

Sharon Lynch

The George Washington University

MY VEXATION

I am vexed by the connections, frailer than the strands in a spider's web, between the science education policy currently being formulated in the United States and the orb of science education research represented by organizations such as NARST, ASTE, and the AERA science education research SIG and strands. Is this something worth worrying about?

Incidentally, this Vexation and Venture in no way represents the views of the National Science Foundation, but rather represents my views as a science education researcher and George Washington University professor

If the research produced by members of professional science teacher research organizations has merit and can potentially improve science education for US K-12 students, then it seems unfortunate, if not silly, that U.S. science education policy is so uninformed by much of this work. There is a noteworthy recent exception. *Taking Science to School* (Duschl, Schweingruber and Shouse, 2007) seems highly regarded and widely cited. How might the research message in *Taking Science to School* influence science education policy at national, state, and local levels? It may affect professional development programs for K-8 teachers or the development of new science curriculum materials (although this is not a time when prodigious amounts of science materials are being developed). The ideas in *Taking Science to School* ideally ought to inform assessment systems. However, this body of research, however thoughtful, does not make a direct practical application to the sort of policy decisions currently being made across the US.

Although science education policy is primarily made at the state level in the US, the winds are shifting to a more substantial national role for policy-influencing organizations and emerging coalitions. Three examples come to mind:

1. *Science Anchors* is an effort led by The National Science Teachers Association (2009). The goal of *Science Anchors* is to bring greater focus, clarity, and coherence to science education. *Science Anchors* would draw from current K-12 science education standards, but would be more streamlined and focused. Science content would be organized around a small number of big ideas rooted in the major fields of science that develop over the K-12 span, resulting in more coherence to science standards across states (NSTA, 2009). This is an effort guided by an Interagency Steering Committee composed of representatives from NSTA, the National Research Council (NRC), Project 2061 of the American Association for the Advancement of Science (AAAS), and Achieve, Inc.
2. *Benchmarking for Success: Ensuring U.S. Students Receive a World-Class Education* is a report written by Achieve, the National Governors Association and the Council for Chief State School Officers (NGA, CCSSO, Achieve, 2008). Similar to *Science Anchors* but with a more international focus, its main premise is the need for mathematics and science benchmarks that would allow states to make international comparisons. Such benchmarks would allow states to focus and stimulate state-level education systems to produce students with improved STEM achievement. Currently, this group is producing a set of mathematics benchmarks, with science soon to follow. Although the rationale for this effort is unabashedly economic, there is also an appeal for equity:
State leaders also should tackle "the equity imperative" by creating strategies for closing the achievement gap between students from different racial and socioeconomic backgrounds...Reducing inequality in education is not only socially just, it's essential for ensuring that the United States retain a competitive edge. Research shows that education systems in the United States tend to give disadvantaged and low-achieving students a watered down curriculum and place them in larger classes taught by less qualified teachers— exactly opposite of the educational practices of high performing countries.
3. *The Opportunity Equation* is the most ambitious current effort to place science education in the center of US education, and was mounted by the Carnegie Corporation of New York and the Institute for Advanced Study (<http://www.opportunityequation.org>). *The Opportunity Equation* has endorsements from major policy, business and advocacy organizations, ranging from National Governors Association, to the National Science Teachers Association, to the National Education Association to La Raza. US Secretary of Education Arnie Duncan, endorsed the *Report's* recommendations on behalf of President Obama and the US Department of Education. It challenges the nation to mobilize for coordinated action to:

Sharon Lynch
The George Washington University

- Establish common standards for the nation in mathematics and science—standards that are fewer, clearer, and higher—along with high-quality assessments
- Improve math and science teaching—and our methods for recruiting and preparing teachers and for managing the nation’s teaching talent
- Redesign schools and systems to deliver excellent, equitable math and science learning

These three efforts are remarkable in their scope. Also remarkable is the fact that they have been mounted without much input from professional science education research community. The research most often cited tends to be the work done by education policy researchers, organizational theorists, and macro-economists. Little of that kind of work can be found within the ranks of NARST and ASTE or the science education special interest groups (SIGs) or strands of AERA.

Perhaps this is OK. Perhaps the science education research articles and conference papers churned out by the education research organizations are better left unsullied by the pedestrian world of policy and politics. Personally, I find this a huge missed opportunity. And I find it vexing.

At the same time, I do not want to be one of those curmudgeons who criticize the research done by colleagues, research that can be elegant, insightful, or that insinuates itself gracefully in the complex worlds of classrooms and students. However, honesty requires me to wish that there was a way to move some of these elegant and promising ideas about science teaching and learning into the world of intervention research or policy research, with all of its warts and postmodern pitfalls. The problem seems to be two-fold. The first is that many good science education researchers will not increase the grain size of their work to a scope that allows it to affect policy. Vistas could be enlarged to include greater numbers of students, teachers, and schools. The second aspect of the problem is that many brilliant science education researchers cling only to research topics that are primarily cognitive, philosophic, or sociological, but for complicated reasons will not take on the large pressing issues that loom in the face of science education reform. Examples of such pressing issues include the nature of state level science assessments and their effects on students, including students with disabilities or English language learners; high school drop-out rates due to changing high school graduation requirements in science; science teacher mobility/attrition rates in urban schools; high school science teaching alternative licensure programs and relationship of costs to any measurable student outcomes; entrepreneurial licensure and induction programs for science teachers and “cost” to the system in restricted or larger senses of the term; the state of science curriculum materials; the relationship of material supplies for teaching science and important education outcomes, especially for high poverty schools; or, my personal favorite, the science and technology signature schools that springing up all over the country with virtually no research in place to track their progress. .

MY VENTURE

I, along with a handful of other colleagues in my science education research community, have tiptoed down the science education policy path a bit. So far, the effects have been underwhelming. The science education community needs to “think bigger” if it is going to play a role. It might be useful to compare science education with mathematics education in policy-influencing potential. NCTM is an organization involving math teachers, math teacher educators, mathematicians and some math policy makers. It has been successful in influencing some modest, but important changes in the direction of US K-12 mathematics teaching and learning.

Science education has no equivalent of NCTM. Its most influential organizations are AAAS and NRC, and to some extent, NSTA. Nationally, USDOE, NSF, NASA, NOAA, DOE, NIH, and NIST have voices, but for the most part are not charged with making policy (the USDOE under NCLB is an exception). The National Governors’ Association, business organization coalitions, and philanthropic organizations are other vectors for change. In addition, separate organizations that specialize in biology, chemistry, physics, geosciences, environmental and informal science education play their small roles, along side of NARST, ASTE, and AERA. These policy forum-ettes for science education are broader and more dispersed than for mathematics, and consequently, the voices are dispersed and inconsistent. However, NSTA’s Policy Coalition is beginning to make some strides. I do not see the largest and most influential organizations signing on to the Coalition because sometimes their charters restrict them from doing so. Perhaps, it is hard to get members of organization to agree on policy issues. What would science education policy organizations actually support collectively, save for the teaching of science in grades K-12 and making sure that evolution is included in a meaningful way?

My small venture includes bringing some science policy makers together at NARST to discuss Carnegie Corporation’s Opportunity Equation, and helping to support another science education policy research effort that still in the pre-natal stage. I am inviting input from those at Crossroads who have perspectives that align with mine — or might offer different views I ought to consider.