K–12 SCIENCE AND MATH EDUCATION ACROSS THE FEDERAL AGENCIES

HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED NINTH CONGRESS

SECOND SESSION

MARCH 30, 2006

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K–12 SCIENCE AND MATH EDUCATION ACROSS THE FEDERAL AGENCIES

THURSDAY, MARCH 30, 2006

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 10:00 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood Boehlert [Chairman of the Committee] presiding.

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

K-12 Science and Math Education Across the Federal Agencies

Thursday, March 30, 2006
10:00 a.m. – 1:00 p.m.
2318 Rayburn House Office Building (WEBCAST)

Witness List

Dr. Margaret Spellings
Secretary of Education

Dr. Arden L. Bement, Jr.
Director
National Science Foundation

Ms. Shana Dale
Deputy Administrator
National Aeronautics and Space Administration

Brigadier General John J. Kelly
Deputy Undersecretary of Commerce for Oceans and Atmosphere
National Oceanic and Atmospheric Administration

Dr. James Decker
Principal Deputy Director, Office of Science
U.S. Department of Energy

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HEARING CHARTER

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

K–12 Science and Math Education Across the Federal Agencies

THURSDAY, MARCH 30, 2006
10:00 A.M.—12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Thursday, March 30, 2006, the Committee on Science of the U.S. House of Representatives will hold a hearing to examine how federal agencies can improve their individual and collective efforts to strengthen K–12 science and math education.

2. Witnesses

Ms. Margaret Spellings is the Secretary of the U.S. Department of Education (ED).

Dr. Arden L. Bement is the Director of the National Science Foundation (NSF).

Ms. Shana Dale is the Deputy Administrator of the National Aeronautics and Space Administration (NASA).

Brigadier General John J. Kelly (ret.) is the Deputy Undersecretary of Commerce for Oceans and Atmosphere of the National Oceanic and Atmospheric Administration (NOAA).

Dr. James Decker is the Principal Deputy Director of the Office of Science at the U.S. Department of Energy (DOE).

3. Overarching Questions

- To what extent and how are the federal agencies involved in K–12 math and science education coordinating their efforts? What are their individual roles? To what extent and how do they ensure that their individual programs are complementary?
- Are there uniform evaluation tools that agencies do or could use to determine the effectiveness of their programs?
- How do individual federal agencies strike a balance in their portfolios among K–12 math and science programs that are designed to encourage students who show great promise and interest, programs that are designed to help students who are struggling academically, and programs that are designed to attract girls, under-represented minorities or students from low-income families? Should every federal agency administer programs for each subgroup of students or are some agencies better served by targeting specific populations, such as those who are academically promising and/or under-represented?

4. Background

Brief Overview

The quality of K–12 math and science education has been a growing national concern. Most recently, the National Academy of Sciences' report *Rising Above the Gathering Storm* pointed to the relatively poor performance of U.S. students in math and science as a threat to the Nation's long-term economic health. Numerous reports in recent years, including the Academy report, have called for renewed efforts to improve K–12 education, particularly by attracting top students into teaching and improving the training of both current and future teachers to deepen their understanding of, and comfort with, math and science content. Prompted by such recommendations, the Science Committee has pushed for years to enhance federal K–12 math and science education efforts, particularly at NSF.

NSF and ED are the two primary federal agencies with responsibility to improve K–12 math and science education. Other federal agencies have also run a variety of programs to improve and promote math and science education, often because they have scientists and research facilities that can be tapped for such activities. Those agencies, including DOE and the NOAA, also feel a commitment to keeping science strong in the U.S. since performing research is part of their missions. In addition, Congress has earmarked funds for education programs and grants in some of the agencies, particularly NOAA and NASA.

The range of education programs across the agencies can be seen as a strength—allowing program diversity and ensuring that all available federal science resources are contributing to K–12 education. But that diversity has also provoked concerns periodically that the federal efforts are uncoordinated and include many programs that are too small to make a difference or are otherwise ineffective and that the education programs are a distraction from agencies' primary missions. A report released by the Government Accountability Office (GAO) in October 2005 found that at least 13 agencies conduct programs designed to strengthen math and science education and raised questions about the lack of evaluation of a number of the programs. In February 2006, Congress created the Academic Competitiveness Council (ACC), a cabinet-level group tasked with coordinating and evaluating the federal role in math and science education.

Coordination could provoke a different set of concerns if it leads to all federal programs fitting a single mold, dominated by *No Child Left Behind,* which some critics charge has led to a reduced focus on science education in the schools. For example, a survey released this week by the Center on Education Policy found that most schools are increasing their focus on reading and math by reducing instruction in other areas, including science. However, others point out that proficiency in math is needed to progress in science so that the emphasis on math skills hardly detracts from the effort to improve science achievement. Moreover, testing in science under the *No Child Left Behind Act* will begin in 2007, and the preparation for these assessments should place a renewed emphasis on science, as seen in the design of new science tests and the reform of science courses to align them to state standards.

