



## Is K–12 Teaching an Acceptable Career Outcome after a PhD Degree?

Science education at both early and late stages of training is facing challenges. In many K–12 classrooms, science is presented as a series of textbook facts; students are not being exposed to scientific methods of inquiry and are losing interest in science. At a higher level of training, life sciences PhDs and postdocs in the United States often experience difficulties in finding university jobs, a situation that will likely persist in the coming decade if research funding fails to grow; we cannot expect all PhD graduates to become PIs at academic institutions. Might these two problems add up to a solution (or at least a partial solution)? Is there a place for graduates of life science PhD training programs in teaching K–12 science, particularly biology at the high school (HS) level?



Ron Vale

The answer to this question is not obvious. There are many roadblocks, both in perception and logistics, that discourage rather than promote a career path by which a PhD can become a HS teacher. Certainly, many PhDs are currently teaching HS biology, but they usually arrive at this choice in spite of, rather than because of, the mentoring system now in place. Furthermore, HS teaching is often omitted from among the many nontraditional career tracks currently being advocated for PhDs (e.g., patent law, public policy, business or nonprofit administration, college teaching, science writing). It is frequently absent or presented only briefly at career workshops, and the HS teaching career option is rarely discussed or debated in our scientific community. This President's Column is intended to stimulate a discussion by highlighting the pros and cons of the HS teaching career choice, the barriers for entry, and what steps might be taken to promote this path for interested individuals.

### Is There a Need and a Role for PhDs in Teaching High School Biology?

A HS science teaching position requires a

BA or BS degree and not a PhD. This requirement makes sense, but raises a host of questions. Are PhDs overqualified for a HS teaching position? Does a PhD degree make one a better HS teacher? Is it worthwhile for a school to hire a PhD at higher cost? Can one apply elements of the PhD training to teaching at the HS level, and are these elements appropriate for HS students?

It would be worthwhile to gather data on these questions, but here I will express my opinions. First, many organizations (e.g., the National Academy of Sciences) and educational leaders advocate introducing inquiry-based learning into the K–12 science curriculum. Scientific inquiry is difficult to teach without having had an experience of trying to solve an unknown scientific question oneself. Offering research opportunities for HS science teachers (or students in training to become teachers) would be one way to provide HS teachers with a deeper understanding of science inquiry. Graduate education in science, however, is predicated upon solving an original research problem, and thus a PhD could enter into teaching with a strong understanding of research and the processes of scientific thinking. Furthermore, it is possible to translate other experiences from PhD training into a HS environment, such as knowledge of how to read a scientific paper or set up a simple experiment (making use of whatever resources might be available). And a PhD may bring to teaching a sense of wonder about the many important things that remain to be discovered in the sciences and the discoveries that are being made right now.

On the other hand, one can argue that an advanced degree does not necessarily make one a great HS teacher. This is absolutely true (although the same argument can be made for a BA/BS degree). There is nothing about PhD training that prepares one for managing a class of teenagers with raging hormones, provides the skills to deliver learning material in the HS curriculum, or offers experiences that

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enable one to better relate to kids of this age group. Also, some may argue that PhDs will be disappointed by teaching below their skill level and that they will be better off teaching more advanced biology in college. That is a judgment call, and one cannot put oneself in the skin of another person and decide what might motivate him or her. During the process of getting a PhD, many students become driven to pursue academic careers in universities, but this is not universally true. Some individuals love teaching and working with teenage kids. They value an opportunity to make a difference to kids at this very formative stage of their lives. They thrive on the gratification that comes from being an excellent teacher and seeing kids enter their classroom “hating” science and leave with an attitude that science is “okay,” maybe even “awesome.” They value the impact that they can make by turning kids onto science and having even a few of them want to pursue a scientific discipline as their college major. Most of us who are in a scientific profession can remember a HS science teacher who was important for our decision to pursue science.

Regarding skills and challenges, there are plenty of opportunities for innovation and creativity in HS science teaching in which PhD training could be beneficial, particularly in developing ideas to make science interesting and introducing scientific thinking into the classroom. Some HS settings will be more conducive to deviating from the script than others, but opportunities exist for teachers who want to make a difference. Education can be as challenging and interesting as bench science for the right type of person.

