation to pursue my career." Results for the public agency episodes are shown in white bars with orange stripes, and results for the private sector episodes are shown in solid blue bars. The mean rating for public agency episodes is 3.9 (out of 5.0) and the mean rating for private sector episodes is 4.1.

Figure 6 shows 63% of students "somewhat agreed" or "strongly agreed" that listening to the public agency episodes were a good use of their time, while 65% of students felt similarly about the private sector episodes.
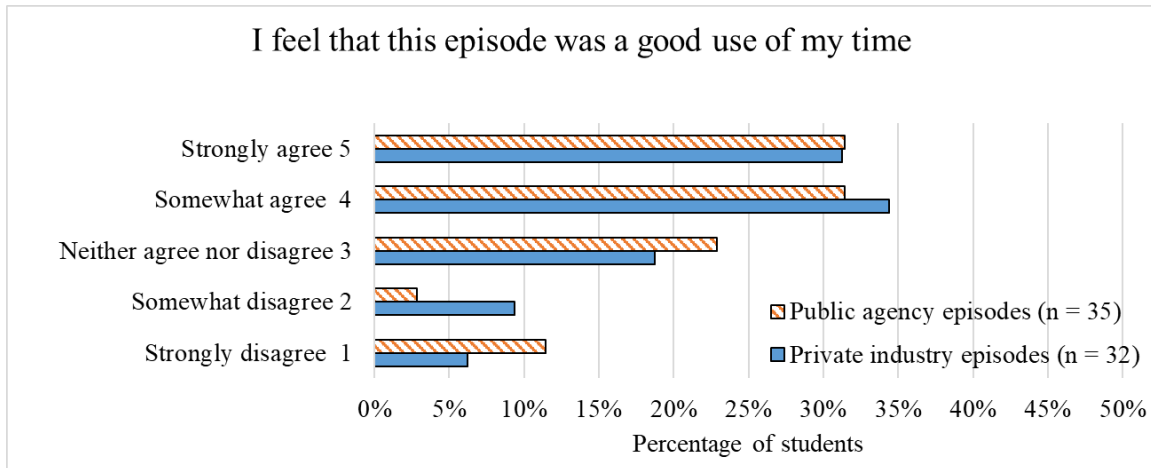
Figure 6: Students' responses to the question, "I feel this episode was a good use of my time." Results for the public agency episodes are shown in white bars with orange stripes, and results for the private sector episodes are shown in solid blue bars. The mean rating for public agency episodes is 3.7 (out of 5.0) and the mean rating for private sector episodes is 3.8.

The ratio of positive responses ("somewhat agree" and "strongly agree") to negative responses ("somewhat disagree" and "strongly disagree") was high – the lowest ratio across all questions was 3.6 for the public agency episodes impacting commitment to being a student (Figure 3). Most students who did not "somewhat agree" or "strongly agree" that the episode benefited them selected "neither agree nor disagree."

In addition to the 5-point Likert scale questions, students were given a free-response question that asked why they selected a particular episode. The authors grouped the free responses into six categories. Table 2 shows that students selected episodes for a variety of reasons, with "related to major or future job" and "general interest in topic" being the most common reasons. About 30% of students selected a particular public agency episode because it was the "most interesting of the three options," which may indicate a lack of interest and/or knowledge of public agencies. Interestingly, students did not list episode length as a reason for selecting an episode, and the shortest public agency episode received the lowest percentage of views (Figure 1).

Table 2: Student responses to the question, "Why did you choose this episode?" Students provided open-ended feedback which was categorized by the authors.

Reason to selecting episode	Public agency episodes (n = 30)	Private sector episodes (n = 31)
General interest in topic	27%	19%
Related to major or future job	20%	32%
Most interesting of the three options	30%	10%
Related to current job or class project	3%	6%
Wanted to learn something new	10%	16%
Other	10%	16%

The results likely are impacted somewhat by the episode topics. For example, many engineering students at Cal Poly Pomona are interested in working at aerospace companies such as Boeing, Northrop Grumman, and SpaceX. If an episode with engineers at an aerospace company were an

option for students, they may have provided even more favorable responses. Despite this caveat, the results of this study show the potential of using podcasts for increasing knowledge of what engineers do, boosting motivation for students to continue studying engineering, and enhancing the desire to pursue engineering as a career.

Future work could investigate the impact of this podcast or similar podcasts on different groups of students. The small sample size in this study prevented the authors from investigating the impact of the podcast episodes by gender, major, year in college, generation status, etc.

4. Acknowledgments

5. References

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