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Listen Up! Using Podcasts in STEM Courses to Improve Engagement and Facilitate Review

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ABSTRACT

This workshop focuses on how to integrate podcasts into science-based courses (e.g., chemistry, psychology). To some students, science-based courses can be perceived as ‘dry’ and difficult to engage with at a level that facilitates retention. Given that engrossing, high-quality teaching is cited as inspiring course enjoyment and leading students to further pursue STEM education (e.g., Horowitz, 2009), lecturers are often looking for ways to increase student interest. More than this, it is the hope of many educators that more enjoyable coursework will lead to better retention and understanding of the material (e.g., Kuh et al., 2008). As a news and entertainment vehicle, podcasts have continued to grow in popularity over the past decade or more. However, the efficacy of using podcasts within educational settings has been mixed (e.g., Daniel & Woody, 2010; Lee & Chan, 2007). This workshop will introduce podcasts as a learning medium and describe ways in which they can be used to effectively complement traditional teaching approaches, either as an enhancement to the course, or as a resource for student review. Attendees will be introduced to several ready-made STEM podcast resources and engage in discussions on how to develop new content that is effective, both logistically and pedagogically.

KEYWORDS

educational podcasts; media; review resources; student engagement; STEM education

LEARNING OUTCOMES

By the end of this workshop, participants will be able to:

- Define the terms podcast, vodcast, and enhanced podcast, and list methods by which they can be used effectively in undergraduate teaching.
- Describe potential beneficial outcomes of including podcasts as a supplementary learning resource.
- Contrast these potential outcomes with those related to using podcasts as a primary learning resource, in order to identify how this medium can be best integrated into classroom teaching.
- Develop an outline for a short (<10 min) course-specific podcast that the participant(s) can create in the future to aid in student review.
- Identify free online resources that will aid in creating said podcast.

ANNOTATED BIBLIOGRAPHY

Daniel, D. B., & Woody, W. D. (2010). They hear, but do not listen: Retention for podcasted material in a classroom context. *Teaching of Psychology*, 37, 199-203.
<https://doi.org/10.1080/00986283.2010.488542>

The authors conducted a small-sample (n = 48) study in which student retention was evaluated via quiz scores for students who either used podcasts or text readings as their primary learning source. Despite students having initially rated podcasts as the more preferred method of material delivery, quiz scores of students who listened to podcasts were lower than those who

completed text readings. Students who listened to the content compared to reading it also rated the material as more difficult and harder to understand. The authors note that podcasts may be better suited as supplementary, rather than primary, sources of educational material.

This article can be used to emphasize the utility of podcasts *in certain situations*, and to make clear that they are not meant to replace other traditional methods of providing course material. This study can also serve as a warning that student preferences may not positively correlate with performance, and that the use of new technologies should be centered on pedagogical goals. The findings from this article can be contrasted to the work reviewed in several of the articles below to highlight the value of podcasts as supplementary aids.

Drew, C. (2017). Edutaining audio: An exploration of education podcast design possibilities. *Educational Media International*, 54(1), 48-62.
<http://doi.org/10.1080/09523987.2017.1324360>

There is a growing interest in education podcasts not only within educational institutions, but from the population at large. In this article, Drew analyses design themes found within 20 popular non-institutional education podcasts, with the aim of uncovering effective production elements that educational podcasters may consider adapting in order to maximize engagement. Drew compares these design themes with the current wisdom held within the literature surrounding educational podcasting. For instance, whereas it is a widely held belief that short podcasts are most beneficial for education, Drew reports many of the most popular non-institutional podcasts maintain audience engagement across 30-60 minute episodes.

In discussing educational podcasts, the workshop will provide examples of sources from the popular media as well as from educational institutions, and design themes will be compared. Participants in the workshop will have the opportunity to consider when to use popular podcasts compared to those produced explicitly for institutional use. Information provided in this article will be foundational when introducing the concept of podcast use within education.

