Guest Editorial

Bridging the Physics Community's Cultural Divide

(*This article is adapted from remarks made at the 2004 Distinguished Teachers Scholar Award Ceremony in Washington, D.C., June 2004. Carl Wieman received the NSF DTS award in 2001 and the Nobel Prize in Physics the same year.*)

Today I want to say a few words about bridging a cultural divide within college faculty. I am referring to the divide between faculty focused on science research and those focused on studying and improving science education. To me, bridging this divide is a big part of what the DTS program is about, and I think it is a divide that has to be bridged if we are to achieve the improvements in science education that I am convinced are possible.

I feel that I straddle this divide thanks in large part to the DTS award. My physics education research group is now about the same size as my atomic physics group. I admit that sometimes I feel like I have each of my feet in a different boat which are headed in opposite directions. Most of the time, however, I feel that science research and education are much closer and have more similar goals and approaches than they realize. So, I spend a fair amount of my time engaged in "shuttle diplomacy", going back and forth between the two groups trying to get them to better understand and appreciate each other.

To Those Engaged Primarily in Science Research. Just because you know science, doesn't mean you know how to teach it, or that students think the way you do (or maybe how you like to think that you did). You are almost certainly unlike nearly all your students. There is good quantitative research on teaching and learning, and claims based only on opinions without data have as little validity in teaching as they do in research.

To Those Engaged Primarily in Science Education. The vast majority of science researchers really do care about students and teaching! The fact that they may not immediately embrace what you tell them as to better ways to teach does not mean that they are uncaring troglodytes. Their reaction should be seen as similar to that of the freshmen in my physics class, who, on the first day, are strangely skeptical when I tell them about the wonders of physics. It is a question of education, not moral deficiency.

Science researchers live and die by data and the conclusions that can be drawn from that data (with the exception of string theorists, of course). So, in order to communicate with these researchers you have to present real data and respect skepticism as a legitimate basis for discussion. And if you can communicate your data in three or four pages instead of in those 35 page tomes typical of many education papers, it wouldn't hurt either.

To the Science Research Faculty. You should learn about and incorporate the established education research in your teaching, just as you build on other studies and principles in your research. Moreover, some of these teaching ideas are pretty basic. For example, there is good research showing that students can't absorb 15 different ideas during a one-hour lecture, even if you use 70 PowerPoint slides and talk so fast that you present each idea in great detail!

To the Science Educators. Old habits and traditions are hard to give up, so you should not expect miraculous conversions. Perhaps, the best indication of how hard it is to change is the number of talks I have heard from science educators where they talked very fast and used 70 PowerPoint slides with lots of data to prove that this is a really bad way to lecture.

To the Science Researchers. Once you start to learn about research-based teaching innovations don't expect to them to work quickly and effectively if you just patch them onto what you are doing without first bothering to understand how and why they work. That would be like thinking that all you need to do atomic physics research is buy a laser.

To the Science Educators. Research faculty have a lot of demands on their time, and teaching, while important, can only be one of several responsibilities that have to be accommodated. That is the system we live in; it is not going to change any time soon. So any research you do on improving teaching can only make an impact on the entire community if you consider not just effectiveness, but also the resources, time required, and the cost to benefit ratio of the innovation.

I could go on, but let me stop and offer a final observation to both sides that is perhaps evident only to someone who is straddling the divide. Namely, frontier science research is a lot more like science education research than either side realizes. Both include variables that are not as well understood or as controlled as you would like, but the challenge and skill of doing good research is to end up with clear results and conclusions despite these limitations, whether those results and conclusions are about the laws of physics or improving student learning.

My hope is that the two sides of this dialogue can come together and share their talents, and I think science education will greatly benefit as a result.

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