

From Messing About to Mixed Messages

Success

Consider these two published statements. Statement A: “Research is necessary to determine how a constant flow of qualified science teachers can be maintained to meet the needs of the public schools.” Statement B: “Research findings should be used to revise and improve teacher education, training and professional development programs.” Although I have no expertise in critical discourse analysis, it seems reasonable to suggest there is little difference between these two statements. However, one of these was published in 1957 and the other in July 2005, both by nationally recognized educational organizations. One might legitimately wonder where the success could reside within research about science teacher education given the apparent lack of movement over five decades.

If we wanted to look for evidence of a lack of substantive changes in science education, we only need to pull out old chapters, articles and books. For example,

“Secondary school education in America, particularly instruction in science, [is] in need of change and should be critically re-examined. The work of the American Association for the Advancement of Science...”

“The important thing to recognize is that the controversies ... [are] not matters of taste concerning the use of new media or the inclusion of a particular topic in the curriculum [but in the] fundamental issues of epistemology, psychology, philosophy of science, policy, and educational theory.”

“Students’ grasp of science as a process of discovery, and of mathematics as the language of scientific reasoning, is often formulaic, fragile, or absent altogether.”

What eras are represented in these statements? Does it help to know that the sources are Paul DeHart reporting upon the situation following World War II, and conditions Lee Shulman and Pinchas Tamir ascribed to the 1960s, and to the Glenn Commission’s sense at the close of the twentieth century? And does knowing that the three quotes are chronological from past to near-present provide any consolation? A cynic could readily claim that nothing much changes in science education except for substituting terms (e.g., replacing ‘webcasts’ with ‘closed circuit television’). Apparently there is little in this material that would seem to suggest success.

However, this apparent intellectual stasis is little more than an annoyance to me. I do perceive a considerable success in science education. For me that success resides within the questions we are asking. In many ways, the past half-century of science education is analogous to efforts to help youngsters learn to conduct scientific investigations. Helping novices, whether fifth graders or preservice teachers, to formulate a question that can be investigated can be a tortuous process. But the dead-ends and detours and missed turns are important and perhaps necessary components of the journey. In a parallel fashion, notions of the past — such as students can learn science by messing about with materials, that teachers can be bypassed through the use of exquisitely crafted curriculum, or that technology can revolutionize learning — may not have proven successful. But these ‘failures’ seem to me as being usefully wrong. For those who pay attention to the history of science education (an area in which we need many more scholars) we can continue to refine our questions. Instead of a naïveté paralleling that of children learning to design investigable questions, science education seems to be moving toward a refinement of the problems. I won’t hazard to suggest what those questions are but will instead contend that the challenges are becoming clearer and the manner in which we imagine investigating these is going to be productive.

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Vexation

My vexation is the overabundance of curriculum materials in science along with the seemingly never-ending desire to create more. Here would seem to be a realm of science education in which very little wisdom has been gained after fifty years of effort. The explosion of curriculum production in the post-Sputnik era generated considerable instructional materials diversity and selective pressures weeded out the weakest of those efforts while the survivors have continued to evolve (e.g., the BSCS high school texts, EDC's elementary curriculum, and the Lawrence Hall of Science and its hands-on materials). Unfortunately, creating new curriculum is a favored endeavor underwritten by a variety of funding agencies; the unfortunate aspect is that each curriculum development group begins as if they are the first, or at least the smartest, to create instructional materials.

This vexation has emerged for me as I've read manuscripts and attended research presentations. An inordinate amount of time and space is devoted to describing the curricular context. Almost inevitably the findings have less to do with important questions (e.g., advancing student learning, differential achievement among different ethnic groups, etc.) but rather the identification of missed opportunities and unanticipated flaws in the curriculum. It seems that by using a newly developed curriculum and conducting research during its initial implementation, researchers are prevented from discerning little in the way of information that might extend beyond the particulars of a certain time and place. This leaves us open to the reasonable question about science education's potential for influencing policy and shaping the improvement of science teaching in K-12 schools.

My sense is that we may have enough curriculum and that the materials already in existence should be refined. As long as science educators (or more accurately, their graduate students) invest countless hours into creating innovative curriculum the science education community is unlikely to move ahead in its collective understandings. I wonder whether we should create a 'new curriculum moratorium' and discontinue providing federal funding for new projects. Any investment in curriculum should be in the form of refining existing materials. Anybody can develop curriculum but there are very few groups who can do it well. It seems far better to find ways to better address inequities in student achievement by improving time-tested curriculum and discontinue the practice of creating new materials in which diversity issues are inevitably neglected. Otherwise, curriculum development seems to be the equivalent of starting and restarting a car but never putting it into motion. Consequently the science education community is sending mixed messages to the public: we want to claim we know how to improve science learning and yet our sporadic efforts to create new curriculum would seem to have the same effect as dipping a stick into a pool of water. In both situations, in a very short period of time, the presence of the introduced object has had no detectable influence.

The vexation is the reasonableness of this stance: Should we propose a standardized K-12 science curriculum? From my perspective, this would be an important step toward improving our efforts to research science teaching practices. The idea of a professional development continuum, starting early within the preservice experience and extending throughout a career of science teaching, would benefit by such clarity and continuity. Research on science learning would benefit because there would be consistency across sites (classrooms, schools or districts) which would afford meaningful comparisons. For all their problems, *Benchmarks* and the *National Science Education Standards* were responses to the need for regularity in terms of what students are expected to learn. We are beginning to see efforts at standardization within literacy and numeracy curriculum. Is the science education community lounging on the shore even as a wave of standardization builds on the horizon? Is this a critical time in which we might take some measure of control or is the situation much less dire? I'm not sure.