

2023-10-10

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Recommended Citation

Engzell, J., & Norrman, C. (2023). Podcasts As A Learning Method In Engineering Education. European Society for Engineering Education (SEFI). DOI: 10.21427/5NP5-JM86

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PODCASTS AS A LEARNING METHOD IN ENGINEERING EDUCATION

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Conference Key Areas: Innovative Teaching and Learning Methods, Curriculum Development

Keywords: Multimedia, podcast, learning method, teaching, technology

ABSTRACT

Multimedia has been integrated in education the last 40 years but podcasts have more recently become popular. Since 2006 podcasts have become increasingly popular in Sweden and nowadays podcasts are used in all types of contexts but are yet to find a place in engineering education. Students do not acquire knowledge or solve problems in the same way. Using a mix of methods in teaching is therefore important if one has the ambition to democratize the learning processes and give students the same opportunity to learn. Traditionally, much of the university education has been based on lectures in classrooms and reading literature. During the pandemic, teachers switched to video lectures and online lectures. Even though all types of multimedia are involved in teaching today, podcasts have not become established as a learning method. This paper explores in what ways podcasts can be beneficial in engineering education. Specifically, the paper investigates what preferences students have on how podcasts for engineering education and how teachers effectively can design and develop podcasts in courses as a learning method. By addressing the gap of evidence on podcasts in engineering education, the findings contribute with effective solutions on how podcasts can be developed and implemented that will help students in their learning processes.

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1 INTRODUCTION

1.1 Podcasts in Education

Traditionally, much of the university education has been based on lectures in classrooms and students' own reading of literature. In our digitalized society it is natural to promote education based on digital technologies. Podcasts is an emerging digital communications medium that is frequently used but has not yet found a place in engineering education. The podcast format brings together the student and the teacher (user vs creator/podcasters) in a specific content and context. One of the strengths of the medium is its intimacy: the student and the teacher are in the same headphones. It builds credibility and trust, even when podcasts are playful, humorous and taking turns.

Today, half of all Swedes listen to podcasts every week. Among young people, it is 65%. And the demand for new stories, developed reasoning and stories aimed at specific target groups is constantly increasing. Many talks about an "audio revolution", both in terms of listening, but also the emergence of a completely new industry for those who want to become podcast producers, screenwriters, or content creators for podcasts. The podcast format facilitates the teacher to share knowledge in a certain topic as well as reasoning, analyzing, and explaining the subject. One of the main advantages is the flexibility and availability of podcasts. Students can listen to the material whenever they want and they can pause and rewind back for review [1]. These advantages as well as the independence of the physical classroom make podcasts also beneficial for students with certain needs [2].

The aim of this study is to explore the potential of using podcasts in engineering education. The research question for this study was *How can podcasts be effectively designed and developed for university students, in particular engineering students?* The paper is based on a quantitative survey that combines several perspectives of students' preferences for podcasts in education. Several previous studies have investigated podcasts and their positive impact on student learning [3] and why students use podcasts and how satisfied they are with them [4]. Surprisingly, few studies have investigated students' preferences and attitudes for podcasts. Thus, this paper explores the student perspective and what preferences and attitudes they have for podcasts.

1.2 Blended Learning

Students do not acquire knowledge or solve problems in the same way. It is something that was shown, for example, by the research done by Kolb [5]. Using a mix of methods in teaching is therefore important [6], [7], [8], if one has an ambition to democratize the learning processes and give all students the opportunity to learn. The term "blended learning" can describe the approach when several forms for learning are used and combined [9], [10], [11]. The combination of traditional face-to-face learning and e-learning can be seen as a central aspect of blended learning [12].

Podcasts can pedagogically facilitate students to have control of their learning and study at their own tempo with differentiation in learning [13]. From this perspective, podcasts can facilitate the so-called “flipped classroom” approach [14]. The approach is that traditional lectures are available for students when they want and the teacher-led activities are more focused on explanations and theoretical based discussions. For example, podcasts can hypothetically be used as inspiration to a certain topic that the teacher will explain in depth in the classroom or podcasts can be used as a tool for repetition and/or summarizing topics. From this perspective, it is possible to assume that the teacher takes the role as a “coach” that guides the students in their learning process to achieve the learning outcomes [15].

