Photo: Diana Rogers, SLAC

Questions and answers in science education

Science education offers exceptional potential to ignite curiosity and cultivate creativity, and it's difficult to understand why the average US high school graduate lacks basic scientific literacy. Some fault the students, but the responsibility rests with the rigid and outdated way our schools teach science. This system is failing to educate students properly, and failing to attract and retain talented teachers.

In graduate school, I taught freshman biology labs at my university, and sixth-grade science lessons at a neighborhood primary school. Most of my peers saw teaching as a distraction from their research, but I loved the sense of career possibilities beyond the lab, and witnessed the importance of good science education.

I tried teaching two years ago, after finishing my research and relocating to Boston. I was hired at a high school to replace a teacher who had left after only one week. When I arrived, the students had endured a series of three substitutes, and their patience was understandably stretched thin. My efforts to connect with them were met with spirited resistance, to put it mildly.

Without an established curriculum, I had to invent one as I went along. Between scratching out the next day's game plan and grading papers, most nights I had to work until I passed out from fatigue. I was told the first year is like this for everyone, and graduate school had taught me that I could fight past emotional and physical exhaustion well enough. But I became more discouraged by the stale, traditional mode of instruction encouraged to meet content standards set by the school's administration. The frustration would lead me to give up just six months after starting.

Grad school had stressed teaching science through inquiry, problem solving, and the scientific method. Yet the high school relied heavily on memorizing facts to pass standardized assessments. I had no choice but to comply, and to force-feed information to my students to keep pace with other classes in the midterm race.

My heart sank every time I had to cut off questions about a rich topic like stem cell research, or shoehorn a two-day lab into half a class period, just to get back on track with lecturing. Students were visibly energized by exploring what they could see, hear, and smell all around them, but they had trouble seeing the relevance of memorizing the cell cycle or photosynthetic equations.

It's impossible to get students excited about science if the teacher feels restricted. Good science teachers are like good scientists: creative and inquisitive, relishing the process of asking questions as much as finding answers. If all they are asked to do is provide students with answers, both student and teacher miss out on more than half of the equation.

When I was teaching during grad school, my sixth-graders were an absolute joy because their curious minds had nothing but questions. My job was to help them learn how to find answers. The college freshmen just wanted the answers so they would know what to memorize. I saw my job as helping them relax and enjoy asking questions again. I realized where they had picked up their bad habits as soon as I began teaching high school.

Breaking the cram-and-test mold of science education will require sacrificing some content coverage in favor of hands-on exploration, which in turn will require inventing new modes of assessment. Many people are uncomfortable with this compromise. But until school systems recognize that the tradeoffs are worthwhile, and shift their philosophies accordingly, they will continue to have trouble convincing talented professionals to teach science, and they will continue to graduate students who lack scientific literacy.

I may have given up teaching as a formal profession, but the desire to share science with others is still a powerful draw for me. As a science writer, I might not be able to engage in the give-and-take of the classroom, but I can still teach my readers something new with each article I write. The only limit to the ideas I can explore is my imagination, and the only limit to what my readers can learn is how far they are willing to read.

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