Hadjianastasis, M., & Nightengale, K. P. (2016). Podcasting in the STEM disciplines: The implications of supplementary lecture recording and 'lecture flipping'. *FEMS Microbiology Letters*, 363(4), fnw006. <http://doi.org/10.1093/femsle/fnw006>

Emphasis in this article is placed on using podcasts as a supplementary vehicle to the traditional classroom lecture. The authors describe ways in which podcasts can be used, from simple recordings of lectures (i.e., 'backup' for students who miss class), to modeling massive open online courses, to being used as short add-ons to reinforce core concepts, and to developing podcasts as interactive activities. While effects on class attendance and overall grade improvement are reported to be mixed, the authors summarize evidence in favor of including podcasts in order to improve student engagement, as well as in supporting teaching of more difficult concepts. Finally, the concept of using podcasts and vodcasts as a way of 'flipping the classroom' is presented, which has also been shown to increase engagement and interaction between students and staff.

Information provided in this article can be integrated into the introductory activities in which participants are developing a knowledge baseline and learning how podcasts can be used.

Kidd, W. (2011). Utilising podcasts for learning and teaching: A review and ways forward for e-Learning cultures. *Management in Education*, 26(2), 52-57.
<http://doi.org/10.1177/0892020612438031>

In this review article, Kidd provides an overview of enhanced learning advances and situates podcast use in education amongst a broader history of newer tools to engage learners. He summarizes arguments that describe both benefits and challenges of teaching for younger students who have been described by some as “digital natives”, having grown up within technology-rich, web-immersed lives. Kidd highlights several advantages of using podcasts in education, including offering flexibility and learner control, engagement, and improved instruction clarity. He then proposes a pedagogic model that can shape podcast production, which includes recommendations on length (3-8 minutes), and structure (e.g., introducing the topic early, including summaries at the end). Ultimately, Kidd ends with the warning of “pedagogy before technology”, reminding readers to be conscious of learning outcomes and choose technologies that will best serve that purpose.

Design tips presented within this article may be beneficial when guiding participants in developing their own podcast outlines later in the workshop. The article references several other good sources of information that can be integrated into the introductory lecture on podcasts, as well as during the activity in which participants are considering how to make effective and engaging podcasts.

WORKSHOP CONTENT AND ORGANIZATION

DURATION (min)	SUBJECT	ACTIVITY	PURPOSE
5	Life Saver Icebreaker (or another useful introductory activity)	Provide an individually wrapped multi-coloured candy (e.g., Life Saver hard candy) as participants come into the room. Each person will then introduce themselves and answer a question based on the colour of their candy. For example, people with a green candy may be asked, “Why did you sign up for this workshop?”, while people with a yellow candy may be asked, “What experiences do you have with podcasts?” Encourage participants with the same	To develop comfort with other participants and allow the facilitator to identify participant goals for attending the workshop and current knowledge on the topic.

		<p>colours to try to answer the question slightly differently if possible.</p> <p>Other potential questions include:</p> <ul style="list-style-type: none"> • Describe a way in which podcasts may have been beneficial in a class you took or taught. • What do you hope to learn by participating in this workshop? • How might popular media (i.e., non-institutionally produced) podcasts enhance learning at the university level? 	
15	Introducing Podcasts as Learning Resources	<p>The facilitator describes the terms podcast, vodcast, and enhanced podcast and provides participants with a handout with names and sources of popular titles of each type (see Appendix A for example). The workshop will focus primarily on podcasts.</p> <p>The facilitator presents the learning outcomes and emphasizes that this workshop will scratch the surface of how podcasts can be used in the classroom and will encourage participants to be creative.</p> <p>The facilitator briefly summarizes recent research that investigated the use of podcasts to enhance student learning and engagement.</p>	To establish a knowledge baseline, as it should be expected that participants will vary in terms of their familiarity with educational podcasts.
10	Listening Without Hearing: When Podcasts Don't Work	<p>Participants will be divided into two groups. Participants will brainstorm with their group some possible ways in which podcasts might not benefit engagement and learning.</p> <p>Each group will then take turns posing one potential problem to the other group, at which point the other group will have the opportunity to devise</p>	To identify in advance some challenges common to teaching with podcasts and develop creative ways to adjust in order to avoid or limit these challenges.

