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Podcasts in Science Classrooms: Storytelling for All Ears!

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Podcasts offer a unique tool in making science learning informative, engaging, and entertaining. They provide an excellent way to incorporate storytelling in science instruction. Podcasts can be accessed easily and free of cost on any internet-enabled device. Recording podcasts is also easy and inexpensive, making them useful to record lesson summaries and other content for revision. This article outlines different ways of using podcasts in the teaching and learning process. To support informal learning, podcasts typically cover cross-disciplinary issues that are relevant to present times as well as those important to local communities. They also feature interviews with researchers who walk through the scientific process of their discoveries. All of these things add value to a physics unit beyond textbook content. In a subject where assessments are dominated by mathematical equations, student-recorded podcasts offer an opportunity for students to string together spoken-word narratives of physics phenomena. In this article, we outline an example lesson centered around the NPR *Short Wave* podcast.

A podcast, by definition, is any audio file that can be made available to download via the internet.[1,2] The term can also be used to describe audio narratives recorded for and by students and shared on a local network accessible by the school or classroom.

There exists an extensive library of physics and science podcasts that can be freely accessed through platforms like Apple podcasts, Google podcasts, and Spotify[3] (see "Resources" section).

Podcasts have been used in classroom instruction in various ways.[4,5] Broadly speaking, they can be applied towards three goals as follows (Fig. 1):

- ***In learning***,[6] teachers can dig into the vast collection of science podcasts available on the internet. They come in different styles: some are short bites (like Scientific American's *60-Second Science*), while others are in-depth analyses. Some are content-specific, while others let the scientists become the story (like *Rad Scientist*). Many podcasts traverse scientific disciplines and emphasize the interplay between science and society.
- ***Teachers can record unit summaries as review*** podcasts that students can listen to from their homes. These can include the biggest lesson takeaways, connection to big ideas, and setting the stage for the next lesson with teaser questions. Compared to written unit reviews and assignments, using one's voice can provide a simple yet effective way of making the learning experience more candid and enjoyable.

Fig. 1. Different ways that podcasts can be used in a classroom.

- ***Finally, the assessment*** exercise of recording a coherent narrative allows students to sharpen their skills in the Next Generation Science Standards (NGSS) science practice of "Obtaining, evaluating, and communicating information."[7]

We present a detailed example of implementing the first and the third goals in a sample lesson centered around an NPR *Short Wave* episode[8] that explores the physics of an everyday phenomenon: What gives a Wiffle ball its peculiar flight?

Implementing a sample lesson

NPR's *Short Wave* is one of many science podcasts that can be used to supplement your unit with a session of informal science education. *Short Wave* episodes, as the name suggests, are short in duration (~10 to 15 min). They often feature interviews with researchers involved in making discoveries. Their physics-based episodes are geared towards digging into the physics of everyday life or providing an introduction to the latest physics research topics such as dark matter and cosmology. As an example of the former, we picked an episode titled "The Peculiar Physics of Wiffle Balls" (released April 2020). We present a 30-minute lesson plan that lets students navigate a set of cross-disciplinary science concepts and string them together into a storyline-styled explanation at the end.

This podcast episode explores basic ideas of fluid mechanics like the flow of air along different surfaces and the forces created by asymmetries that guide the motion of an object's flight. While these big ideas are well understood and can be extended to explain a wide array of phenomena, tiny variations in the design of everyday objects like Wiffle balls can make them behave in an unpredictable manner—providing ample scope for research and brain-teasing questions involving high school and undergraduate physics.

Part 1. *Podcast consumption: Listen and analyze (30 minutes)*

The lesson starts off by simply listening to the podcast. Every podcast is structured differently, so a brief five-minute

Table I. Rubric for assessment evaluation.

