Podcasts as Tools in Introductory Environmental Studies

Christine Vatovec[1] and Teri Balser[1, 2, 3]*

*Nelson Institute of Environmental Studies,[1] Department of Soil Science,[2] and Institute for Cross-College
Biology Education,[3] University of Wisconsin-Madison, Madison, Wisconsin 53706*

Technological tools have increasingly become a part of the college classroom, often appealing to teachers because of their potential to increase student engagement with course materials. Podcasts in particular have gained popularity as tools to better inform students by providing access to lectures outside of the classroom. In this paper, we argue that educators should expand course materials to include prepublished podcasts to engage students with both course topics and a broader skill set for evaluating readily available media. We present a pre- and postassignment survey evaluation assessing student preferences for using podcasts and the ability of a podcast assignment to support learning objectives in an introductory environmental studies course. Overall, students reported that the podcasts were useful tools for learning, easy to use, and increased their understanding of course topics. However, students also provided insightful comments on visual versus aural learning styles, leading us to recommend assigning video podcasts or providing text-based transcripts along with audio podcasts. A qualitative analysis of survey data provides evidence that the podcast assignment supported the course learning objective for students to demonstrate critical evaluation of media messages. Finally, we provide recommendations for selecting published podcasts and designing podcast assignments.

Technology in the college classroom has increasingly been used to help students engage with course materials (1). The benefits of using technology in college courses include enhancing student learning in ways that reach beyond the classroom, using the vast resources available online and that prepare students to live in a "wired world" (7). For example, PowerPoint and "clicker" technologies have gained rapid appeal in large lecture-format classes (5) by engaging the senses of today's active learners (8). Podcasts are another newer technology that hold several potential benefits for student learning, including allowing students to listen to course materials outside of the classroom, as well as providing a cost-effective way to disseminate information to students in a timely fashion (4).

However, while the use of podcasts in education has grown rapidly, little information is available about the efficacy of this tool in enhancing student learning. The few studies that have looked at the use of podcasts in college courses have focused on distributing recordings of course lectures or discussions so students can access course information at a later time (4), rather than looking at the effectiveness of using prepublished podcasts (as opposed to those created by recording a professor's classroom lectures) to enhance course materials. In fact however, the increasing availability of published podcasts relevant to a wide array of topics may provide tools for enhancing classroom learning (3, 6, 9).

A quick Google search for "environmental podcast" on any given day will result in numerous podcast resources from several well-respected sources published daily or weekly— for example, news sources like National Public Radio and *The New York Times*; nonprofit organizations such as The Nature Conservancy and National Geographic; and educational institutions, including the Yale School of Forestry and Environmental Studies. The growing availability of environmentally focused podcasts provides increasing opportunities to engage students using current events applicable to course topics. Perhaps more importantly, published podcasts provide a means and opportunity for teaching students to evaluate the abundance of often contradictory information that surrounds them daily in the popular media.

Introductory environmental studies courses often draw interest from a wide range of students with diverse learning styles and backgrounds. At the University of Wisconsin—Madison, Environmental Studies 101: Forum on the Environment typically enrolls 150 to 250 students from as many as 50 majors. With the realization that this one course will be the only exposure that many of these students will have to environmental studies, we seek not just to impart knowledge about current environmental issues, but also to provide the tools these students will need to evaluate the often contradictory information they will find in the popular media for years to come. Incorporating published podcasts into course materials has the potential to both engage students of diverse learning styles and teach students evaluation tools that will allow them to become thoughtful environmental citizens once they graduate. Therefore, the present investigation sought to (i) assess student preferences for using podcasts and (ii) evaluate the effectiveness of podcasts in achieving course learning objectives.