		ways in which this challenge can be addressed. The facilitator can jump in to contribute relevant information based on the articles in the annotated bibliography.	
10	Using Popular Podcasts to Supplement Lecture	<p>The facilitator will introduce the idea of integrating popular media podcasts (i.e., those not intended explicitly for higher educational teaching) into STEM courses. Emphasis will be placed on using these as supplemental rather than primary sources of information. Participants will be asked to provide titles of any popular podcasts they have used in the past or think may be useful (e.g., Radiolab, TEDTalks, Science VS).</p> <p>As a group, participants can brainstorm specific instances in which using popular podcasts may be beneficial (e.g., to provide more depth into a particular topic that was only superficially covered in class; to supplement 'core' teachings with examples of the concepts being used in more applied settings). The facilitator can provide a comparison chart of design themes that are similar/unique to popular podcasts relative to institutionally-produced education podcasts to aid brainstorming. Facilitators can reference the handout (Appendix A) to direct students to online resources.</p>	<p>To identify pre-made resources that often have higher quality production and are intended to be accessible to a broad audience that can be used as engaging supplemental resources.</p> <p>To discriminate instances in which using general audience materials can facilitate learning outcomes.</p>
15	Tips on Ways to Develop an Educational Podcast	<p>Participants will pair with a person near them to complete the following prompts: 'The most effective lecturers tend to:' 'The most engaging lecturers tend to:'</p> <p>As a group, share ideas that were discussed, asking whether the characteristic provided is true for both effective and engaging lecturers. As the</p>	To connect skills participants already have in engaging students in the classroom with those that will facilitate developing their own podcasts, as well as identify unique characteristics that are

		<p>discussion continues, create a Venn diagram on the board to visualise where characteristics overlap.</p> <p>Discuss together whether there are features of an effective and engaging lecturer that do not translate to audio-only format or if there are audio-specific elements that need to be considered when developing a podcast.</p> <p>When appropriate, the facilitator is encouraged to share examples from the literature on both effective teaching practices as well as recommendations for creating effective educational podcast resources.</p>	important to consider when recording material in an audio-only format.
30	Developing a STEM Podcast	<p>Attendees will develop an outline for a podcast that students in an introductory STEM course could use as a review aid. This activity has three phases:</p> <p>Phase 1: Participants will be encouraged to list on the whiteboard any qualities that make a review podcast/vodcast effective and those that may detract from effective review. Post-it notes can be distributed if chalk/whiteboards are unavailable (~5 minutes).</p> <p>Phase 2: Participants will be divided into small groups of 3-5 people and provided with a cue card that describes a basic scientific concept (e.g., the scientific method, experimental versus observational study, ethical code of conduct). Groups will work together to develop an outline for a short (~5-10 min) podcast that could be developed as a review resource for that concept. Participants are welcome to use laptops to aid in development. The facilitator(s) can circle to provide support and feedback (~10 minutes)</p>	To have the opportunity to synthesize material covered in the workshop, discuss with others, and develop an outline that they may be able to adapt in their own classrooms.

		Phase 3: Each group will share their outline idea. Participants and facilitators can discuss and provide feedback about the developed outline (~15 minutes).	
5	Feedback and Reflection	Facilitators circulate a short questionnaire to solicit feedback from participants about what was effective and what could be improved in the workshop. Response prompts can include: "I found the most useful part of this workshop was:", "If I could change anything about this workshop, I would:", "This workshop taught me:", "I will likely incorporate podcasts into future courses I teach (T/F)."	To encourage self-reflection for participants and provide facilitators with feedback on how to improve the workshop in the future.
Total Time: 90 minutes			

PRESENTATION STRATEGIES

The content and organization table provides details about how activities can be run, including what materials may be necessary to facilitate each activity.

