After 55 years of teaching science, I have reached the conclusion that we can do a much better job in science education at all levels. We are constantly reforming science education, but we never seem to be able to get it “right.” Maybe that’s because there is no “right” way to do things in science education. Much of what we do is based upon common sense, for which sophisticated names have been invented, such as “constructivism,” authentic assessment,” “self-efficacy,” “inquiry teaching,” “active learning,” “pedagogical content knowledge,” “cooperative learning,” and so forth. We have new words to describe common-sense concepts.

Generalizations are rare, since what happens in one classroom setting is different from what happens in another classroom setting. The concept of “wait time” seems to have universal applications (Rowe, 1986). If a teacher waits at least three seconds for a student response after asking a question, rather than answering the question immediately, there are positive outcomes for the student and the teacher. For example, more students volunteer responses and answers tend to be more accurate. Also, the teachers tend to ask fewer questions and increase the quality of their questions. However, many education research findings are not generalizable, or they are simply obvious. This is true for many “innovations” in science teaching. Having students build their own knowledge from what they already know, that is, constructivism, seems obvious. Indeed, any good teacher would use this concept intuitively.

I don’t want to belittle the value of educational research. We do need to know more about what’s going on. However, education researchers sometimes get caught up in insignificant debates, for example, whether a study is qualitative or quantitative, or whether a research instrument is a survey or a questionnaire. These debates sometimes cause the researcher to lose sight of the goal of the research, namely to find out something important. Also, if research does produce some new ideas, they often get lost in the application. Finding generalizations in educational research is extremely difficult, given the complexity of the human mind and of human behavior. Every teacher, every student, every classroom setting, every lesson, is different and unique. So, standards about what constitutes good teaching outcomes is dependent upon all sorts of uncontrollable variables. Outcomes may depend upon class size, topic, the mood of the teacher, the individual strategy, the physical setting, the time of the day, the weather. It all depends (Druger, 2002).

I am always puzzled when a student cannot seem to understand a basic science concept that seems obvious to other students. I think one of the most promising areas of research involves studies that link the science of the brain and learning. Such research can be useful tools for the teacher in the classroom (National Research Council, 2000).

Bandwagons and Experiences

At the present time, we are caught in a trap of own making. We have created bandwagons about learning that teachers are compelled to jump on. Students are not teaching them anything. But we learn from every experience that we do because we are. So, students learn from every experience, they don’t master testable information. Attribution of the subject, motivation to learn, and outcomes may be far more important for a student than memorizing subject matter to pass a test.

Motivating students is extremely important so that students want to learn, and provide them with content and resources, learning will follow. As one colleague said, “Our job as teachers is to inform and motivate students.” But, if we motivate them, they inform themselves.

Also, each student learns differently. My 10-year-old daughter, for example, reads with a degree of fluency, but reading out loud is a nightmare. My 7-year-old son, on the other hand, can rattle off the alphabet and sing all the songs in his book, but can’t read it without stopping. We have to work with each student at their own pace. Our job as teachers is to help our students learn, and we do that by giving them the opportunities to do it.