Outreach Opportunities for Undergraduate Students through the Physics Communication Course at the University of Guelph

by Joanne M. O'Meara, Christian Schultz-Nielsen, and Martin Williams

During our curriculum mapping exercise in 2013/2014, we closely examined the role that each course played in the development of the desired graduate attributes of our students. As a result, our program has undergone an extensive update, with 5 courses deleted, 6 new courses added, and 9 existing courses significantly restructured. This restructuring afforded us the opportunity for a more intentional approach to developing communication skills, which is identified as one of the five core components of undergraduate and graduate education at the University of Guelph.

More specifically, the five key learning outcomes identified by the University of Guelph are:

- Critical and creative thinking
- Literacy
- Global understanding
- Communicating
- Professional and ethical behaviour

The university goes on to specify that communicating is "the ability to interact effectively with a variety of individuals and groups, and convey information successfully in a variety of formats including oral and written communication. Communicating also comprises attentiveness and listening, as well as reading comprehension. It includes the ability to communicate and synthesize information, arguments, and analyses accurately and reliably." [1] In addition, communication and interpersonal skills are identified as two of the criteria by which the CAP's Professional Certification Committee assesses physics-related work experience in the professional designation process [2].

Summary

In 2014, we launched our updated undergraduate program. Students are now required to take our Physics Communication course, sharing their passion for physics with different audiences.

Our redesigned program now requires all of our majors to take a course in third year that focuses on communicating physics to diverse audiences. As a result, there is a natural partnering of the curricular intentions of this course with our departmental commitment to public outreach. The following outlines our plans for honing our students' abilities to interact effectively with a variety of individuals and groups, and convey information successfully in a variety of formats through the first offering of this new course in the winter semester of 2017. In the revised program, our second, third, and fourth year physics laboratory courses have also been redesigned to strengthen the technical writing and presenting skills developed during the undergraduate experience at the University of Guelph, in keeping with the recommendations of the AAPT Laboratory Curriculum document [3].

COMMUNICATIONS COURSE STRUCTURE

Students are required to complete three major summative assessments during the semester, along with smaller formative assessments throughout. The major components include an individual writing project, an oral presentation, and a group project. The smaller formative assessments will explore important elements of writing and oral communication as we build towards these more significant course assignments. In addition, there are weekly readings, videos to watch, or podcasts to listen to before class. Students earn participation marks by coming to class prepared to critique these selected pieces in our group discussions.

Writing Project

Graded by the instructor, the format of the writing project is selected by each student from a list of possible options, such as a newspaper article or a story for a popular science publication (such as *Scientific American*) on a recent development in physics, a briefing document for a politician as background material for a request for significant government funding, a manuscript for a children's science/physics book, or a guest commentary for the opinions/analysis section of a major publication that addresses a controversial physics subject in the public domain.

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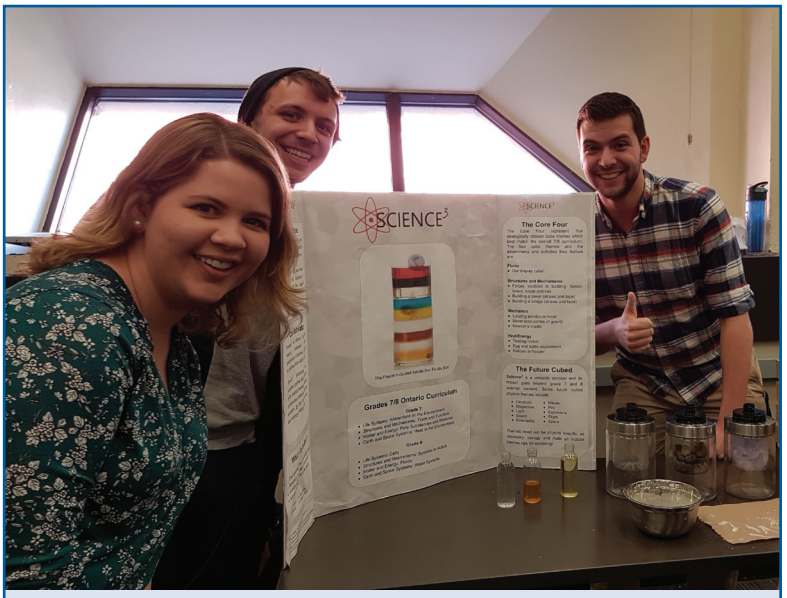
Working towards this significant assignment, all students in the course participate in formative writing exercises that focus on matching structure, content, and style to the target audience.

Oral Presentation

Graded by peer assessment and the instructor, students will choose their own physics topic to present to the class. In the initial offering of this course, the scenario for this presentation is a classroom visit at the elementary or secondary school level, to discuss a specific topic from the mandated physical sciences curriculum. Each year the target audience for this final presentation will change. Working towards this final presentation, students will participate in formative exercises that explore the key elements of orally communicating information and analyses in a clear, accurate, and engaging manner.



Physics students (left to right) Danielle St Jean, Dan Cureatz, and Eric Boucher stand with their display at the Open House presentations of the final group projects in PHYS*4300.

Group Project

Assessed by the community through an end-of-semester open house, as well as by the instructor, the capstone group project will draw upon skills developed in writing, oral presentations, as well as some aspects of multimedia design depending on the format chosen by each group. Potential formats from which the students can choose include: designing and creating a short physics-related YouTube video, developing a hands-on, low cost, activity kit for a particular physical science topic in the K-12 curriculum [4], or writing and creating a physics-themed podcast. These projects also provide opportunities to develop collaborative working skills. The group projects are the clearest example of the synergy between the goals of the communication course and those of our departmental outreach initiatives. Visitors to the open house are provided with a structured rubric for assessing the group projects on display, which is also provided to the students in the course as they work on these projects. Faculty, staff, students, as well as local high school physics teachers are invited to attend. Involving the wider community in the open house will be explored in future offerings.

CONCLUSIONS

We are excited about our plans for enhancing the communication skills of our students, while simultaneously expanding our outreach initiatives. As with all curricular developments, there will be an evolution as we learn what works and what doesn't in the context of this course in the coming years. Regardless of the specifics of the course structure in the future, however, we are committed to providing our students with opportunities to learn effective ways to share their passion and enthusiasm for physics with diverse audiences.

REFERENCES

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4. I. Braithwaite, J. Raykha, R. Tunley, and J.M. O'Meara, "*Developing Hands-on Physical Science Workshops for Elementary School Teachers: A 4th year research project*", *Physics in Canada,* **65**(4), 211-213 (2009).