2 METHODOLOGY

2.1 Sample and Data

Following a descriptive research design [16], [17], this study explores the potential of including podcasts in education based on existing literature and quantitative data. Data were collected between February 29 and April 30, 2023. The survey consisted of question about preferences for using podcasts in education. Data comprised a representative sample of engineering students at Linköping University. In total, 40 responses were usable and complete. To assure a diversified sample, students in different courses were included. The selection of students was done based on the courses that we currently are teaching. Examples of courses were: (1) InGenious (2) Innovative entrepreneurship (3) Entrepreneurship and idea growth. Students participated in the study on a voluntary basis.

The data were collected by the authors, using a questionnaire conducted in English. The data collection procedure was carried out by means of an invitation to take part in a digital survey, sent by a text message at the course website to the students. Participation was voluntary, and we assured the participants that their anonymity would be protected. The option to respond via a smartphone or tablet was offered at the webpage. To increase the response rate, respondents were offered a long response period.

2.2 Measurement

The background questions in the survey were chosen to provide a basic understanding of the students' demography including the following questions: age, gender and previous studies at university level. Then students were asked about their previous experiences of podcasts as well as what preferences they had for podcasts in the future. Their future preferences of podcasts e.g., format, length were explored. The operationalization is consistent with other studies that have investigated students' preferences for podcasts in the educational settings, see [4], [18].

This article focuses on the development of podcasts for university students, in particular engineering students, and their preferences for podcasts but also how teachers effectively can design and develop podcasts. Therefore, the last part of the survey covered more specific questions about content and learning. This part of the survey was answered on a 5-point Likert scale, ranging from 1= 'don't agree at all' to

5 = 'completely agree'. For all such questions, respondents were also offered a 'don't know' option.

2.3 Methodological Considerations

The problem of "social desirability" [24] is when respondents might answer the questions in the way that puts them in a good position. Thus, it can potentially have an impact on the data. However, this is not a crucial problem in this paper as the introduction of the survey stated that all answers were treated coincidentally with anonymity and that the results were treated in aggregate form. Thus, no answers from a certain individual and their preferences could be identified.

The data collected and the measures developed should represent a trustworthy description of the phenomena, both from a reliability and validity perspective [25]. Podcasting preferences of students is a social phenomenon, and it is difficult to develop a general understanding without considering the context.

3 RESULTS AND DISCUSSION

Descriptive statistics are presented of the podcasts preferences in Table 1. In total, 40 students were included in the study (29 men, 10 women, 1 non-binary). The average age of students was 24 years. The majority of students (31 students) had previously studied, 4-5 years was the most answered category. In general, most of the students (31 students) currently listen to podcasts three times per week or twice a week (7 students), one time per week (1 student) and currently do not listen to podcasts (1 student).

Table 1. Results from the survey

| Questions | Number of students N = 40 | Share of all students 100% |
|--|-------------------------------------|--------------------------------------|
| Today, I listen to podcasts which length is... | | |
| -10-20 minutes | 2 | 5 % |
| -20-30 minutes | 3 | 7.5 % |
| -30-40 minutes | 4 | 10 % |
| -40-50 minutes | 9 | 22,5 |
| -50-60 minutes | 7 | 17.5 % |
| -60 minutes or more | 6 | 15 % |
| -Do not know/do not listen | 9 | 22.5 % |
| The optimal length of podcasts in education would be... | | |
| -10-20 minutes | 6 | 15 % |
| -20-30 minutes | 18 | 45 % |
| -30-40 minutes | 10 | 25 % |
| -40-50 minutes | 2 | 5 % |
| -50-60 minutes | 2 | 5 % |
| -60 minutes or more | 1 | 2.5 % |
| -Do not know | 1 | 2.5 % |

| | | |
|--|-----|--------|
| Podcasts for education should be... | | |
| -Humorous | 15 | 37.5 % |
| -Entertaining | 15 | 37.5 % |
| -Inspiring | 4 | 10 % |
| -Informative | 4 | 10 % |
| -Contain guest | 0 | 0 % |
| -Contain famous people | 0 | 0 % |
| -Give new knowledge | 0 | 0 % |
| -Interesting | 1 | 2.5 % |
| -Other | 1 | 2.5 % |
| I like to listen to podcasts... | | |
| -Before a course begins | 7 | 17.5 % |
| -At the end of each week as repetition | 7 | 17.5 % |
| -Before the exam | 5 | 12.5 % |
| -Spontaneously during the course | 16 | 40 % |
| - Other | 5 | 12.5 % |
| How much of the course' teacher activities would you like to have in podcast form... | | |
| -A smaller part | 18 | 45 % |
| -Half | 11 | 27.5 % |
| -A larger part | 4 | 10 % |
| -All the lectures | 3 | 7.5 % |
| -Other | 4 | 10 % |
| Preferences for podcasts in a university course | | |
| -I would like to have a model/theory explained in a podcast | 3.9 | |
| -I would like to hear the teacher reason and analyze a topic in relation to real-life examples | 4.4 | |
| -I would like to hear a lecture in a podcast | 2.8 | |
| -I would like the course literature to be read aloud in a podcast | 2.6 | |
| -I would more easily get a pass/higher grade in the course if I had access to a podcast | 2.7 | |
| -I would remember the content better in a course if a podcast was available in the course | 2.9 | |
| -A podcast would supplement the course literature with new perspectives | 4.0 | |
| -I would more easily get a pass or higher grade in the course if I had access to a podcast | 2.6 | |