GAO Report

In October 2005, the Government Accountability Office (GAO), at the request of Rules Committee Chairman David Dreier, attempted to inventory the federal programs that were designed to increase the number of students or graduates in science, technology, engineering and mathematics (STEM) fields or to improve the quality of education in those areas. The GAO report examined education programs at all levels, from kindergarten to graduate school, not just the K–12 fields that are the focus of this hearing. Among other things, GAO found the following:

- In fiscal year 2004 (FY04), 13 agencies[1] spent a total of $2.8 billion for 207 programs that were designed to increase the number of students and graduates or to improve educational programs in STEM fields.
- Of the 207 programs, 103 had not been evaluated, including 17 programs that had been operating for more than 15 years.
- 94 of the programs identified were funded at less than $1 million and 51 were funded between $1 and $5 million.
- Six federal agencies spent the bulk (about $2.6 billion) of the reported funding for STEM education. The largest amount of funding was at the National Institutes of Health, followed by NSF, NASA, ED, the Environmental Protection Agency, and the Health Resources and Services Administration (within the Department of Health and Human Services). The remaining agencies spent a combined total of $154 million.

According to GAO, the report took one year to complete due, in large part, to the amount of time agencies took to provide GAO with comprehensive information on their education programs. Also, since GAO relied primarily on self-reporting by agencies, the inventory is not a definitive list of STEM education programs or activities. (For example, the Science Committee is aware of programs that were not included in the survey, including several programs at NASA and the Department of Defense.)

[1] The 13 federal agencies are as follows—National Science Foundation, Department of Energy, National Aeronautics and Space Administration, Department of Commerce, Department of Education, Environmental Protection Agency, National Institutes of Health, Department of Agriculture, Department of the Interior, Department of Homeland Security, Department of Transportation, Indian Health Service, and Health Resources and Services Administration. The Department of Defense, while identified by GAO as having STEM programs, did not participate.

Academic Competitiveness Council

Partly in response to the GAO report, Congress established the Academic Competitiveness Council (ACC), a cabinet-level group tasked with coordinating and evaluating the federal role in math and science education. Established in the *Budget Deficit Reduction Act* (Public Law 109–171), the ACC is chaired by the Secretary of Education and includes "officials from federal agencies with responsibilities for managing existing federal programs that promote mathematics and science." ACC is responsible, within a year, for (1) identifying all federal programs with a mathematics or science focus; (2) identifying the target populations being served by such programs; (3) determining the effectiveness of such programs; (4) identifying areas of overlap or duplication in such programs; and (5) recommending ways to efficiently integrate and coordinate such programs.

The ACC met for the first time on March 6, 2006, about a month after the Act creating it was signed into law. The ACC, in conjunction with the Office of Management and Budget, will inventory existing federal math and science education programs, sort these programs by program focus or goals, and then evaluate the effectiveness of the programs. Within one year, the ACC is required to submit to each Congressional committee with jurisdiction over a federal program identified as promoting math and science education a report detailing the ACC findings and recommendations, including recommendations for legislative or administrative action. The *Budget Deficit Reduction Act* provided ED with $50,000 to support the ACC's activities.

Prior to the creation of the ACC, there was already an existing mechanism for coordinating math and science education, established by Executive Order. The National Science and Technology Council (NSTC) is a cabinet-level council, overseen by the White House Office of Science and Technology Policy (OSTP), which serves as the principal means to coordinate the federal research and development enterprise. NSTC established a subcommittee on education in 2003, but it has been relatively dormant.

American Competitiveness Initiative

In addition to proposing the doubling of the combined budgets of the NSF, the National Institute of Standards and Technology, and DOE's Office of Science over the next 10 years, President Bush's *American Competitiveness Initiative* (ACI), proposes the creation and expansion of a number of programs specifically targeted at improving K–12 math and science education. To implement ACI, the President's budget request proposes $380 million for programs at ED, including:

- expansion of the Advanced Placement/International Baccalaureate (AP/IB) program to support an additional 70,000 AP/IB math and science teachers;
- creation of an Adjunct Teachers Corps to encourage up to 30,000 math and science professionals to become adjunct high school teachers;
- creation of "Math Now for Elementary Students" to help elementary school teachers learn proven methods and practices of math instruction; and,
- creation of "Math Now for Secondary Students" to promote research-based instruction to improve upper level math proficiency.

ACI also provides for the evaluation of federal science, technology, engineering and math programs, and proposes an additional $5 million to support the ACC's evaluation efforts.

