Sound Perspectives

It Is Our Responsibility to Teach Science Communication to Students

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Science and technology impact the lives of everyday citizens, but we currently face a lack of understanding of even basic scientific concepts by the general public. For example, only about one in five Americans is considered "scientifically literate" (Miller, 2010). Various factors affect knowledge and attitudes toward science, including age, race, educational level, and political ideology (PEW Research Center, 2015; American Academy of Arts and Sciences, 2018), but the perception of science directly influences public support of funding for scientific research (Allum et al., 2008; Muñoz et al., 2012). Unfortunately, we have a history of a bad public perception of science, especially in the media. Perhaps you remember the "shrimp on a treadmill" story from 2011, in which a National Science Foundation-funded study to investigate the response of marine organisms to climate change was twisted into headlines proclaiming scientists were "wasting" millions of taxpayers' dollars to force shrimp to exercise (National Public Radio, 2011). Or what about the current "anti-vax" movement, initiated by dramatic headlines and celebrity endorsements, which has led to multiple measles outbreaks across the United States (*The New York Times*, 2019)? As scientists, we may think this isn't our problem. After all, we are scientifically literate. We conduct research, attend conferences, and publish papers. It's not our fault that nonscientists can't understand the different between evidence-based research and headline-grabbing taglines. That's the job for the media, right?

Albert Einstein once said, "You do not really understand something unless you can explain it to your grandmother." Even though this statement was delivered before the rise of social media and 24/7 news cycles, his words are even more important today. I argue that it is indeed every scientist's responsibility to learn how to effectively communicate the key ideas of their research to the general public, including the societal relevance of their work. As scientists, we cannot rely on others to communicate our research. We must all be advocates for science and help promote the importance of research funding through effective science communication. Otherwise, we face the continued problem of science skepticism, which bleeds into our politicians and directly impacts our ability to secure future research funding. Whether our communication is through technical writing, conference presentations, discussions with the media, tweets, or even informal conversations with airline seatmates, scientists everywhere need to learn effective strategies to communicate science to a wide audience. Fortunately, we are beginning to understand the importance of science communication, and there are numerous workshops and seminars that scientists can attend to hone their communication skills (e.g., aldacenter.org/workshops; aaas.org/programs/communicating-science; comscicon.com; sciencetalk.org). But with the increasing demand of time on scientists, are extracurricular workshops enough?

If we want to truly effect change, we need to view science communication as a fundamental skill that we teach our students. A recent survey of the acoustics graduate programs listed in the Acoustical Society of America Acoustics Program Directory determined that although writing is informally part of the graduate education process, only 9% of programs have required science writing courses (either technical, i.e., scientific papers,

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or nontechnical, i.e., writing for the public) for graduate students, and 36% have optional science writing programs. No programs have required courses on science communication, and only 32% of programs have optional science communication courses.

Including a required scientific writing and communication course into the curriculum of a program, especially in the first year of graduate school, would better equip students to present at conferences, network with future employers, write a thesis, and communicate science at outreach events. For several years, I have been teaching a semester-long course emphasizing both technical and nontechnical science communication (Kloepper, 2017). Through this course, students learn to design and deliver effective scientific presentations, speak to potential program officers or collaborators in the form of an elevator pitch, write organized research papers with clarity and flow, and speak informally to the public about science. More importantly, students immerse themselves in science communication outside the classroom, evaluating science communication activities from a wide range of events including academic lectures, public outreach events, TED talks, and press conferences. Student evaluation of the course has always been high, with many students stating this as a transformative course for their education and career development.

I designed this course as a writing-intensive course with the goal of improving every student's writing, and students submit weekly writing assignments. My class compositions have ranged from nonnative English speakers to accomplished writers, but every student has consistently shown improvement in writing style by the end of the course. Students complete online grammar quizzes and watch videos from the Comma Queen at *The New Yorker* (2019) to understand common writing pitfalls. Peer review is also a strong component of the course; students learn to critically and constructively evaluate the writing of their peers, which leads to a better awareness of one's own writing.

In addition to an emphasis on writing, the course also helps students develop more confidence with public speaking. Early in the course, students learn how to develop and present an elevator pitch about their research, which they deliver to the class and a panel of faculty evaluators. Students also learn the fundamentals of a PowerPoint slide design and give a research presentation to their peers. Once students have mastered the technical communication of their work, we move on to nontechnical communication. The first step is teaching students how to identify and communicate the societal relevance of their work or, as I call it, the "why should my tax dollars fund your research" approach. Once students have identified how to communicate the societal relevance, they learn how to tailor their nontechnical communication to diverse audiences. Effective oral communication is honed through regular simulations in which students draw a target audience from a cup and then deliver their message to their peers, who act as the target audience. Through these simulations, students learn to be comfortable discussing science to audiences of different ages, education levels, and political ideology. More importantly, students learn to engage others in a conversation about science rather than a one-way lecture.

I encourage all readers who are part of academic departments to consider including a science writing and communication course into required graduate and undergraduate coursework for your students. It is our responsibility to equip students with the skills necessary to be effective communicators of science; their future research funding depends on it. Changing the public's attitude and understanding about science won't happen overnight. It won't happen with one headline. Change happens slowly, one conversation at a time. Let us help inspire students to control the narrative, regain the public's trust in and excitement about science, and lead that change.

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