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Making It Matter: Increasing Student-Perceived Value of Microbiology through Reflective and Critical News Story Analysis

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INTRODUCTION

Between the 2019 coronavirus disease (COVID-19) pandemic and other scientific developments, both social media and mass media are full of stories that relate to microbiology classrooms. Confronted with this expanding information load, sometimes it is cumbersome for students to differentiate between the real and fake articles and adequately interpret the main message in those stories (1). The iterative intervention described here combines a myriad of news stories and active learning strategies (2) to (i) help students apply critical thinking and scientific principles learned in class to analyze news reports and (ii) positively influence student motivation to engage and interact with course content. Past studies have shown graduate-level science students (3, 4) and undergraduates (5) alike benefit from engaging with articles based on current events. By allowing students to select their own course-related news topic, they perceive content to be more valuable, resulting in improved critical thinking (6) and information literacy skills (7).

Expectancy-value theory predicts that students will put in more effort if they perceive value in a learning activity, which has been shown to be effective in encouraging active learning (8). By providing students with opportunities to engage with microbiology and immunology current events of their own choosing, students are expected to be intrinsically motivated to work harder, pursue more biology-based coursework in the future (9), and become better consumers of science-based news stories. This iterative series of activities uses expectancy-value theory by asking students to explain, using lay language, the relevance of course content to contemporary news events, all to increase student motivation. The assignment series can be adopted by instructors looking for an active learning intervention to assist students in applying their knowledge to current events and actively discuss the concepts and identify potential misconceptions and/or misrepresented information.

PROCEDURE

Modeling the iterative activity

Figure 1 depicts the flow of events through the first iteration of the intervention. During week one, instructors model selecting trustworthy news articles in class (see Appendix S1 in the supplemental material). Once criteria for article selection are established, a template for the submitted activity and two submission examples are introduced along with the rubric for synchronous critiques (Appendices S2 and S3). The template guides students in how to report article metadata and introduces a series of reflective prompts to assist students with summarizing and making direct connections with course concepts. Students are further

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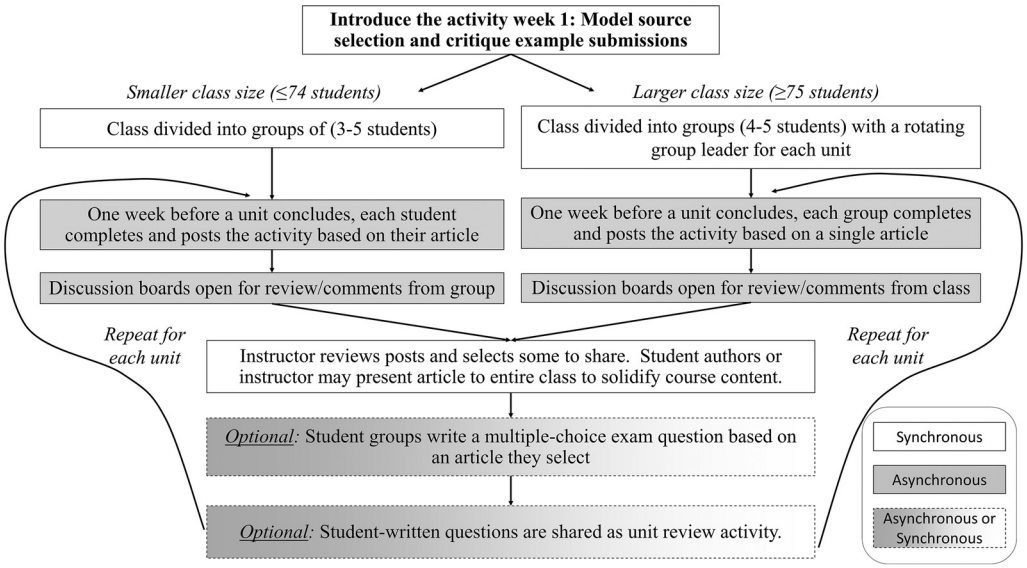