METHODS

Study design. In the spring semester of 2007, the enrollment for Environmental Studies 101: Forum on the Environment was approximately 250 students from more than 50 majors. The one-credit course met once per week for a 50-minute lecture period. Each week, an outside speaker

*Corresponding author. Mailing address: Department of Soil Science, 204 Soils, 1525 Observatory Drive, Madison, WI 53706. Phone: (608) 262-0132. E-mail: tcbalser@wisc.edu.

considered to be an expert on a topic relevant to the course would make a 40-minute presentation to the class, with the remaining 10 minutes used by students to ask questions and complete worksheets on the lecture topic. In an effort to build learning communities within the class, students were encouraged to discuss worksheet questions with their classmates before answering. The weekly worksheets accounted for 50% of each student's grade for the course. The remaining 50% of student grades were determined by a series of five assignments that were completed outside of the classroom. We built this research project around one of these assignments, "Evaluating popular versus scholarly presentations of global climate change."

The assignment itself required students to read two articles (one scientific and one popular) and review two podcasts (one scientific video podcast and one popular audio podcast) on global climate change and then write a one-page reflection on the material presented and the presentation style of each piece. The overall goal of the assignment was to allow students to critically examine and evaluate the way that different forms of media present information about the same topic and to suggest ways to present environmental issues to the general public that would engage people without overdramatizing the issue. Our main learning objective for the assignment was for students to demonstrate critical evaluation of media messages, and our research objectives were to (i) assess student preferences for using podcasts in course

assignments and (ii) evaluate the effectiveness of podcasts in supporting the assignment learning objective.

Survey tools. We designed pre- and postassignment surveys to evaluate our research objectives. Students who chose to participate in this Institutional Review Board-approved research study were asked to complete the preassignment survey prior to being given the assignment and the postassignment survey after they had finished the assignment. The survey was available online via the University of Wisconsin's Student Assessment of their Learning Gains website (http://www.salgsite.org/). The preassignment survey consisted of 17 questions (yes/no, 5-point Likert scale, or open-ended [Table 1]) and focused on gathering data about student experiences and preferences for using podcasts. The postassignment survey gathered data to determine student preferences for using published podcasts in the course assignment and also asked the open-ended question, "List three ways in which climate change was portrayed differently by scientific versus popular media in the podcasts you listened to," in order to evaluate our assignment learning objective for students to demonstrate critical evaluation of media messages.

Analysis. Response frequencies (n and %) and chi-square tests to determine P values for statistical significance were performed using SAS Statistical Software (version 9; SAS Institute, Inc., Cary, NC). Qualitative data were coded in a Microsoft Excel spreadsheet using a coding structure developed from reviewing the responses to the open-ended

TABLE 1. Selected questions from the pre- and postassignment Student Assessment of their Learning Gains survey

Question	Survey	Answer choices
Have you heard of "podcasts" before?	Pre	Yes/no
How often do you use podcasts outside of course assignments?	Pre	Daily, weekly, monthly, yearly, never
I enjoy using podcasts./I enjoyed using podcasts in this assignment.	Pre, post	Strongly agree, agree, neutral, disagree, strongly disagree, not applicable
I think podcasts are a useful tool for learning.	Pre, post	Strongly agree, agree, neutral, disagree, strongly disagree, not applicable
I would like to use more podcasts as a part of course assignments.	Pre, post	Strongly agree, agree, neutral, disagree, strongly disagree, not applicable
I think podcasts are easy to use.	Pre, post	Strongly agree, agree, neutral, disagree, strongly disagree, not applicable
Podcasts are potentially a valuable way to teach people about global climate change.	Pre	Strongly agree, agree, neutral, disagree, strongly disagree, not applicable
I have a better understanding of climate change because of the podcasts in this assignment.	Post	Strongly agree, agree, neutral, disagree, strongly disagree, not applicable
Which medium was most helpful in improving your understanding of global climate change?	Post	Scientific article, popular article, scientific podcast, popular podcast, scientific guest lecture, popular guest lecture
Which medium was least helpful in improving your understanding of global climate change?	Post	Scientific article, popular article, scientific podcast, popular podcast, scientific guest lecture, popular guest lecture
List three ways in which climate change was portrayed differently by scientific versus popular media in the podcasts you listened to.	Post	Open-ended

postassignment survey question, "List three ways in which climate change was portrayed differently by scientific versus popular media in the podcasts you listened to." We did not collect any demographic or personally identifying data from participants, limiting our ability to determine who was lost to follow-up in the postassignment survey.