Criteria	Needs Improvement	Good	Excellent
Content: relevance	The physics ideas have little connection to the phenomenon	The physics ideas discussed are relevant to the phenomenon	The physics ideas are relevant and enriched with personal experiences
Content: accuracy	The explanation is not factually accurate	The ideas presented are factually accurate	Ideas are accurate with a complete hypothesis-claim-reasoning structure
Clarity	The narrative is bland and lacks the structure of a storyline	The narrative is sequenced well, with few or no gaps	The story is very well constructed, with a good introduction, conflict, and resolution
Confidence	The narration voice is passive, monotonous, and has frequent interruptions	The narration flows well with little or no interruption, includes some voice modulation	Active voice, creative use of voice modulation and/or sound effects

description at the beginning will help inform the students what to expect. For example, *Short Wave* has a very conversational tone where the host explores the topic by uncovering key ideas through informal interviews with the researchers. An introduction to the science topic itself may also be included, but is not necessary here since the podcast episode is fairly self-contained. If you choose to use a different podcast, encouraging students to consider the structure of the podcast can be useful as they prepare to create their own.

Students listen carefully with a notepad in hand, and are instructed to note down sections they find intriguing, parts they do not fully understand, and questions they might want to ask for further clarification by stepping into the shoes of the interviewer. Teachers may choose to pause the podcast at a set of predetermined timestamps to help students reflect on key ideas. The timestamps may be used to walk students through the scientific process and highlight instances where the main problem is presented, the researcher(s) discuss their motivation behind working on it, their approach for solving it, the roadblocks they may have experienced, and finally the resolution. Breaking things down this way is especially useful for podcasts longer than 10 minutes in duration. If needed, a teacher may also provide a scaffolded handout to students for taking notes by listing timestamps and prompting students to attend to information and take notes at those times as well.

Students then divide themselves into small groups to focus on a specific question, and brainstorm answers and explanations for them. During this part of the lesson, students make connections between the podcast story and the content they have been learning in the unit. This activity promotes the NGSS practice of "asking questions" and "constructing explanations."[2]

Beyond understanding the science being talked about, another important aspect of podcast consumption is for students to identify and analyze the elements that make audio a powerful medium for storytelling. These include, but are not limited to, (i) the vocal intonation, (ii) effective use of pauses, (iii) the story structure and flow of ideas, (iv) use of a conversational tone and humor, and (v) enhancing the experience through sound effects. Identifying these elements will prepare students for the next part, a homework assignment where they get to make their own podcast.

Part 2. *Podcast production: Tell your own story!*

Ultimately, the main goal of this activity is to encourage students to get behind a microphone and become podcasters themselves. Podcasting has been shown to be useful in classrooms for assessment, as "a way to reinforce the importance of talking like scientists, [having] correct grammar and a presentation voice."[3] The homework assessment involves students recording a short (three- to five-minute) story about any physics phenomenon that they encounter in their day-to-day lives. Their job is to narrate how concepts of physics such as forces and motion, light, sound, electricity, and so on connect to real-world events. Recording a science summary teaches students how to script it in a way that catches the listeners' attention, rather than writing it as a report. It instills verbal skills like taking up an active "presenter" voice, using voice modulations, and speaking with confidence. In addition to talking about the science surrounding the phenomenon, students should be encouraged to link it with their own personal experiences.

The recording assessment can be completed using a phone voice recorder or any simple microphone. Open-source software such as Audacity[9] can be used to learn and do basic sound-editing to make the podcast sound seamless. The rubric displayed in Table I may be used to evaluate the student recordings. At the end of the class, student podcasts can be grouped together based on physics topics and released for their peers, parents, and other listeners in the local school web network, with each class year contributing to one season of episodes. The podcasts can also be used to help students review for exams and to continue to make connections between the real world and the classroom.