Key Federal Agencies

NSF and ED are the two agencies of the Federal Government that share primary responsibility for programs in K–12 education. While ED is responsible for K–12 education across all disciplines and is experienced in addressing the systemic problems of education, including such varied challenges as student diversity (i.e., English language learners, students from low socioeconomic backgrounds and students with special needs) and school financing, NSF is specifically concerned with improving math and science education. Another key difference between the two agencies is that ED funding is generally distributed by statutory formulas (usually based on student population and income), while NSF funding is competed for nationally and projects are chosen by peer review.

U.S. Department of Education

ED currently administers a budget of about $88.9 billion per year (that covers more than K–12 programs)—$57.6 billion in discretionary appropriations and $31.3 billion in mandatory spending—and operates programs that touch on every area and level of education. ED's current programs strongly emphasize equitable educational opportunity for all, and most major K–12 spending programs are designed either to

equalize available funding among schools or school districts or to help specific groups of students, such as English language learners or those with special needs. In addition, while some ED programs, such as Reading First, are subject-specific, the vast majority of ED's programs allow states and school districts flexibility in choosing what sorts of programs or disciplines federal funding will be used to support.

The Math and Science Partnership at ED (ED MSP) is the one program that specifically seeks to increase the academic achievement of students in mathematics and science by enhancing the content knowledge and teaching skills of classroom teachers. Allowable uses of funding include professional development opportunities, recruitment bonuses and performance incentives for qualified math and science teachers, and scholarships for advanced course work in math and science. Funding for ED MSP ($182 million in FY06), is, like most ED programs, distributed from the Federal Government to all 50 states by a statutory formula, based on state factors such as population and poverty. The amount of funds awarded to the states in FY05 ranged from approximately $888,000 for small states like Delaware to $24 million for large states like California. Each state then distributes the funding, on a competitive basis, to partnerships of school districts, schools, and an institution of higher education. According to Congressional Research Service analysis of ED awards, funding at the local level can range from $20,000 to $3.3 million, but it is not clear if this amount is for a single year or for a multi-year award.

National Science Foundation

The *National Science Foundation Act of 1950,* which established NSF, directs NSF to support and strengthen math and science education programs at all levels. Other statutes, notably the *Education for Economic Security Act* (Public Law 98–377, signed in 1984), have expanded this authority. Most recently, the Science Committee created additional education programs at NSF in the *National Science Foundation Authorization Act of 2002* (Public Law 107–368).

NSF carries out its K–12 mission by supporting a variety of math and science education activities, including teacher training (both in-service and pre-service), curriculum development, education research, and informal education at museums and science centers. A recent reorganization of K–12 education has divided NSF's activities into three categories: the development of more effective tests in math and science, improving science teaching and learning, and translating the results of education and cognitive research into classroom practice.

Like all NSF programs, funds for education projects are awarded through a national, competitive process that draws on a wide variety of experts from outside government for peer review of proposed activities. While most federal agencies make little effort to evaluate the effectiveness of their math and science education programs, NSF requires an evaluation component to be included in individual education projects, and also has commissioned evaluations of NSF"s overall NSF education programs. NSF has sought outside advice on how to perform the evaluations. For example, a National Academy of Sciences committee in 2004 provided recommendations to further improve program and project evaluations at NSF.

Most NSF education programs are housed in the Education and Human Resources (EHR) Directorate. The President's budget proposes $816 million for EHR in FY07, a level that only begins to restore cuts EHR experienced in previous years (dropping from $944 million in FY04 to $797 million in FY06). Funding for the K–12 programs within EHR experienced similar declines in that period, with "formal" K–12 programs[2] going from $118 million in FY04 to $93 million in FY06 and the NSF's Math and Science Partnership Program (NSF MSP) dropping from $139 million in FY04 to $63 million in FY06.

President Bush proposed the creation of the NSF MSP as part of his original *No Child Left Behind* initiative, and NSF MSP was authorized as part of the *NSF Authorization Act of 2002.* Congress then created a complementary (and similarly titled) program at ED as part of the *No Child Left Behind Act.* The NSF MSP program funds partnerships between universities and local school districts to strengthen the content knowledge of elementary and secondary schoolteachers. The grantees are expected to run innovative reform programs that, if successful, would be the key to large-scale reform at the State level. Unlike ED MSP, NSF MSP funds are competitively awarded at the national level, and the grants range from $2.5 million per year for up to five years for targeted programs to $7 million per year for comprehen-

[2] The "formal K–12 programs" are the Instructional Materials Development Program, the Teacher Professional Continuum Program, and the Centers for Learning and Teaching Program, which were combined to form the Discovery Research K–12 program in the recent reorganization of NSF EHR.

sive efforts to improve math and science teaching and learning across the K–12 continuum.

