Science Communication Flipped: Teaching and Learning Resources for Improving Science Writing

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In both classroom and laboratory settings, traditional science, technology, engineering and mathematics education often provides little or no opportunity for students to improve their scientific writing and argumentation skills (Motavalli, Patton, & Miles, 2007; Stout, 2011). Classes with writing assignments typically do not give students a chance to respond to feedback by making improvements and resubmitting their work, both of which are effective communication instruction strategies (Fallahi, Wood, Austad, & Fallahi, 2006). Furthermore, while there are many excellent general online writing resources, we found no satisfactory or comprehensive examples tailored to science writing.

In response to these deficiencies, a multi-year collaboration between the Faculty of Science and the Writing Centre at the University of British Columbia (UBC) has led to a curated suite of science-specific writing resources that include introductory videos and practice exercises of increasing difficulty with feedback at each stage. <IMAGE1 HERE PLEASE>

The openly available resources include science-focused lessons on writing topics such as using the active and passive voice, concise writing, transition words, minimizing jargon, descriptive and comparative techniques, summarizing, paraphrasing, and more. Taking inspiration from the "flipped" learning cycle commonly used in university science classes, each lesson begins with pre-class readings and a short online quiz on a specific writing topic. Working in pairs or small groups, the in-class portion of the activity builds on the pre-class exercises and often includes a peer review step. Here, the instructor and teaching assistant can answer questions, provide feedback, challenge students, detect problem areas, and give mini-lectures, when necessary. Finally, students return to a post-class online module with additional exercises and a quiz. Each stage of the activity includes instructor guidelines, sample answers, and suggested grading rubrics. Instructors also have access to slides on the writing topic.

<IMAGE2 HERE PLEASE> As an introductory hook to the writing topics, the pre-class part of the activity often includes a science writing video featuring the character Grammar Squirrel. The videos are collected on our YouTube channel: http://bit.ly/17Y09Yg. Additional science writing resources are available, such as, essay writing guides and quizzes, calibrated peer review assignments, and a universal citation tool, all of which are available in an open online repository.

The science-specific writing resources impact both students and faculty. Students benefit by learning writing skills in the context of their field of study and complete their university degree better equipped to effectively communicate complex information. To evaluate the resources, we developed a detailed rubric for assessing student work both before and after implementation. We also collect student feedback on the resources by including a short survey with each activity and video. On these surveys, a majority of students agreed that (a) the writing activities were useful, (b) they were using the acquired skills in their coursework, and (c) the writing activities were a good use of class time. Specific feedback about the science writing skills videos was also generally positive:

- "I liked how they gave examples and used images because I'm a visual learner."
- "I liked how the video is short and succinct and that the main points are recapped at the end."
- "The visuals are really funny and help bring it to life. It's actually fun to learn some of this stuff."

Faculty benefit by having access to a collection of resources from which they can choose activities that best align with their course learning objectives and assessments. This is particularly beneficial because although they recognize the importance of communication skills training, some faculty have indicated that they are uncomfortable teaching writing to students because it is not their area of expertise.

During this interactive session at ONLINE EDUCA BERLIN we will share some of our writing resources and invite your ideas on student and faculty needs in terms of developing further resources for the repository and how they might be used in the science laboratory or classroom. We will also collect audience experiences with integrating science writing into labs and classes and discuss how these ideas could be adapted for other venues.

References

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