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A science writing center as a catalyst for improving undergraduate writing skills in the sciences

Andrew J. Felton

Abstract. Having earned a PhD in the sciences, I am keenly aware that writing skills are at the core of being a successful scientist. Undergraduate students in the sciences not only face the immediate demands of complex course material, but in many cases the prospect of a career in which writing skills can determine professional success. Unfortunately, due to the complexity of science course material, writing assignments, revisions, and feedback to students are given relatively little attention. The Utah State University Science Writing Center is unique platform in its ability to address this limitation; bringing together a diverse pool of trained undergraduate students, graduate students, and PhDs like myself to help science majors navigate the writing process and improve writing skills. Here, I use my experiences over the past few months in the Utah State University Science Writing Center as a case study in why such a platform could be critical towards improving science writing and learning outcomes.

My motivation to be involved with the Utah State University Science Writing Center has its roots in a longstanding interest I have had in writing. I remember writing small books as a child, and excelling in writing-centered assignments throughout my early education. As an undergraduate, I became interested in evolutionary biology, but did not naturally excel in science-based courses in the same way I did for writing-based courses. It was not until I took a writing-intensive plant biology course that I realized my affinity for writing could be married with a fascination of biology. At that time, I did not realize how central writing is to success in scientific research. But the combination of my affinity for writing and passion for biology drove my later successes in science, with the eventual attainment of a PhD. This combination of interests also solidified a deep interest in the role of writing in science education. Here, I use my initial experiences with the Utah State University Science Writing Center as a case study in why such a platform could be critical towards improving undergraduate student writing and learning outcomes in the sciences.

Most universities do not have a writing center tailored to students in science-based majors, and so I was pleasantly surprised to stumble upon the Utah State University Science Writing Center. Having earned a PhD in the sciences, I can confidently say that writing is central to success in scientific research and related fields. But it is also apparent to me, having gone through the full gamut of the educational process, that undergraduate students in the sciences don't receive an education that reflects the potential importance of writing to their future careers. Motivated by this understanding, I contacted the assistant director of the Science Writing Center to see what sorts of opportunities exist for mentoring students. I was especially interested in those opportunities in which my PhD training could be best leveraged to help students.

The best opportunity was to mentor students with their Undergraduate Research and Creative Opportunities (URCO) grants. This program provides funding support for undergraduate students to pursue independent research projects. As an undergraduate at the University of Minnesota, I was awarded funding from a similar program. This small funding allowed me to gain experience with independent scientific research, which solidified my interest in pursuing a PhD and career in science. Motivated by my own experience, my initial work at the Science Writing Center involved working with students on their URCO grants. This work entailed meeting with students, going over their research proposal, and providing my insight with another tutor. This also exposed me to scientific ideas outside of my specific discipline of ecology, which ranged from psychology to geology.

For example, one student proposed to utilize a computer game to better understand what drives impulsivity in human behavior. These sessions often played more like a discussion of how best to communicate the complex ideas of their topic, and how to convey the importance to a broad audience. As a consequence, the benefits worked both ways; I was able to learn something interesting (perhaps a selfish benefit), and the student was forced to think about how to clarify their own writing. For example, I would ask, “In one or two sentences, describe the big question you are asking here?” The student struggled a bit with this, but it forced the issue of the student going back to the start and thinking of the actual motivation behind their writing. If the motivation behind the work isn’t crystal clear to the reviewer of a grant proposal, the grant simply won’t get funded.

I found the ideas these students had for their URCO proposals interesting and exciting, and that in general the raw material needed to convince the reader about why the research is important was already present in the proposal. The challenge for the students ultimately became

one of *structuring* their writing, and in particular better emphasizing the development of a cohesive argument throughout their proposal. An outlet such as the SWC is critical for such students because it provides a platform for feedback on their writing and revisions to be driven by the advice of trained and experienced tutors who have the time to provide feedback. Tutors range from experienced and trained undergraduate students, to those like me who are working on or who have a PhD. My training and perspectives are more strongly shaped by my experiences in science as a discipline, whereas undergraduate tutors often have extensive experience working with students in a tutor setting. As a result, a mix of expertise and perspectives is embedded in the Science Writing Center for students to take advantage of.

This can be demonstrated in the URCO sessions, where I co-tutored with both graduate and undergraduate students. For the geology student proposal, the first thing I went to was how the argument for the proposed research was presented; the student needed to start with the big picture, identify the key knowledge gap, and leverage those bits of information to establish the urgency and importance of the work within the first two paragraphs. But the other tutor, an undergraduate, first went to how the student may consider switching from passive to active voice, something I didn't even consider, which yielded complimentary insights for the student. What I feel is also unique about The Science Writing Center is that it provides students a potential opportunity to engage with those (PhD students or post-docs) who have learned through their own experiences and training what an effective research proposal, or other forms of scientific writing, looks like.

Somewhere in between my experiences with URCO grants and shadowing other tutors, conversations with the assistant director about writing in science education evolved to the point that ideas for a writing-intensive science course began to take shape. These discussions lead to

the evolution of an idea in which writing could be utilized as a tool not only for communication but for facilitating learning in the natural resource sciences. This specific idea grew through a general discussion of the central role that writing plays in the sciences. Specifically, writing skills underlie the successful attainment of funding to conduct research and the communication of research findings to both the scientific community and the broader public. This requires communicating complex ideas in a concise, understandable, and engaging way.

However, undergraduate science courses are rarely tailored to build these skills, and the writing process can be difficult to navigate. Indeed, my undergraduate science courses contained very little writing and writing revisions. I thus saw a potential opportunity through The Science Writing Center to design a science-based course that emphasized building experience and skills in writing the reflect multiple components of the writing process. In that way, I see the course as a potential small-scale version of the real scientific writing process. This course will entail building skills in reading actual scientific papers, extracting core information from them, and organizing that information to build an effective argument through a literature review and synthesis paper or a research proposal. Outcomes such as the production of a course tailored to fill educational gaps in science writing is a direct outcome of the Utah State University Science Writing Center, and is a concrete example of why such a platform can be of great benefit to a University.

My experiences so far at the Utah State University Science Writing Center serve as tangible examples of why such an outlet could be critical for facilitating improved writing and learning outcomes for students in the sciences at other universities. The Science Writing Center serves as a platform for feedback and subsequent writing revisions to be driven by trained and experienced peers that also possess a diversity of background and insights. Revision and

feedback is critical to improved writing and is often not emphasized in courses. A Science Writing Center provides a free outlet for undergraduate students in scientific majors to reach their full writing and communication potential, whether it be for coursework, a research proposal, or a PhD dissertation. A Science Writing Center also can serve as a basis for interactions and collaborations among individuals motivated by their passion for writing to pursue writing-based pursuits that can ultimately benefit students. While my time at The Utah State University Science Writing Center has been short, it has convinced me of its service to undergraduate science students. As I continue through my professional career as a researcher and science educator, I will leverage my experiences and insights from the Science Writing Center in an effort to improve learning and writing skills for students in the sciences.