Chapter II

Controversies and Concurrence in Science Education

Science is facts; just as houses are made of stone, so is science made of facts; but a pile of stones is not a house, and a collection of facts is not necessarily science

– Jules Henri Poincaré (1854-1912)

The practical application of theory, or praxis, in science education is arguably less straightforward today than it has been in preceding generations. While formal education and learning theories have been promulgated for close to 100 years, the changing disposition and balance of academia, and the consequent dissemination of questionable and unverifiable social theories, have led to a more ambiguous discussion and application of au courant learning theories to science education. Much of what the authors consider the detrimental entanglement in academia of definitions and educational theories about science occurs at the confluence of different professional attitudes and motivation. Scientists are generally complacent in terms of championing and defending their own core philosophy and epistemology, and a scientist’s professional rewards and efforts rarely consist of debunking critics in the so-called other “ways of knowing” (see the Science Wars Web site and the Sokal Affair for a droll exception at http://members.tripod.com/ScienceWars/). The defense of scientific
reasoning is not what scientists focus on by training; thus, this is an area that almost certainly needs more systematic attention and treatment in science curricula. By contrast, science’s detractors in the humanities, social sciences, and even education find professional incentive and marketable topic in assailing the science colossus. Most notably, postmodernism with its socially relativistic and radical constructivist theories, replete with the denial of objective truth, have attempted to undermine science, or as Fishman (1996) noted, are attempting to put science on an “indefinite furlough” (p. 95). Like it or not, the science community is at war with nihilistic ideologies and one of the battlegrounds is pedagogy, a deliberation that extends to online science learning environments.

While such debates about science may seem to be pedantic and simply the posturing of academics, there are concrete consequences for how science education is carried out in schools and universities. As colleges of education—the fount of pedagogy—accept and convey postmodernist theory (“fashionable nonsense” of Sokal & Bricmont, 1998) and its derivative pedagogies to budding science teachers, the epistemology and stature of science and science reasoning is diminished in the classroom and, thus, the science learning outcomes for students and their subsequent students. It is difficult to develop a science literate society when the foundation of science and reason is bantered about as suspect. As Gross (2000) stated, “Educational constructivism is in whole or in part a postmodernist view of things, and postmodernism questions the objectivity of observation and the truth of scientific knowledge….” (p. 14).

As a result of this conflict, not only is how science should be taught debated—a reasonable and proper discussion—but whether and to what extent science belongs in the curriculum has been reduced in academia to a matter of dispute. In our own experience at an interdisciplinary faculty meeting not long ago, a humanities colleague openly stated opposition to restructuring a research methods course, maintaining within the argument that the sciences are no more than inquiry. This revelation effectively negated the value of science subject matter, but even more stunning were the multiple heads nodding in agreement from other humanities and social scientists in the meeting. Osborne (2006) states that this sort of perspective—science as inquiry, rather than content—was documented as early as 1851, when Great Britain was concerned about the quality of its science education; worth noting is that the perspective was rejected as an influencing factor on curriculum.

Furthermore, beyond the definition and validity of science as “the world’s most comprehensive, consistent, and successful knowledge acquisition system for nearly 400 years” (Gross, 2000, p. 12) contemporary society’s role for science has also caused considerable misunderstanding among the public, educators, and practicing scientists, as seemingly competing views and needs come to the fore. Society looks to science and the science community to help explain and deal with complex problems that affect the quality of life, such as those involving the environment, health, and natural resources. However, as introduced in Chapter I, there is a prominent, if not growing, gap in science literacy between the public and the scientific community. The rapid expansion of human knowledge in science and technology makes it problematic even for scientists to keep abreast of developments in their own areas, not to mention developments in closely allied disciplines. It might be said that there is a growing literacy gap even between scientists of different disciplines. In this chapter, we summarize competing educational and learning theories, those that apply to science as well as those that apply to online science learning. In this way, our discussion provides the epistemological
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