National Science Board presents draft Action Plan

Because "a number of spokespersons for the science and engineering education communities have urged the National Science Board . . . to undertake an effort similar to the 1982-1983 Board Commission on Pre-college Education in Mathematics, Science, and Technology," on 30 March 2006 the Board charged the National Science Board Commission on 21st Century Education in Science, Technology, Engineering, and Mathematics "to develop a national action plan addressing issues that have inhibited effective reform of U.S. science, technology, engineering, and mathematics (STEM) education." The action plan was to "address the following issues and identify the specific role of NSF [National Science Foundation] in each:

• Improving the quality of pre-K-16 education related to both general and pre-professional training in mathematics, engineering and the sciences. . . . .

• Identifying critical aspects in the entry, selection, education and exploitation of the full range of potential talents, with special attention to transition points during the educational career where loss of student interest is greatest. . . .
• Improving mathematics and science programs, curricula, and pedagogy. . . .

• Promulgating a set of principles, options and education strategies that can be employed by all concerned, nationwide, to improve the quality of secondary school mathematics and science education in the 21st century. . . ."

The Commission submitted its draft to the Board a little less than a year later, on 15 March 2007, and on 9 August 2007 the Board published a draft version of A National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering, and Mathematics Education System, with requests for comment through 30 August. In their draft to the Board, the Commission stated that it had "read and incorporated the work of previous groups . . . and is mindful that many previous recommendations have never been implemented" -- including the recommendation of the 1982-83 Commission to attract more students to science and math courses by increasing their range and quality (as reported in our May 1984 issue).

The draft report published by the Board in August focuses on "two central challenges to constructing a strong, coordinated STEM education system," which are encapsulated in the following sentence: "A coherent, coordinated system of STEM education provided by well-prepared and highly effective STEM teachers is essential to the future prosperity and security of our Nation."

The coherence and coordination to which the Board refers must exist "both horizontally among states and vertically across grade levels." To achieve it, the Board proposes a "non-Federal National Council for STEM Education," whose authority will come from Congress' requiring "Federal STEM education programs to be coordinated with state and local education

agencies through the Council."

The Board also recommends that the present Subcommittee on Education and Workforce Development under the National Science and Technology Council (NSTC) Committee on Science be upgraded to a separate NSTC Committee on STEM Education and that a new Assistant Secretary of Education be appointed solely for STEM Education. For the NSF, over which the Board has oversight, the Board envisions three responsibilities:

• "Support research on learning and educational practices and the development of instructional materials."

• "Develop human capital" [in STEM fields]. (Here the Board is especially laudatory about "the highly successful model Math Science Partnership (MSP)
Program.")

• "Increase public appreciation for and understanding of science, technology, engineering, and mathematics." (Here the Board emphasizes that each of its members should be a "personal ambassador" for STEM education.)

To achieve horizontal coordination and coherence of STEM education, the Board has four recommendations, three of which are to be done through the National Council for STEM Education:

• "Develop National STEM Content Guidelines." By requiring states to align their STEM content standards to these national guidelines, this would mean a much more homogeneous set of state science education standards than presently exists.

• "Align the Metrics Used for Assessment of Student Performance with National STEM Content Guidelines." "Once national STEM content guidelines are developed, the National Assessment Governing Board (NAGB) should investigate alignment of the National Assessment of Educational Progress (NAEP) tests utilizing these guidelines."

• "Communicate Best Practices." "The National Council for STEM Education should serve as a forum for NSF and the Department of Education to gather and review inputs based on research and practical experience and disseminate information on best practices in STEM education teaching and learning."

The final horizontal integration recommendation is to "Ensure that Assessments under No Child Left Behind Promote STEM Learning," and "the Board recommends that NCLB eventually align its expectations of states with the [national] STEM content guidelines."

To achieve vertical coordination and coherence of STEM education, the Board recommends improved linkage between high school and higher education and the creation or strengthening of existing state P-16 councils.

To increase the number of well-qualified and highly effective STEM teachers, the Board recommends providing resources to increase STEM teacher compensation and to prepare future STEM teachers, also to create national STEM teacher certification guidelines and coordinate STEM teacher preparation with those guidelines. These last two recommendations, made possible by the horizontal coordination recommendations, will increase the mobility of STEM teachers just as national STEM content guidelines will make it easier for students moving in the middle of the school year to experience greater continuity in their STEM education.

The Commission was co-chaired by Drs. Leon Lederman, Illinois Mathematics and Science Academy, and Shirley Malcom, American Association for the Advancement of Science. The draft version of the Action Plan is available on-line at <www.nsf.gov/nsb/edu_com/report.jsp>.

(*Editor's Note*: Previous reference to the work of the Commission has been made in all our issues for the year 2006.)