4 DISCUSSION AND CONCLUSIONS

The aim of this study was to explore the potential of using podcasts in engineering education. We found that the majority of students today listen to podcasts that are 40-

50 minutes long. However, they prefer a shorter length of podcasts that are intended for education, 20-30 minutes. Contrary to expectations, students prefer rather long podcasts compared to previous studies that claim that podcasts should be “short” 1-5 minutes [19], or 18 minutes [20]. We believe that students within 20-30 minutes can gain a basic understanding of the subject on their own and then develop their skills and abilities together in the classroom.

Students had the strongest preferences for humorous and entertaining podcasts (15 students per category), compared to the categories inspiring and informative (4 students per category). There is a basic assumption that podcasts should be informative [19], but this result clearly shows that students want humorous and entertaining podcasts. Another finding is that students prefer to listen to podcasts spontaneously during a course (16 students) and would like to have a smaller part of the course teacher activities (18 students) or half (11 students) in the podcast format. This result confirms previous research which claims that podcasts can complement traditional teaching i.e. lecturing being a complement for students [21]. Building on [22] (cited in [23] p.3), we thus argue that the traditional classroom teaching can be added with the podcast component resulting in a blended learning environment that is beneficial for students.



Figure 1. Blended learning environment based on podcasts

We also specifically asked students about their preferences for content in podcasts. In line with previous research, students rated the question “I would like to hear the teacher’s reason and analyze a topic in relation to real-life examples” relatively high, (4.4 on a 5-point scale). The question “I would like to have a model/theory explained in a podcast” is also relatively high (3.9). In line with expectations, the questions “I would like to hear a lecture in a podcast” (2.8) and “I would like the course literature to be read aloud in a podcast” (2.6), are relatively low numbers. On the question “A podcast would supplement the course literature with new perspectives” students answered relatively high (4.0). This shows that students rather want the teacher to inspire, reason and explain specific content in depth. In line with the reasoning on podcasts as a complement to traditional teaching, students answered only (2.9) on “I would remember the content better in a course if a podcast” and (2.7) on “I would more easily get a pass/higher grade in the course if I had access to a podcast”. Finally, the result (2.6) on the question “I would more easily get a pass or higher grade in the course if I had access to a podcast” also confirms this. Overall, students think that podcasts have the potential to be an important complement to the existing teaching and can help in the learning process, but it does not help them to receive a higher grade or easily pass the course.

5 CONCLUSION AND RECOMMENDATIONS

The aim of this study was to explore the potential of using podcasts in engineering education. There is no question that the podcast format is a valuable pedagogical tool. However, the design, format and content of podcasts are very important. Hence, the recommendations for teachers to effectively design and develop podcasts in courses, are to keep podcasts short, approximately 20-30 minutes and focus on the reasoning and analyzing (a certain topic, model or theory in relation to real-life examples). The podcast should be available for spontaneous listening during a course and should not replace ordinary teaching activities. They are recommended to be seen as a humorous and entertaining element that can supplement the course with new perspectives. The fact that students seem to prefer humorous podcasts could be seen as a drawback from an academic perspective. However, it could also be seen as an opportunity to package theories and models in a more prestige less way and through this make them easier to access.

Finally, working with podcasts as a tool for teaching comes with learning thresholds. According to our own experience, the best way to overcome this is to start on a small scale and make shorter presentations as a complement. The equipment needed to produce a podcast is rather simple, basically it is a quiet room, software, mics and a small mixer. The sound quality is rather important though, so to start, the best way probably is to use an existing studio, and these have become rather common at most universities.

6 ACKNOWLEDGMENTS

The writing of this paper has been financed by PUG as a pedagogical project 2023.

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