RESULTS

Student preferences for podcasts. Two hundred nine (83%) students completed the preassignment survey; 154 (62%) completed the postassignment survey. According to the survey, 179 (86%) of the preassignment respondents had heard of podcasts before, and 76 (36%) had used podcasts previously. Of the students who had used podcasts, 6 (8%) reported using podcasts daily, 21 (28%) weekly, 33 (43%) monthly, and 16 (21%) yearly. These students reported using the technology for news, entertainment, and educational purposes (lectures or supplemental materials). Forty-six students (22%) had previously listened to podcasts for University assignments in biochemistry, biology, human development and family studies, psychology, Scandinavian studies, Spanish, and zoology. Of the students who had previously used podcasts, 69 (94%) reported enjoying the technology (Table 2).

In the preassignment survey, 61 respondents (89%) who reported enjoying podcasts also agreed that podcasts are a valuable tool for learning ($P < 0.0001$). In the postassignment survey, this value increased to 130 (97%; $P < 0.0001$). However, only 111 respondents (83%) in the postassignment survey who reported enjoying podcasts also reported wanting more podcasts as part of course assignments ($P < 0.0001$).

In the postassignment survey, 90 students wrote comments about podcasts (50% positive, 18% neutral, and 32% negative). The following qualitative data represent typical comments related to each issue raised. Several students raised issues of diversity in aural versus visual learning styles:

> "I liked listening to the podcasts better than reading articles; I felt I retained the information better."

> "A written transcript to follow along with would be helpful. Although podcasts are interesting and help to engage auditory learners, it's very easy to miss something if your attention is distracted. Although you can "rewind," having text makes it much more comprehensive."

> "Podcasts would be much better if there was something to watch along with listening to something. I know some podcasts have video and audio which is probably more effective rather than listening to the story being told."

In addition, a few students commented on issues of socioeconomic diversity, including concerns that some students would be at a disadvantage when using podcast technology:

TABLE 2. Student preferences for using podcasts[a]

Question	n[b]		Agree or Neutral n (%)		Disagree n (%)		P value[c]
	Pre	Post	Pre	Post	Pre	Post	
I enjoy using podcasts./I enjoyed using podcasts in this assignment.	73[d]	154	69 (94)	134 (87)	4 (6)	20 (13)	0.08
I think podcasts are a useful tool for learning.	143	153	131 (92)	141 (92)	12 (8)	12 (8)	0.86
I would like to use more podcasts as part of course assignments.	168	154	126 (75)	124 (81)	42 (25)	30 (19)	0.24
I think podcasts are easy to use.	146	154	136 (93)	148 (96)	10 (7)	6 (4)	0.26
Podcasts are a potentially valuable way to teach people about global climate change.	209		195 (93)		14 (7)		
I have a better understanding of global climate change because of the podcasts in this assignment.		152		128 (84)		24 (16)	

[a] Preassignment survey $n = 209$; postassignment survey $n = 154$.

[b] A total of 209 students participated in the preassignment survey. However, the smaller number of responses for the preassignment questions reflect the fact that only 179 (86%) students had heard of podcasts before; the remainder of students either replied "Not applicable" or were coded as "No response."

[c] P values are for chi-square tests comparing pre- and postassignment survey responses.

[d] While 130 students responded to the preassignment question "I enjoy using podcasts," only 76 (36%) reported having previously used the technology. Therefore, in our preassignment sample for analyzing enjoyment of using podcasts, we included only those students who reported having used the technology previously and answered the enjoyment question ($n = 73$).

"I dislike them for scholarly use due to socioeconomic discrimination. Those with more money will be able to be more flexible (i.e., listen to podcasts while on the go versus someone on a computer). This disadvantage is huge in the long run and should not be implemented unless all students have access to iPods or mp3 players."

A number of students commented on the usefulness of listening to podcasts in comparison to reading:

"I thought they were a nice change from just reading. I think it would be good to incorporate podcasts in future learning alongside readings."

