Teaching, Explained

Years ago, I had a rude awakening after I had finished teaching an undergraduate mineralogy course. The petrology professor who taught the next course in the sequence told me that he had given a simple, short test (one that would not count towards the students’ grades) on the first day of class, not to check on my teaching, but to gauge the knowledge base of the students for more effective instruction—clearly a sound, educationally responsible idea. To his amazement, half of the students did not know the chemical formula of quartz. Many who thought they knew the formula wrote down “SiO4.” I was shocked. Only a month had passed between final examinations and my colleague’s test.

I had been very happy with that mineralogy course and those students. I was young, full of energy and enthusiasm. I tried to keep memorization to a minimum, and tried to make everything taught in the course directly relevant to the geosciences and/or to society. We went on several eye-opening trips, and not just to the field, but to the Smithsonian Institution and to a Corning plant where automotive catalytic converter substrates were manufactured out of synthetic cordierite. Clearly, however, something was missing. But what? I wondered. From what I know now about teaching, it turns out a great deal was missing.

I have heard it all before... you don’t have to teach a teacher how to teach. Great teachers are born that way. For the rest of us, good or average teaching is a challenging task that requires much more than I thought they knew the formula wrote down “SiO4.”

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Personally, I know now that truly excellent teaching is a challenging task that requires much more than I was capable of through many years of my career. But this was simply because I didn’t know any better. As I started to learn about cognitive psychology and how the human brain learns and organizes knowledge, I was amazed, and was left wishing that I had known about this much sooner.

This issue offers all of us relatively straightforward ways to improve our teaching. Better teaching translates into students and citizens that are better educated and, perhaps more importantly, turned on and truly appreciative of our science. One can argue that this is as important as our funding manager. In fact, you will find in these pages what I was missing years ago in my mineralogy class. In a nutshell, what I was missing were the techniques of turning passive learners into active learners. I am no longer a talking head. I constantly demand classroom interaction, even when teaching large classes. Learning and retention are up, and my teacher ratings are nearly off the charts.

Educational research is offering a remarkable gift to science. This is low-hanging fruit that we cannot afford to miss. Helping to prepare the next generation of scientists and society, in the very best way possible, is simply too important. On the other hand, if we choose to ignore modern educational research through our arrogance, we do so at our own—and our students’ and society’s—peril.

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