New report offers roadmap for success in K-12 STEM education

June 28 2011

The report's recommendations include devoting adequate instructional time and resources to science in grades K-5. Credit: Amy Snyder, © Exploratorium, Exploratorium.edu

From educators to leaders in industry, there is broad agreement that U.S. schools have a crucial challenge in improving teaching and learning in science, technology, engineering and math (STEM) among students from kindergarten through high school. A background in STEM is not only essential to many current and future careers; it is also a means for citizens to understand and participate in an increasingly complex world--from understanding the challenges of environmental sustainability to addressing the need for alternative sources of energy.

The NRC report, "Successful K-12 STEM Education," is a response to a request from a member of Congress, Rep. Frank Wolf, to identify the

characteristics of highly successful K-12 schools and programs in STEM. The report was prepared by a committee of educators led by Adam Gamoran of the Department of Sociology and Wisconsin Center for Education Research at the University of Wisconsin-Madison. The committee's work included examining existing research and research in progress on STEM-focused schools, as well as a broader base of research related to effective STEM education practices and effective schooling in general. The committee also conducted a public workshop to explore criteria for identifying highly successful K-12 schools and programs in the area of STEM education through examination of a select set of examples.

The report offers two sets of recommendations, geared for schools and districts, and for state and national policy-makers. They are summarized as follows.

Districts seeking to improve STEM outcomes should:

- Consider the adoption of STEM-focused schools. The report identifies three models for such schools: selective STEM Schools for academically talented students, who need to apply for admission; inclusive STEM high schools, often referred to as "magnet schools;" and schools and programs with STEM-focused career and technical education.

- Devote adequate instructional time and resources to science in grades K-5.

- Ensure that their STEM curricula are focused on the most important topics in each discipline, are rigorous, and are articulated as a sequence of topics and performances.

- Enhance the capacity of K-12 teachers.

- Provide instructional leaders with professional development that helps them create the school conditions that appear to support student achievement.

Educational organizations and policy makers at the state and national levels should:

- Elevate science to the same level of importance as reading and mathematics.

- Develop effective systems of assessment that are aligned with the next generation of science standards and that emphasize science practices rather than mere factual recall.

- Invest in a coherent, focused, and sustained set of support for STEM teachers.

- Support key areas for future research.

"NSF appreciates Chairman Wolf's deep interest in improving K-12 STEM education," said Subra Suresh, NSF director. "This report, developed at Rep. Wolf's request, is a resource that will be very useful to all involved in STEM education--from policy makers to teachers to education researchers. The report's findings will be shared with these groups in the months ahead and will guide future research in the field."

"The National Research Council, through leading education researchers, has done a thorough job of identifying evidence-based directions for successful K-12 STEM education," said Joan Ferrini-Mundy, NSF assistant director for Education and Human Resources. "This report will

guide a number of follow-up and implementation activities to bring the results to practitioners, state and local STEM education leaders, and others.

Provided by National Science Foundation