"I feel that podcasts can be a delight to use, if they would present something that we couldn't achieve from reading a textbook, such as on-site analysis. I would much rather have read a textbook than listened to the podcasts, that is not to say that the podcasts were horrible; I would just prefer to reread a paragraph than rewind a sound wave."

Finally, some students commented on having technological difficulties with downloading or playing the podcasts:

"They took really long to load on this computer and I did not find it something I'd like to do again."

Regarding the course information that students found most helpful in improving their understanding of global climate change, they ranked the scientific podcast highest ($n = 50$; 48%), followed by the scientific article ($n = 24$; 23%), the popular article ($n = 18$; 17%), and the popular podcast ($n = 12$; 12%). In the postassignment survey, 87 students (62%) who reported that podcasts were a useful tool for learning also responded that the assigned podcasts had given them a better understanding of global climate change ($P = 0.0005$).

Student capacity to critically evaluate media messages. One hundred forty-five students responded to the open-ended postassignment survey question, "List three ways in which climate change was portrayed differently by scientific versus popular media in the podcasts you listened to." Of these respondents, 104 (72%) shared comments relating to the credibility of the media based on referenced facts. The second most popular cited difference between the popular and scientific podcasts referred to the presentation style of the media, be it the narrative voice of the popular podcast or the interview with an expert question-and-answer discussion style of the scientific podcast, and how the style influenced the overall message of the podcast (50 students; 34%). The third theme that arose from student responses suggested that the popular podcast relied on emotion to impress a sense of urgency or loss on the listener (47 students; 32%). A number of students commented on the difference in terminology used in the two podcasts as related to either appealing to a broad audience, in the case of the popular podcast, or restricting the ability for the public to understand the information, in the case of the scientific podcast (35 students; 24%). The difference in the depth of content between the podcasts was another common theme (29 students; 20%), followed by entertainment value (28 students; 19%), risk portrayal or sensationalism (23 students; 16%), objectivity (18 students; 12%), and bias (4 students; 3%). The following student responses provide examples of these common themes that arose from student evaluation of the podcasts:

"The popular media used anecdotal and descriptive methods for discussing climate change while the science podcast discussed theories and facts. The popular media appealed to the listener's emotions by discussing personal impressions and feelings and by rambling on about unrelated topics (the scuba divers from the ship, the feelings of "vastness" regarding the area, etc., etc.) while the science podcast was thorough yet concise. Popular media descriptions of the mode of action of global warming were vague while the scientific podcast took time to explain technical terms regarding global warming effects in order to more thoroughly explain the phenomenon."

"1. Scientific sources go into much greater depth than popular sources. While this can be particularly useful for audiences with a scientific background, it may prove confusing for people that lack such a background. 2. Scientific sources, especially written journal articles like the one we read, lack bias in comparison to comparable articles and broadcasts in the popular media. 3. Popular media broadcasts are often more catchy and interesting to listen to, despite the fact they might not contain a lot of good scientific evidence on a topic. While this hinders the use of this genre of broadcast from an educational standpoint, it provides a valuable tool to drive the public into action."

"In the podcasts, popular media portrayed climate change insufficiently; it composed a "pretty story" but told me very little. 2. The scientific podcast narrator made sure her audience was aware that the future

of the Arctic isn't wholly certain; there are many models that suggest different results. What is clear, she claims, is that progressive melting will occur. 3. The scientific media portrayed climate change as a documentable phenomenon which can be explored with rational experimentation. The popular media simply suggested that a beautiful ecosystem is being degraded (which is true, but lacks depth)."

DISCUSSION

Overall, student attitudes toward podcasts were positive, and we believe they are a potentially valuable addition to undergraduate introductory courses. The podcast assignment itself had minimal impact on student attitude (as indicated by a lack of statistically significant difference between pre- and postassignment surveys), yet because the majority of students reported enjoying using the podcasts in the assignment (87%), found them to be both easy to use (96%) and a useful tool for learning (92%), and agreed that they would like to use podcasts in more course assignments (81%), we feel confident in recommending the use of this technology to enhance student learning.

