Testimony

U. S. House of Representatives
Subcommittee on Research and Science Education, Committee on Science
Federal STEM Education Programs: Educators' Perspectives
May 15, 2007
2318 Rayburn House Office Building

Statement of Linda Froschauer
President, National Science Teachers Association
1840 Wilson Blvd
Arlington, VA 22201
Fro2@mac.com
703-243-7100

Mr. Chairman and Members of the Committee

Thank you for this opportunity to present testimony on behalf of the National Science Teachers Association. My name is Linda Froschauer, and I am President of the NSTA. For 32 years I have been a science teacher and I am currently an 8th grade science teacher and Department Chair at the Weston Public Schools in Connecticut.

This is the second opportunity I have had in recent months to testify before this subcommittee. A few months ago I appeared in support of H.R. 524, the Partnerships for Access to Laboratory Science grants. I want to sincerely thank the members of the Science Committee and the House for passing this extremely important legislation as part of H.R. 362.

Today I will talk about the Federal STEM education programs for K-12 teachers.

As you know the vast majority of STEM education programs originate from the U.S. Department of Education and the National Science Foundation. Strengthening science and math education is a core mission of the NSF.

Science education is unique because it is concerned with the special character of science and its related disciplines – it is at once a body of knowledge and a dynamic questioning activity. Because of the nature of science it is important to have scientists involved in critical questions of science education. It was the recognition of this interdependence between scientists and the science education enterprise that drove the identification of science education as a key part of the NSF agenda when the agency was founded.

We consider the NSF to be the engine of innovation for K-12 STEM education.

The new NSF Education and Human Resources Division of Research on Learning in Formal and Informal Settings—known as DRL--is working to advance discovery and

innovation at the frontiers of STEM learning and teaching. NSF supports the highly innovative models and approaches to learning in formal and informal settings. NSF works to advance equity and participation for all, to foster linkages between STEM education research and practice, and to unite education research and evaluation activities across the Foundation and with other federal agencies.

The NSF has the capacity to incorporate the best from both the science and education R&D communities and can enlist scientists, academicians and researchers in a peer review process that generates and tests innovations in science-related disciplines for education. Unlike the Department of Education, the NSF has the ability to tap into basic cognitive research, fold in new content and new ways of teaching this content from the disciplines, and explore new technologies for the delivery of professional development and for assessing teachers and their students.

One of the most effective education programs at NSF is the Math and Science Partnerships. An analysis of 123 schools participating in the NSF MSP program shows continued increases in student proficiency in math and science since the program was first established in 2002. Students showed the most significant improvements in mathematics proficiency, with a 13.7 percent increase for elementary, 6.2 percent increase for middle school, and 17.1 percent increase for high-school students. Science proficiency at each level showed marked gains as well, with a 5.3 percent increase for elementary, 4.5 percent increase for middle school, and 1.4 percent increase for high-school students.

African-American, Hispanic, and white students showed significant improvements in elementary level mathematics, as did students designated as special education or as limited English-proficiency students.

In addition to working with NSF on a MSP grant, NSTA has worked directly with federal agencies such as NASA, NOAA, and FDA to develop a combination of face-to-face

training and online experiences that we believe has the potential to reach hundreds of thousands of K–12 science teachers.

NASA, NOAA, DOT and the FDA have partnered with NSTA to develop SciPacks on topics supporting their mission. SciPacks are designed for educators who want or need to learn core science content. SciPacks contain three to five Science Objects, which are stand-alone, content-based units aligned with National Science Education Standards and Benchmarks for Science Literacy. These discrete online learning experiences are especially beneficial to teachers who are forced to teach out-of-field, elementary and middle level teachers who lack degrees in science, or those who need to increase their science knowledge of a particular content area.

Each SciPak also contains a pedagogical implications section highlighting age-appropriate concepts and common student misconceptions. Teachers utilizing SciPaks get individualized e-mail support from a content expert and can complete a graded assessment demonstrating content mastery.

SciPacks recently unveiled in the NSTA Learning Center focus on these content areas: Gravity and Orbits; the Universe and the Solar System; Earth, Sun and Moon; Coral Reef Ecosystems; Ocean's Effect on Weather and Climate; Plate Tectonics, The Rock Cycle, Force and Motion and Energy.

In addition, thousands of teachers have taken advantage of weekly NSTA Web Seminars on these topics. In addition NSTA Symposiums provide face-to-face training with experts on these content areas from federal agencies, who interact one-on-one with K-12 teachers.

