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Science Communication

Collaborative Posters Develop Students' Ability to Communicate about Undervalued Scientific Resources to Nonscientists †

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Scientists are increasingly called upon to communicate with the public, yet most never receive formal training in this area. Public understanding is particularly critical to maintaining support for undervalued resources such as biological collections, research data repositories, and expensive equipment. We describe activities carried out in an inquiry-driven organismal biology laboratory course designed to engage a diverse student body using biological collections. The goals of this cooperative learning experience were to increase students' ability to locate and comprehend primary research articles, and to communicate the importance of an undervalued scientific resource to nonscientists. Our results indicate that collaboratively created, research-focused informational posters are an effective tool for achieving these goals and may be applied in other disciplines or classroom settings.

INTRODUCTION

Valuable scientific resources such as biological, geological, and anthropological museum collections, research data repositories (e.g., GenBank, Biospecimen Repository Access and Data Sharing [BRADS]), public health resources (e.g., CDC WONDER, Hazardous Substance Data Bank [HSDB]), and expensive equipment (e.g., telescopes, imaging systems) may be underappreciated by nonscientists. This undervaluing can contribute to decreasing public support, threatening the sustainability of these resources (1), and creating the risk of losing the science knowledge they contain and create (e.g., 2). In order to maintain these important resources, scientists must be able to communicate their value. However, specific training in communicating to nonscientists is lacking for most students, despite recent reports indicating a need for scientists at all levels to communicate effectively and in impactful ways (3, 4). In this article, we discuss the use of informational posters in an inquiry-driven organismal biology laboratory course as a mechanism for integrating training in communication of science to nonscientists. We focused on biological collections because they "support a whole range of disciplines and professions for which the end product is valued but the role of the collections in it is often unnoticed" (5). Continued budget cuts threaten many biological collections, and building public knowledge of, and support for, collections is critical for reversing that trend (6).

Engaging a diverse student body is a priority at our institution. Cooperative learning has been used to involve students with diverse backgrounds (7), and informational posters have been recommended as a tool for both actively engaging students (8) and improving public communication skills (9). Our course sought to combine these tools to increase students' ability to locate and comprehend primary research articles and communicate the value of an undervalued scientific resource to nonscientists; to enhance student engagement; and to highlight the role and importance of biological collections in research.

PROCEDURE

This inquiry-driven organismal biology laboratory had students work in groups to communicate answers to three general questions about an undervalued scientific resource: 1) What is the resource? 2) Why is the resource important to nonscientists? 3) How is the resource used, managed, and maintained? Our course focused on the University of Texas at El Paso (UTEP) Biodiversity Collections, a well-kept secret that we hoped to reveal through the work of our students. The students in the lab were engaged in hands-on activities with specimens and citizen-science projects that exposed them to the collections, specimen care, and use of biological collections in scientific research. Activities were paired with readings, discussion, and writing assignments (Appendix 1) to prepare the students for the communication goals of the poster (Appendix 2).

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Students were placed into groups by the instructors for the duration of the poster project, based on balancing their strengths as observed during the first half of the semester. Their posters were to inform nonscientists about biological collections with four defined sections: 1) Introduction, 2) Importance, 3) Management, and 4) "Did you know?" (Appendix 2). The first and third sections communicated the background, purpose, and curation of collections. The second section was designed to help students understand primary research articles and communicate about them, an important skill that is often challenging for undergraduates (10). Students located three articles that relied on the use of biological specimens and then summarized them while emphasizing how the research was only possible because of biological collections. The fourth section focused on interesting facts about the UTEP Biodiversity Collections and included a call to action in support of the collections. Student research and writing were primarily completed during lab meetings. During the final lab, groups presented their posters to biology and museum studies faculty and graduate-student reviewers in a conference-style poster session. Although the reviewers were scientists, they assessed the groups using a rubric focused on communication to nonscientists (Appendix 3), and those assessments contributed to the groups' poster grades. The posters now hang near the entrances to the UTEP Biodiversity Collections and continue to enhance awareness of the collections' existence and importance.

CONCLUSIONS

Students were actively engaged during the poster creation process, discussing research articles within their groups as well as with other groups. Although the students were not able to present to nonscientists due to logistical constraints, the reviewers commented on the students' enthusiasm for, and knowledge of, biological collections. The 88% average rubric scores assigned by the reviewers indicate that students' posters successfully met the communication goals.

We feel that time constraints are the biggest obstacle to overcome with this type of project, and it would therefore have been beneficial to begin work on sections of the poster earlier in the semester. The variety of research articles chosen for the Importance section of the posters left many openings for deeper discussions into related topics such as taxonomy, specimen preparation, and collecting bias that were engaging to the students and pertinent to the course.

Deliberate creation of groups did not appear to play a part in the groups' ability to collaborate, and random assignment of students to poster groups may have worked just as well. In addition, we suspect it may have been beneficial to assign groups at the beginning of the semester and allow them to work together for the entire semester in order to build learning communities and foster collaboration. Although the students completed a short reading on working in groups, we believe that they would have benefited from additional training in collaborative learning (7).

We did not assign readings directly discussing science communication but relied upon indirectly communicating these principles. We introduced students to formal science writing through the reading of primary literature related to each specimen-based lab assignment, and to informal science writing by having them prepare a critique of a natural history museum exhibition. The addition of a unit dedicated to scientific communication might further increase the students' skills in this area (11). In addition, presenting the posters to nonscientists in a museum or library setting would meet the goals of students practicing communication skills and increasing public awareness of the scientific resources.

Our experience indicates that collaboratively-created informational posters are an effective tool for increasing freshman biology students' ability to find and comprehend primary research articles and to communicate the value of an undervalued scientific resource to nonscientists. We believe that additional instruction in collaboration and science communication could generate an even better outcome. Although developed for an inquiry-driven organismal biology laboratory, this exercise requires few resources and therefore can readily be adapted to both lower- and upper-division coursework. The focus on undervalued scientific resources provides real-world context that can foster student engagement while beginning to build public knowledge of the resources. Most fields have undervalued resources, thus providing excellent opportunities for this exercise to be applied across disciplines.

SUPPLEMENTAL MATERIALS

Appendix 1: Sample laboratory exercises
Appendix 2: Poster project instructions
Appendix 3: Poster grading rubric

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