

Editorial

Critical Needs of STEM Education

The National Science Board (NSB), governing body of the National Science Foundation (NSF), unveiled at its October 3, 2007 meeting *A National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering, and Mathematics Education System* (1). Released in nearly final form the day before the 50th anniversary of the launching of Sputnik, the report is important for everyone in chemical education. It addresses two major challenges: ensuring coherence in science, technology, engineering, and mathematics (STEM) learning and maintaining an adequate number of high-quality STEM teachers.

The most striking recommendation is, “Congress should pass and the President should sign into law an act chartering a new, independent, non-Federal *National Council for STEM Education*”. This NCSE would coordinate and facilitate STEM education activities and report to policy makers and the public regarding the status of STEM education. The proposed national council is to consist of 10 non-voting seats representing the federal government and Congress and 23 additional seats chosen from many different categories: state and local governments (6 seats), the National Science Board (1 permanent seat), STEM educators (5 seats including one active classroom teacher and one administrator) higher education associations (3 seats), business and industry associations (2 seats), private and corporate foundations (2 seats), informal STEM education such as broadcasting and museums (2 seats), and disciplinary societies (2 seats). To include such a broad constituency the NCSE is rather large, which might make it unwieldy. Nevertheless, it should be able to continually remind policy makers and public of the importance of science education.

The plan lists three other changes at the governmental level. The President’s Office of Science and Technology Policy is requested to create a standing committee on STEM education to coordinate all federal STEM education activities. The Department of Education is requested to create an Assistant Secretary of Education to coordinate its STEM efforts and to link with interested parties outside the department. Because it has demonstrated leadership in STEM education for decades, the NSF is requested to create “a national road map to improve pre-kindergarten to college and beyond (P-16/P-20) STEM education”.

This NSF road map would be developed with “input of the Directorate for Education and Human Resources (EHR) Advisory Committee” and would extend well beyond EHR to programs in Research and Related Activities directorates (see my editorial about collaborations, ref 2). Further, the road map should recognize that “NSF possesses a profound knowledge base in STEM disciplines, deep involvement with the scientific and engineering research communities, ongoing relationships

with institutions of higher education, and a Congressional mandate to be involved in STEM education at all levels”. The time line for the road map is very short. An interim report is to be developed by “early 2008” and a final version by May 2008. The road map is to be based



The editorial is blogged at <http://expertvoices.nsd.org/>; see p 1921.

**“STEM educators should be viewed
as a valuable national resource.”**

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on NSF’s responsibilities to: “(1) Support research on learning and educational practices and the development of instructional materials; (2) Develop human capital; [and] (3) Increase public appreciation for and understanding of science, technology, engineering, and mathematics”.

The NSB action plan recommends much better horizontal coordination of STEM education among states by defining national STEM content guidelines for each grade level, by developing ways to measure how well students meet those guidelines, by ensuring that assessments under No Child Left Behind encourage STEM learning, and by providing a forum to share best practices for teaching and learning. In addition, much improved vertical alignment across grade levels is recommended. This involves better links between high school and higher education, and creating or strengthening state councils on STEM education that would align and rationalize content at all educational levels.

Last, but far from least, the NSB wants to “Ensure that students are taught by well-qualified and highly effective STEM teachers”. According to the plan, “serious national attention must be focused on attracting, preparing, and retaining qualified and committed teaching candidates. STEM educators should be viewed as a valuable national resource, and the best and the brightest should be encouraged to consider pre-college STEM teaching as a profession.” Actions in support of this effort include making certain that STEM teachers receive increased compensation, developing means to attract more talented students to STEM teaching careers, setting up national teacher certification criteria that would allow teachers to move more easily from one state to another, coordinating STEM teacher preparation with national content guidelines, and improving articulation agreements in higher education so that students aspiring to become STEM teachers can more easily transfer credits from one institution to another. (One mechanism for encouraging students to teaching careers is the Hach Foundation program described on p 1896.)

The NSB action plan aims to improve quantitative skills and science literacy across the entire educational system as a means to maintaining a workforce and public that requires more and more technical knowledge. That is a worthy goal—one that we all should support.

JWM

Literature Cited

1. National Science Board. *A National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering, and Mathematics Education System*, NSB-07-114; http://www.nsf.gov/nsb/edu_com/draft_stem_report.pdf (accessed Oct 2007).
2. Moore, J. W. *J. Chem. Educ.* **2007**, *84*, 1735.