Other STEM education programs from federal agencies are promoted extensively through NSTA print and online channels, and on the NSTA website. These communication vehicles reach hundreds of thousands of teachers, teacher leaders, and others in the science education community.

Federal agencies also share information about programs for science educators at the NSTA conferences, which draw approximately 25,000 teachers each year.

During the last NSTA annual conference the National Institutes of Health featured the NIH Research Zone, a coordinated effort that involved 27 institutes and centers from NIH professional societies and other supporting partners. The NIH Research Zone provided one stop shopping for teachers interested in discovering the resources available from the NIH research community. The groups represented included the National Biomedical Imaging and Bioengineering; the National Center for Research Resources; the National Human Genome Research Institute; the National Institute of Allergy and Infectious Diseases; the National Institute of General Medical Sciences; the National Institute of Neurological Disorders and Stroke; the National Institutes of Health Office of Science Education; the National Library of Medicine; and the Society for Neuroscience.

In addition, the NIH Office of Science Education provides medical and life science curriculum supplements for grades K-12, as well as posters and videos promoting health science careers.

Workshops and exhibits on NASA's education programs are also prominent at NSTA conferences. These include the NASA Educator Astronaut Launch, where teachers can join NASA's first educator astronaut, Barbara Morgan, on her flight to the International Space Station later this summer. NASA is offering a website, classroom activities and challenges to teachers and students.

Other NASA programs highlighted at the conference include the Student Observation Network, 21st Century Explorer, and the Engineering Design Challenge. These programs allow students to use NASA data to conduct their own analyses and apply engineering principles to solve scientific problems. The NASA Smart Skies features a web-based simulator with real world air traffic control motion problems between two or more

planes. Students apply proportional reasoning and distance rate time relationships to resolve conflicts by changing plane routes and speeds.

While I cannot speak to the efficacy or the outcomes of these federal programs, we have found that many of these programs do provide key research and content to classroom teachers and help to excite teachers and students about science. One of the challenges with federal education programs, however, is that they reach only a miniscule proportion of our nation's science teachers. We must find new ways to get proven, effective professional development programs up to scale so they reach a large number of teachers.

Why is professional development so important? Last year the National Research Council report titled *Taking Science to School: Learning and Teaching Science in Grades K-8* said that professional development was **key** to supporting effective science instruction in the critical, early years of a child's education. The NRC called for a dramatic departure from current professional development practice, both in scope and kind.

All teachers need opportunities to deepen their knowledge of the science content. The NRC also believes that teachers need opportunities to learn how students learn science and how to teach it. They need to know how children's understanding of core ideas in science builds across K-8, not just at a given grade or grade band. Teachers need to learn about the conceptual ideas that students have in the earliest grades and their ideas about science itself. They need to learn how to assess children's developing ideas over time and how to interpret and respond (instructionally) to the results of assessment.

In short, teachers need opportunities to learn how to teach science as an integrated body of knowledge and practice—to teach for scientific proficiency. They need to learn how to teach science to diverse student populations, and to provide adequate opportunities for all students to learn science.

We believe federal agencies have a key role in providing programs that will enhance teacher content knowledge, help them to deliver effective instruction, and provide insight into how students learn.

It is interesting to note that the NRC report also asserts that "*Federal agencies that support professional development should require that the programs they fund incorporate models of instruction that combine the four strands of science proficiency; focus on core ideas in science; and enhance teachers' science content knowledge, knowledge of how students learn science, and knowledge of how to teach science."*

Looking to the future we anticipate that the soon-to-be released Academic Competitiveness Council report on the myriad of federal STEM education programs will bring about needed changes.

From our observations, there is an overlap in many of the programs offered at the federal level.

There is no oversight entity at the federal level that works to coordinate these STEM programs. The federal agencies do not appear to work together to facilitate the dissemination of research, or to discuss possible new ideas and avoid duplicative programs.

We believe that better coordination and communication is desperately needed among federal agencies, bureaus, divisions, and centers that are involved with STEM education research and programs.

Finally an inventory of STEM education programs across the Federal agencies would inform future priorities and initiatives. Federal agencies should also work to coordinate their STEM education initiatives with states, local districts, the higher education community, and other key stakeholders.

Improvements in STEM education require a commitment of leadership at the local, state, and federal levels. Education programs at the federal agencies will always have a critical role to play in improving STEM education. We hope that any changes to existing programs, especially at the National Science Foundation, that may be come about as a result of the Academic Competitiveness Council report will be carefully reviewed and considered.

Thank you for allowing me the opportunity to address you today and I look forward to any questions you may have.