### Many Barriers to Entry

There is an unspoken perception in the graduate school community and beyond that becoming a HS teacher after obtaining a PhD represents a failure, a last resort after other options do not pan out. It is not something that one pursues as a first choice. This perception is expressed in a

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blog by a PhD HS teacher:

I often feel like the world looks at this choice we've made as some sort of failing condition. Once in a while I get a student asking me, carefully, why I'm not teaching college if I've got my doctorate. The assumption often seems that it's because I couldn't make it as an academic so now I'm stuck teaching high school.... If only graduate schools valued and encouraged returning to (or entering) K12 practice as an outcome for the PhD.<sup>1</sup>

The perception of HS teaching as a failure for someone with an advanced degree is damaging to graduate students who entertain the idea of such a career choice and to the culture of the scientific community. Many students would be hesitant about discussing becoming a HS teacher with their advisor or thesis committee, fearing that it will “disappoint” them. HS teaching is not discussed as a career option in thesis committees. Most PIs have little idea of what HS teaching involves or what is being or could be taught in HS. There are no special programs for graduate students to explore HS teaching or be directed toward it as a career choice.

Beyond the perception problem, additional barriers discourage PhD graduates from entering a HS teaching career. First, it is difficult for graduate students to have a significant HS teaching experience during their PhD training in order to decide whether they might like it or be good at it. Second, a teaching certificate is required to teach in public school, which often necessitates one or two additional years of training, a significant burden for someone who has already completed a lengthy PhD training program. Private HSs do not have this requirement and so provide a better entry point for PhDs. However, it is unfortunate that options are so restricted, because many individuals might like to teach in public HS. Third, salaries for HS teachers are significantly lower than those for other professions that are open to PhDs. Nevertheless, many individuals are willing to accept a lower salary for a job that best fits their aspirations.

## Can We Provide a Better Entry Path for PhDs to Teach High School Biology?

A large government or philanthropic organization (e.g., the National Science Foundation, Gates Foundation, Carnegie Foundation, Howard Hughes Medical Institute) could make a major impact by establishing a first-of-kind program to facilitate the transition of PhD graduates into HS teaching. Such a program might incorporate, for example, a postgraduate HS teaching internship and then assistance with facilitating HS placement. It could also include a summer stipend for science curriculum development (perhaps for a limited time of five years). In addition to augmenting teachers' salaries, such a summer program would provide opportunities for creativity and innovation that could attract energetic PhDs towards HS teaching. The cohort of PhD HS teachers could also interact at a national meeting where they could present their efforts and share notes on science curriculum development as well as meet senior guest scientists and educators. Even if this cohort is small (e.g., 50 fellowships per year), it could have a powerful effect. In addition to providing an attractive entry point to teaching, such a program would send a message that PhD trainees have a place in the HS system and that it is important to foster science curriculum development.

Before they make commitments to pursue HS teaching paths, it would also be useful to give interested PhDs an opportunity to see what HS teaching is like. All of us have been in HS, but it is hard to imagine what it is really like to be on the other side of the classroom. Even with a two-week teaching internship, students could gain a sense of whether they could teach several classes per day, five days per week.

It is hard to say whether there is sufficient buy-in at this time for private foundations, graduate schools, and school boards to develop novel programs and change attitudes about PhDs entering HS teaching. But can we wholeheartedly

advocate bringing real science to K–12 education and yet discourage or make it difficult for trained scientists to enter the HS teaching profession?

### Catalyzing Change: Importance beyond Numbers

Why be concerned about PhDs and the HS teaching profession? Even if we facilitate entry into the profession, the number of PhDs will be just a drop in the very large HS teaching pool. Moreover, the number of PhDs who will be

interested in HS teaching also will remain small. But impact and change are not always driven by sheer numbers of people. Rather, it is important to identify circumstances in which a few individuals can make important differences to a system. A PhD who has a significant understanding of scientific research and learns to become a great HS teacher would have an unusual opportunity to improve catalytically the quality of science being taught to many students at a very influential stage of their lives. This improvement can come through many avenues—through direct contact with the many students who come through his or her classroom, by

sharing ideas with and assisting peer teachers, and through curriculum development. Through the latter means, such teachers could reach even more students and influence teachers in their districts or beyond.

A subset of these scientist–HS educators also may later become administrators in schools or school boards, where they could have broader impact on science curriculum, as discussed in a recent editorial by Bruce Alberts.<sup>2</sup> ■

*Comments are welcome and should be sent to [president@ascb.org](mailto:president@ascb.org).*

### References

<sup>1</sup>DOCZ. (January 8, 2012). PhDs as K12 teachers. <http://thepapergraders.org/?p=363>.

<sup>2</sup>Alberts B. (2011) Science adapters wanted. *Science* 334, 1031.

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