Before choosing to use podcasts as a part of course assignments, we recommend paying careful attention to the comments students raised regarding the technology in order to avoid any potential problems. Several students commented on issues of learning diversity, which may indicate that podcasts support the learning of audio learners, but may not be preferred by individuals who prefer the visual reinforcement of text-based materials. We suggest two ways to overcome this problem: provide a text-based transcript along with the audio recordings or use video rather than audio podcasts to help support visual learners. It is important to note, however, that using only video podcasts may create difficulties. Because fewer students have access to a portable player capable of showing video, video podcasts might require students to sit at a computer for viewing. This potentially offsets the benefits of "portability" in using podcasts to reinforce course learning objectives. Furthermore, as one student pointed out, using technology that requires expensive equipment raises an issue of socioeconomic discrimination in the classroom. Some universities have overcome this disparity by distributing mp3 players to incoming first-year students (2). Institutions that do not have this ability could help overcome the problem of socioeconomic discrimination by making mp3 players available for check-out through student technology labs. The University of Wisconsin—Madison has a successful program of this nature that provides students with access to a variety of technologies. Further research is needed to ascertain whether students have access to portable players and to determine the learning styles of students (aural versus visual) for comparison with podcast preferences.

Our main learning objective for this assignment was for students to demonstrate critical evaluation of media

messages. The majority of participating students (72%) did critically evaluate the credibility of the podcasts with regard to their use of scientific evidence. Students also evaluated how the style of the podcast influenced the media message (34%), and likewise how the use of emotion in the popular podcast incited a sense of urgency in the listener (32%). Other critiques of the media and message included comments on the depth of content used (20%), the entertainment value of the piece (19%), the portrayal or sensationalism of risk (16%), objectivity of the message (12%), and bias (3%). The main point we wanted students to take away from this activity regarding the way that media portrays science is that the popular press can often sensationalize scientific information, thereby making it necessary to understand the credibility of an information source by evaluating the evidence provided before regarding the message as accurate. Therefore, we believe that the comments students shared regarding the portrayal of climate change in each podcast provide evidence that our learning objective for the podcast assignment was achieved.

While a large percentage of students raised concerns over the credibility of podcasts in terms of the evidence they provided about climate change, we were surprised that only a small number of students commented on the objectivity or bias of the podcasts. In reviewing the podcasts, however, we realize that the presentation styles of the podcasts—the narrative voice of the popular podcast and interview style of the scientific podcast—do not lend themselves to easy comparative critique of objectivity and bias. If critical evaluations of these characteristics are main learning objectives of a course or assignment, we recommend coupling a podcast assignment with course information that discusses the importance of objectivity and bias in media sources.

CONCLUSION

Students reported that podcasts were easy to use, but their comments prompt us to recommend providing transcripts along with audio podcasts or assign video podcasts to support visual learners. In addition, we recommend alerting students to problems they may encounter downloading the podcasts, letting them know how much time they can expect to spend accessing the podcasts, and providing help in troubleshooting problems that students encounter.

We also found podcasts to be effective overall at enhancing course learning, and we recommend that educators assign podcasts that build upon course learning objectives—in other words, use the podcast as a tool to provide a depth of understanding such as through a specific case study, rather than as a standalone component of a course. Educators should first listen to a few relevant published podcasts to ensure that the content of a selected podcast matches course objectives, and then design course assignments around the specific content of the podcast. There are numerous published podcasts available on material directly related to course content, so educators must decide whether the content of a podcast fits well enough within a previously defined learning objective

to be used on its own, or whether the podcast should only be a tool for reinforcing material covered in other aspects of the course material. Specific learning objectives may be created based upon a podcast, rather than trying to fit the podcast into previously developed objectives or assignments.

Finally, we suggest using published podcasts as a way to engage students as environmental citizens. Exposing students to a variety of tools for evaluating media claims will help engage them with the "wired world" in which they live, the one that bombards us all with conflicting information on a daily basis. Providing students with the ability to evaluate media's portrayal of science will strengthen their abilities as an engaged global environmental citizenry.

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