Conclusion

In our courses, we have used podcast creation as a unique means to assess students on their understanding of physics concepts and how those concepts connect to the real world. However, depending on your lesson purposes, you could have students create podcasts for a variety of reasons. Podcasts can be a means for all students to convey their understanding of a specific topic or as an alternative assessment for just some of your students, you could have different groups or students create review podcasts at the end of each unit, or you may have students develop podcasts as part of a culminating project for a problem-based learning unit. The use of podcasts is

a valuable means to get at students' understanding in lieu of a traditional exam. For us, it has illuminated the understanding of some students who have not been able to show that same understanding on a traditional test. Students are engaged in the listening and podcast production process, excited about creating their own, and enjoy thinking about how they can convey their learning. We have found with some scaffolding as described in this article that students are able to create powerful and meaningful podcasts to share with their peers.

Podcasts are a wonderful, freely available resource that can be used to add a new dimension to classroom instruction. They provide a breath of fresh air from daily text-based doses of information. In an informal setting, students can get to listen to the stories behind the science, understand how it interplays with society, and connect their knowledge across disciplines. Podcasts also provide an opportunity for teachers to experiment with a different format of providing content for revision. They can also be utilized as a unique option to assess students' understanding, by letting them record a narrative. This creates a great platform for students who are good in verbal communication, while developing a vital soft skill in students who are not comfortable at it. We have provided one example of how these elements can be tied together in a lesson plan, which can be adapted for any of the wide variety of science podcasts available online.

References

1. "Podcast: Definition of Podcast by Oxford Dictionary," Lexico.com, https://www.lexico.com/en/definition/podcast.
2. L. MacKenzie, "Science podcasts: Analysis of global production and output from 2004 to 2018," *R. Soc. Open Sci.* **6**, 180932 (2019).
3. D. MacIsaac, "Podcasts for physics, astronomy and science teachers," *Phys. Teach.* **44**, 622 (Dec. 2006).
4. D. Shapiro, "Podcasting in the science classroom," *NSTA Reports* **30** (8), 1–4 (2019), http://static.nsta.org/pdfs/nstareports/nstareports201904.pdf .
5. J. Blickenstaff, "Science podcasts in the classroom," NSTA, nsta.org/resources/science-podcasts-classroom.
6. A. Popova et al., "How can podcasts support engaging students in learning activities?" *Procedia Soc. Behav. Sci.* **2**, 5034 (2010).
7. NGSS Lead States, *Next Generation Science Standards: For States, By States* (The National Academies Press, Washington, DC, 2013).
8. M. Sofia (Producer), "The Peculiar Physics of Wiffle Balls," *Short Wave* [Audio podcast] (April 2020), https://www.npr.org/2020/04/03/826747309/the-peculiar-physics-of-wiffle-balls.
9. Audacity Team, "Audacity(R): Free Audio Editor and Recorder," Version 2.4.2 (2020), https://audacityteam.org/ .

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Resources

Name	*Description*	*Approximate duration*	*Link*
Short Wave	Daily science podcast featuring current news and general topics	15 min	https://www.npr.org/podcasts/510351/short-wave
The Physics Teaching Podcast	For teachers: a podcast that discusses new teaching methods	30 min	https://the.physicsteachingpodcast.com/
60-Second Science	Quick science bites about recent developments	5 min	https://www.kpbs.org/podcasts/rad-scientist/
Rad Scientist	Science stories with a spotlight on the researchers' lives	10 min	https://www.kpbs.org/podcasts/rad-scientist/
Radiolab for Kids	Kid-friendly science stories covering a wide variety of topics	20 min	https://www.wnycstudios.org/podcasts/radiolab-kids
Science Friday	In-depth coverage of recent events and entertaining science topics for curious minds	45 min	https://www.sciencefriday.com/science-friday-podcasts/
Nature Podcast	Weekly podcast with stories covering all fields of science	20 min	https://www.nature.com/nature/articles?type=nature-podcast
Ssippin' Science	Science stories shared by researchers at a local science cafe in Oxford, MS	10 min	https://open.spotify.com/show/3J0VNtgE6LNatgA6sJyNYW
Lab Out Loud	Exploring science education through discussions with educators, researchers, leading scientists, and science writers	40 min	https://www.nsta.org/publications/laboutloud.aspx

Additional podcast resources are described in Ref. 5.