Workshop Size:

- Workshop size should be capped to about 20 participants, as activities will work best with groups between 10 and 20 people. More than about 20 participants would make discussions lengthy and may decrease active participation by all members.

Classroom Set-up:

- To facilitate group work, it would be ideal if desks are arranged in pods of 3-5 people. Otherwise, workspaces and chairs should be able to be moved around easily.

Facilitator Experience:

- Facilitators would ideally have some experience with using educational podcasts in teaching environments, or at the very least be familiar with the literature concerning effective and ineffective ways of utilizing podcasts with STEM courses.
- It would be especially beneficial to recruit a facilitator that has first-hand experience creating educational podcasts to aid in the main podcast development activity.

Helpful Materials:

- Participants should be encouraged (though not required) to bring laptops to use during the podcast development activity.
- Individually-wrapped multi-coloured candies are recommended for the icebreaker activity, though facilitators can use non-food items (e.g., pieces of paper).

- Facilitators can choose how they would like to present lecture-based components of the workshop (e.g., through PowerPoint, notes on the board, a handout, etc.)
- Post-it notes or white boards with white board markers will be useful for group activities.
- Facilitators should prepare a final reflection questionnaire and provide pens.

Handout

- Share the handout example found in Appendix A that includes a collection of freely available resources that either provide podcast material for STEM courses or would facilitate participants creating their own podcast material. The handout can be provided at the beginning of the workshop to reference throughout, if need be. Check and update hyperlinks before future distribution.

ADDITIONAL REFERENCES

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APPENDIX A: Podcasting for STEM Courses Resources and Links

Popular Media STEM Podcast Links:

- Great starting point for identifying STEM-based popular podcasts:
www.teachthought.com/uncategorized/40-of-the-best-science-podcasts-for-mobile-learning/
Recommendation: Radiolab – a pioneer in the podcasting realm, this general interest ‘curiosity’ show has been running since 2002 and has won several podcast awards.
- Past winners in the Education, Science, or Technology categories for the Webby Awards (www.webbyawards.com) and/or the Podcast Awards (www.podcastawards.com).
Recommendation: Hidden Brain by NPR – Examines science and education with interviews, conversation, and 60-second science summaries.
- Browse iTunes (or a similar podcast directory: BluBrry, Google Play Music, Overcast) under the desired category (e.g., Natural Sciences, Medicine) to find an extensive list of other appropriate podcasts.

Education-based STEM Podcasts:

- Several renowned universities have developed podcasts for different STEM departments, including Stanford, Harvard, University of California at Berkeley, and Oxford, to name a few. While some are available on internal sites (e.g., Oxford: podcasts.ox.ac.uk/), others are available through iTunes (e.g., Harvard: www.harvard.edu/itunes).

D.I.Y. Podcast Tips and Tools:

- Lifehacker’s ‘How to Start Your Own Podcast’ breaks down getting started into seven steps and includes recommendations for free editing software (Audacity), MP3 encoder (Lame), and podcast hosting (SoundCloud).
<http://lifehacker.com/how-to-start-your-own-podcast-1709798447>
- The Podcast Host’s ‘How to Start a Podcast’ links to many useful resources and additional tutorials; it covers decisions relating to podcast format as well.
<https://www.thepodcasthost.com/planning/how-to-start-a-podcast/>
- Check what services are offered by your host institution: many will have dedicated recording spaces, as well as staff to help with technical details. Your institution’s learning management system may also have built-in capabilities to upload podcasts along with other course materials to streamline their presentation to students.

More questions? Connect with your workshop facilitator: [\(facilitator email here\)](#)