Designing an Audiocast Assignment: A Primary-Literature-Based Approach that Promotes Student Learning of Cell and Molecular Biology through Conversations with Scientist Authors †

Sadek Shorbagi1 and Aarthi Ashok2*

1 Cell & Systems Biology Graduate Program, Department of Biological Sciences, University of Toronto Scarborough, Toronto, ON, M1C 1A4, Canada, 2 Department of Biological Sciences, University of Toronto Scarborough, Toronto, ON, M1C 1A4, Canada

INTRODUCTION

Instructors of large (>300 students) undergraduate foundation courses at the authors’ university tell students that what they learn has relevance to ongoing research in the field and convey stories about the relentless curiosity behind the exciting work of biologists. However, in our opinion, students seldom actually have a chance to experience such links between research advances, researchers, and their own learning. We hypothesized that engaging students with research articles and the researchers who produced the work could enhance their learning of related course concepts and perhaps even influence their perception of scientific research. This was the motivation behind the design of this audiocast assignment that allows students to interview scientist–authors after reading their published research.

PROCEDURE

The audiocast assignment is offered as an optional assignment for students in a second-year Cell & Molecular Biology course. Students who opted in worked in groups of two or three to choose, read, and analyze an article from a reading list provided by the instructor. The reading list was composed of recent publications by principal investigators (PIs) who had previously agreed to participate. No more than three groups of students were allowed to choose the same paper, in order to manage the demands on the time of scientists. Following a critical reading of the chosen paper, students contacted the PI for a recorded interview during which they would ask probing questions about the paper. The final product was a five- to ten-minute audiocast or videocast (Appendix 4) in which students summarized the paper’s findings, its relevance to course concepts and implications for the field, using clips from the author interview.

The assignment was scaffolded with multiple meetings and deadlines as follows:

1. At an initial information session in which assignment structure and expectations were described (Appendix 1), resources on how to read scientific literature (a guide written by the instructor and online resources) and examples of appropriate interview questions were provided.
2. Students reported their group composition and article choice to the teaching assistant (TA; co-author) prior to the opt-in and article deadlines, respectively.
3. Students scheduled a TA meeting after reading the paper, prior to an assigned deadline. At this assessed meeting, students summarized the paper’s findings and provided a rough draft of the author interview questions.
4. Weekly TA and instructor office hours were available for students to ask clarifying questions about the content or techniques used in the paper; however, self-directed learning was encouraged.
5. Students contacted the PI via Skype for a 60- to 90-minute recorded interview, prior to an assigned deadline. Students then recorded their own paper summary and linked that to author interview clips to produce the final audiocast, prior to the assignment due date.

The final audiocast (worth 14% of students’ final grade) was assessed as shown in Table 1. Twenty-five percent of the points assigned to categories 1 and 3 were determined during student–TA meetings, in which students’ level of academic preparation, interest, and self-directed learning were evaluated (Appendix 2).

CONCLUSION

Anonymous student feedback was solicited through an optional, online survey (the full survey and responses can...
be found in Appendix 3) distributed in summer 2013 \((n = 20)\). All materials, survey and responses are entirely original documents with author names and identifiers redacted to allow for blinded review.

Overall, participation in the assignment was regarded as a positive experience (Fig. 1). It is gratifying that 75% of students (15 out of 20) responded in an open-ended question that learning to critically read and analyze scientific papers was among the skills they acquired (Appendix 3, p. 11).

A full 95% of students (19 out of 20) suggested that the opportunity to interview a scientist was a very positive experience and aided in their learning (Fig. 2). Students remarked that they were able to see how a scientist might think in terms of breaking down a problem and that speaking with scientists was “fun and exciting.” Studies have shown that when students incorporate people (their stories, explanations, etc.) into their framework for the storage of specific concepts, they can access such concepts more readily (2, 3, 5, 9). Seventy-five percent of students suggested that participation in this assignment positively influenced their attitude toward scientific research (Fig. 3). With increasing need for public support for science, it is critical that undergraduates appreciate the role and value of research.

This assignment design draws from successfully implemented methods, such as “CREATE” (6), which have established the importance of 1) using primary literature to nurture critical thinking (6) and 2) influence students’ attitudes toward the process of science (7). With CREATE, the instructor moderated bi-weekly sessions throughout a 14-week course aimed entirely at developing literature reading skills. This differs from our assignment, which is only one component of learning in a large foundation course and hence can be easily adapted to existing courses without large demands on instructor time and resources. More loosely structured approaches utilizing instructor-generated questions to guide learning, similar to our literature-reading guide, are shown to be as effective as CREATE in stimulating critical thinking, lending support to our design (4, 10). Notably and unlike other studies (8), our students were neither a subset of high performers nor advanced research project students, as our goal was to engage all students early in their undergraduate tenure.

While this pilot assignment was optional, it is highly amenable as a mandatory course component. In the spirit of calls for change to science, technology, engineering and mathematics (STEM) education proposing curiosity-driven approaches that incorporate the process of science (1, 11, 12), we believe this assignment is especially germane to stimulating biology learning.

**FIGURE 1.** Assignment survey results to Question 1: Did you enjoy participating in this audiocast assignment?

**“Nothing beats hearing from the author, and asking more questions helps you really get the details and mind set of scientists when they face a problem.”**

**“Asking questions is not one of the things I am good at. However, through this assignment, I was able to let my curiosity run in all different directions and learn more than what the article talked about.”**

**“Exciting and fun as I am allowed to talk to the author who actually wrote the article and this is an unforgettable and meaningful experience.”**

**TABLE 1.** Grading of assignment.

<table>
<thead>
<tr>
<th>Category</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understanding of scientific paper</td>
<td>4</td>
</tr>
<tr>
<td>2. Accuracy of implications of paper to field of cell biology</td>
<td>4</td>
</tr>
<tr>
<td>3. Suitability/quality of questions asked of the scientist</td>
<td>3</td>
</tr>
<tr>
<td>4. Production value of final piece</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

**FIGURE 2.** Assignment survey results to Question 4: Comment on the experience of learning through asking questions. All responses can be found in Appendix 3, p. 12.

**FIGURE 3.** The influence of the assignment on student attitudes toward scientific research. Assignment survey results to Question 8: Has participation in this assignment influenced your attitude towards scientific research? The “Please explain” bar refers to the 50% of respondents who provided a written explanation of the nature of this influence (responses can be found in Appendix 3, p. 17–18).
SUPPLEMENTAL MATERIALS

Appendix 1: Information sheet about assignment
Appendix 2: TA evaluation of students
Appendix 3: Survey and student responses (Survey Monkey)
Appendix 4: Links to sample video- and audiocasts produced by students

ACKNOWLEDGMENTS

We thank all the scientist–authors who participated in this assignment for their time and support of our students’ learning and Drs. Rene Harrison and Mark Bayfield for providing insightful comments that improved the manuscript. The authors declare that there are no conflicts of interest.

REFERENCES