

Quick Read

It's Time, Once Again, for Science Education

As anxiety rises about the state of science education, an upcoming report could spell out how we should teach science to best educate our students to compete in the global marketplace. In the meantime, opportunities abound to make an impact today.

By Randy Wedin

Cycles abound in nature and in human affairs. Once every 11 years, for example, sunspot activity reaches a peak, with the next especially intense crest expected in 2011. Every 13 or 17 years, depending on the brood, billions of cicadas emerge from the ground for a few noisy weeks of mating and egg-laying. And approximately every 25 years, just like clockwork it seems, science education captures the attention of the American public. Could this be the year?

Fifty years ago, on October 4, 1957, the Soviets launched Sputnik, the first artificial satellite to orbit the Earth. This stunning event shattered American complacency, ignited the Space Race, and set off a wave of science education reform. The Baby Boom generation cut its teeth on the new post-Sputnik curricula—textbooks such as CHEM Study (Chemical Education Materials Study), PSSC Physics (Physical Science Study Committee) and BSCS Biology (Biological Sciences Curriculum Study).

A generation later, in the early 1980s, another international “crisis”—this time the rise of Japan as an economic power—provoked a new period of introspection and reform. Two landmark reports, both published in 1983, sounded the rallying cry for another round of change. In *A Nation at Risk: The Imperative for Educational Reform* (1983), the members of the National Commission on Excellence in Education, including former ACS president and Nobel Laureate Glenn Seaborg, wrote: “If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. As it stands, we have allowed this to happen to ourselves. We have even squandered the gains in student achievement made in the wake of the Sputnik challenge.”

Several months later, a commission appointed by the National Science Board (NSB) published its report, *Educating Americans for the 21st Century* (1983). That report focused on precollege science and math education. Today, educators consider this report as being instrumental in reinvigorating science education programs at the National Science Foundation—programs that had been dismantled by President Reagan earlier in the decade.

Fast forward another 25 years. It's 2007, and just like those cicadas emerging en masse in Chicago this past June, science education is emerging from a relatively quiet period. Today, science educators and industry leaders are beginning to make noise about the poor state of science education in the United States. This time, the "crisis" is globalization, and the focus of the reform effort is on STEM education—science, technology, engineering, and math education.

A year ago, the National Academy of Sciences released a comprehensive report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (<http://www.nap.edu/catalog/11463.html>). The report's executive summary includes these disturbing words: "Having reviewed the trends in the United States and abroad, the committee is deeply concerned that the scientific and technical building blocks of our economic leadership are eroding at a time when many other nations are gathering strength." Almost from the moment it was released, the *Gathering Storm* report and its recommendations were embraced enthusiastically, on a bipartisan basis, by leaders in Washington. However, the real challenge remains—can recommendations and rhetoric be transformed into results and reality? The NSB believes the answer is "yes."

The NSB's "Bold New Action Plan"

In 2006, the NSB, responding to requests from Congress and believing that the time was ripe for taking action, established the NSB Commission on 21st Century Education in Science, Technology, Engineering, and Mathematics (<http://www.nsf.gov/nsb/edu.com>). Mindful that Washington bookshelves didn't need—and probably couldn't hold—yet another lengthy and comprehensive report, the charge to the commission was action-oriented.

Operating on a fast track, the 21st Century STEM Education Commission held its first meeting in August 2006 and delivered its report to the NSB less than nine months later. For the past several months, the NSB has been reviewing the commission report and refining its recommendations. As this issue of *Chemistry* goes online, the NSB is expected to release a draft report, one that could conceivably chart the course of STEM Education in the United States for the next 25 years.

Interviews with commission co-chair Leon Lederman, 1988 Nobel laureate in physics and Director Emeritus of Fermi National Accelerator Laboratory, and Harvard chemist and 1986 Nobel laureate Dudley Herschbach reveal the scope of the challenge facing the commission—and the nation. The need for reform is great, yet the system in which to make those changes is complex. According to Herschbach,

"The most basic problem is a deep social attitude that kids in our society can't escape, because they see it all over. It's the attitude that science and mathematics are not regarded as part of our general culture, part of what

everyone should understand. Rather, science is just seen as the province of a subspecies—‘nerds’ who are especially talented and driven to pursue science. ‘Ordinary’ people who go into other professions don’t really need to understand science—and it’s not accessible in the first place. People they know, like their parents and even their teachers, reinforce that impression all along the way.”

Lederman adds, “We have a complex educational system. It has the teachers and their unions, the principals and their unions, the school boards, the states’ education officials, the colleges that train teachers, the book publishers, on and on and on. It’s a very complex system, and it’s very decentralized. No other leading industrial nation has a system as decentralized as ours: 50 states, 15,000 school districts, and 25,000 high schools.”

How to Get Involved

With a challenge so great and a system so complex, can any one person hope to make a difference?

When viewed from a different perspective, complexity and decentralization can provide excellent opportunities for the individual. There are many ways to get involved, and many places to lend a hand. Here are five specific examples of actions you can take today as part of the effort to improve and reform science education:

- Familiarize yourself with the STEM education issue. Read the Gathering Storm report. Visit the [NSB Web site](#) latest draft of its “bold new action plan” and learn how to offer comments and feedback on the draft report.
- Learn about “scientific teaching,” an approach to science education that promises to be an important element of the next generation of reform. See “Scientific Teaching,” a Policy Forum article by Jo Handelsman et al. in *Science* (April 23, 2004; pp 521–522). More details and resources are available through the [Wisconsin Program for Scientific Teaching](#).
- Get involved in the political process by joining the [ACS Legislative Action Network](#). This network allows members to receive timely information on legislative issues such as science education and to easily send letters to their legislators.
- Become a mentor. Contact your local school district or college to learn how to serve as a mentor to a young person interested in science.
- Participate in [ACS Project SEED](#). If you’d rather do your mentoring in cyberspace through an e-mail-based system, join [MentorNet](#), the E-mentoring Network for Diversity in Engineering and Science.

Already, thousands of members of the chemistry community are proving that they can make a difference. But in case you aren’t yet sold on the need to be personally involved, just consider these words from Herschbach: “So often the science education issue is put in terms of workforce needs and competitiveness.

Of course, that's a factor. But for me it's even more fundamental. How can you have a democracy if you don't have literacy? Without scientific literacy, citizens don't know what to believe, and 'snake-oil' people can mislead them. It is so sad that in the world's richest country, a country that prides itself on being a leader in science and technology, we have a large fraction of the population that might as well live in the 19th, 18th, or 17th century. They aren't getting to live in the 21st century except in the superficial way of benefiting from all the gadgets. They don't have any sense of the human adventure and of the worldview that science brings to us. It's so tragic. It should be part of the birthright of anyone born in the 21st century, whether they're born in the United States or anywhere else, to have a decent understanding of what science is all about."

If you're waiting for the right time to get involved in science education, it has arrived.

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