FIG 1. Flowchart depicting stages of the iterative learning activity.

challenged to write an engaging exposition for a friend or family member to practice science communication skills. Finally, students identify potential misconceptions, omissions, or inaccuracies from the article. Students are encouraged to monitor news throughout the course, with the submission due 1 week before closing a unit to allow time for subsequent activities and review. The initial iterative activity is repeated during each unit (3 to 5 units per course), with students encouraged to explore pertinent topics, thereby ensuring students branch out with their topics rather than repeat coverage of a topic (e.g., COVID-19).

Sharing products and reinforcing applied concepts

For small classes, individuals produce and post their submissions to online discussion boards in groups of 3 to 5 students. For larger classes (>75 students), groups of 4 to 5 students (including a designated group leader) work together on a single, combined submission to streamline instructor workload. Similarly, submissions are shared on discussion boards for analysis within larger groups. During the following class session, the instructor may ask students or groups to share a summary of highlighted articles, or the instructor may themselves summarize articles of interest. The latter approach (i) recognizes students for finding interesting articles potentially motivating the class to find captivating articles for future units and (ii) allows the instructor to clearly and efficiently connect articles to unit concepts and reinforce them prior to a summative unit assessment.

Writing student-generated article-based questions in groups

Optionally, the instructors may ask students to conclude the activity by writing potential multiple-choice exam questions for their peers based on concepts related to the article (Appendix S4). This deeper dive into the material should also be modeled by the instructor and practiced as a class. For stories summarized by groups, the larger meta-group, having seen the other submissions, can write a single question or questions can be written by each smaller group. In-class time (30 to 45 min) can be provided for students to write, which may then be presented by the instructor for real-time critique and analysis of both concept and question. Student-generated questions can be shared with the entire class as a supplemental study resource and/or can be included on unit assessments.

Ethics statement

Work was conducted with institutional review board approval from each participating institution and participants' informed consent.

CONCLUSION

Preliminary observations are promising

Anecdotal evidence from multiple institutions, including both large and small microbiology lecture courses, shows students are highly engaged with the current events project. Students appear to be excited to share their stories, not only with classmates in the course but also friends and family. Using this activity in a large lecture course effectively brought students together in discussion to build community as campuses were beginning to open back up from COVID-19 restrictions or continuing in online or hybrid format (10). Students often shared stories they found with instructors outside of the assigned work, thereby increasing positive, informal interactions and building rapport.

Analysis of pilot data showed, compared to students in a control group, students in the intervention group assigned higher perceived value of microbiology content, spent more time actively thinking about microbiology, and indicated a greater likelihood of taking additional biology courses not required by their major (primarily nursing students). Preliminary data resembled gains observed in high school students when instructors frequently show relevance of biology concepts to daily life (11). Such data are promising as educators work to help students engage and persist in science, technology, engineering, and math fields. Finally, the activity allowed students to display their science literacy competencies through assessing the reporting of each story. As reputable sources were used for this project, students primarily cited omissions and lack of depth rather than factual inaccuracies.

Effective article-based question writing may require additional time

Although many students struggled to write usable questions about concepts related to student-selected news articles, especially while working in groups to achieve consensus, such activities can strengthen student learning and engagement. These complications may be eased by (i) allowing additional time for peer review and revision of questions and (ii) using instructor-written, rather than student-written, questions that reference stories. There is a case for keeping the question-writing activity in some form, as it can be a successful active learning intervention (12, 13); however, creating usable assessment products may require additional instruction.

Overall, students and instructors both enjoyed the activity. This activity keeps class content relevant to our global context and empowers students to make sense of a fast-paced and often-confusing world of scientific current events.

SUPPLEMENTAL MATERIAL

Supplemental material is available online only.

SUPPLEMENTAL FILE 1, PPT file, 3.6 MB.
SUPPLEMENTAL FILE 2, DOCX file, 0.03 MB.

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