Dark Room, Bright Ideas

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Scientific presentations are tools – objects scientists use to build and advance their fields. At the rawest level, presentations must tell a story, complete with a foundational question, pivots that serve as plot twists and a resolution, all working to convey the research's significance.

In 2014, that was my intent: give a presentation revealing the source of my enthusiasm for disarmament. But then the power went out.

As a third-year Ph.D. student in the Nuclear Science and Engineering (NSE) Department at the Massachusetts Institute of Technology, I was chosen to give a featured presentation for our Graduate Research Expo. As I stood before the audience, with my title slide looming behind me, I was excited. It was time to perform, and I had an interesting story to tell.

My graduate work focuses on approaches to verify compliance with nuclear arms reduction agreements. This field has a significant history, and it was important that I provide this context for my research. Building on decades of arms control collaboration, the United States and Russia in the 1980s added on-site radiation detection as a verification option, ushering in a new era. Significantly, this shift toward on-site inspection using radiation detection allowed scientists and engineers, like me, to develop systems that provide more detailed evidence of compliance than previous methods.

Thirty-five years later, I stood before my department presenting what I saw as the next challenge: how best to verify the dismantling of nuclear warheads. This differs from previous arms control verification because it specifically examines the warheads themselves, not the missiles or bombers that deliver them. In the context of verification, scientists and engineers must give treaty negotiators a list of technologies to confirm warheads are dismantled so they can choose the most politically feasible option.

I confidently walked spectators in the packed auditorium through this, using my slides to orient them in a sea of dates, numbers and concepts. Then, as I finished explaining my research motivation, everything went black. Only a dim glow from my laptop screen was visible.

My thoughts dashed to my remaining slides. I had yet to provide what academics value most from a Ph.D. candidate: my novel approach to a solution. One of the most compelling portions of any scientific presentation is the data – the preliminary or well-established proof addressing the promise of one's idea. My mind raced as I considered how to best depict the graphs and images I intended to show – the visuals that captured the essence of my argument.

Once the seminar chair verified that we didn't need to evacuate, I decided to continue, with only my words and passion for my research as tools.

Consulting my laptop, I painted a picture of my idea to develop a passive approach to verify a warhead's presence. I explained the need to balance assuring compliance with avoiding intrusion into a country's national secrets. I walked listeners through the basic open-source knowledge of nuclear weapon designs. Then I explained my idea: leveraging the natural radiation interactions between the warhead's neutron-emitting plutonium and the high explosive surrounding it to tell us about the object to be dismantled. I paced in front of my audience, trying to read faces for looks of puzzlement or affirmation, gauging the effectiveness of my communication.

As hands shot up during the question and answer period, I realized that continuing was the right decision. Just as an audience shows its appreciation for a performance by applauding, scientists and engineers know that questions following a research talk are signs of interest and affirmation of a job well done.

As idealistic as it may sound, I believe all things work for the good. In science, as in life, an experience's impact is as much a function of how one responds to it as it is what actually happens. On that day, in that 30-minute free-style talk, a new aspect of my identity, as a strong scientific communicator, was cemented in my mind and the minds of my peers.

This gained significance when I was approached about becoming a coach in the new NSE Communication Lab, an initiative aimed at empowering scientists and engineers to become more confident and effective communicators. Nuclear engineering graduate students, trained in effective communication, work with members of the NSE community on how best to convey their scientific ideas. By focusing on tailored messaging and emphasizing the work's impact, I help my peers cultivate skills needed to engage their communities, thereby increasing the exchange of ideas in nuclear engineering.

I could not have imagined myself in this role. The abilities I exhibited during that Graduate Research Expo presented it to me. A non-ideal situation let me demonstrate key qualities of a successful researcher: confidence, resilience and grit. These aspects of my identity have allowed me to persist in the interdisciplinary field of nuclear arms control and turned what could have been my worst scientific presentation into one of my proudest moments.

This is the winning entry in the 2016 SSGF Essay Slam contest.