In addition to NSF MSP and the "formal" K–12 programs, NSF also runs the Robert Noyce Scholarship Program, created by the *NSF Authorization Act of 2002.* The Noyce program awards grants to colleges and universities to award scholarships to top math and science majors or minors in return for a commitment to teach at the elementary or secondary school level two years for each year of support received. Universities may also use the grant funds to support programs to help these prospective teachers obtain their certification and prosper in their new profession. In FY06, the program was funded at $9 million, and $10 million is requested for FY07.

Outside of EHR, NSF supports education through its "broader impacts" criteria for all research grants awarded through its Research and Related Activities account. Applications for NSF research awards are reviewed not only to determine the merit of the proposed research activity, but also to determine how the activity will promote teaching, training and learning, broaden the participation of under-represented groups, and provide larger benefits to society.

Other Federal Agencies

U.S. Department of Energy

DOE runs its K–12 programs out of both headquarters and its National Laboratories, focusing primarily on supporting of mathematics, science and engineering education programs by using the personnel, facilities, equipment and resources of its laboratories to assist local schools, teachers and students. DOE's activities include providing research experiences for students intending to become math or science teachers, providing training for teachers who agree to become "teacher leaders" in math and science, and supporting academic competitions in science and math for high school students. The impetus for these programs often comes from individual National Labs, whose commitment to education often depends on the leadership at the lab. According to DOE, $86 million was spent on education activities at all levels in FY05, with $8 million specifically allocated for K–12 education.[3]

DOE's involvement in education, particularly at the graduate level, go back to its predecessor agency, the Atomic Energy Commission. Congressional support for DOE's educational programs has varied over time, with Congress sometimes encouraging these programs and sometimes discouraging them. In FY95, Congress appropriated $70 million to the DOE Office of Science Education and Technical Information for science education activities, including undergraduate research activities at DOE laboratories, graduate and faculty fellowships, teacher development programs and K–12 outreach. In FY96, Congress abolished the Office of Science Education and Technical Information, reduced funding for science education, and centralized the remaining education programs within the Office of Energy Research (now the Office of Science). In FY97, Congress eliminated all funding for university and science education programs at DOE but, in FY97 and FY98, required that line programs should sponsor the education programs. Most recently, the *Energy Policy Act of 2005* included a set-aside of 0.3 percent of the applied energy program research and development funding to support DOE Office of Science education programs, and several new programs were created at the undergraduate and graduate levels, again affirming the role of the agency in education.

National Aeronautics and Space Administration

NASA's organic act, the *National Aeronautics and Space Act of 1958,* directs the agency to expand human knowledge about space. As part of this effort, NASA's K–12 education activities include workshops and internships for teachers and students offered by NASA's centers, professional development for science and math teachers, and providing materials and visiting astronauts to schools, museums and science centers. Specifically, NASA K–12 education programs include the Educator Astronaut Program, which selects three teachers to become members of the Astronaut Corps, and the NASA Explorer Schools program, which brings together teachers and administrators to improve STEM teaching and learning in low-income schools.

In recent years, NASA education has been organized in a number of different ways, from being consolidated into an "Enterprise" on par with other NASA activities, such as space flight, to being spread out throughout the agency. Today, NASA education is centralized in the Office of Education, which contains five program

[3] Additional funding from DOE's undergraduate activities, funded at $40 million in FY05, may have supported teacher training in math and science but a breakdown of this funding was not available at the time of the charter.

areas,[4] including one for Elementary and Secondary Education. Funding for Elementary and Secondary Education at NASA totaled $29 million in FY06. (Many NASA earmarks are focused on education activities; according to NASA, in FY06, 72 earmarks, totaling $82 million, were located within the $162 million budget of the Office of Education.) The *National Aeronautics and Space Administration Authorization Act of 2005* (Public Law 109–155) requires NASA to have the National Academy of Sciences conduct a review and evaluation of NASA's precollege science, technology, and mathematics education programs.

In addition to the activities funded through the Office of Education, NASA promotes education and outreach as an integral component of every major research and development mission, spending an additional $150 million on activities at all educational levels through its Mission Directorates. For instance, as part of the Materials International Space Station Experiment, NASA researchers worked with high school students to analyze the effects of low orbit on a variety of materials.

National Oceanic and Atmospheric Administration

NOAA's K–12 activities focus on improving understanding of Earth and ocean sciences through such activities as teacher training and the development of educational materials.

NOAA's Office of Education serves as the primary point of contact for NOAA on education activities and coordinates the programs within the agency whose primary purpose is education. The FY06 budget for the Office was about $38 million, but there is no breakdown available for K–12 education. Historically, many of NOAA's education programs at the K–12 level have been funded through Congressional earmarks. The Administration believes that earmarks accounted for about half of the FY06 budget for the Office.

Earmarked programs include the creation of a high school Earth system science laboratory course ($4 million in FY06), and several regional education and training programs to support hands-on environmental experiences ($7 million in FY06). Congress has also added funding to programs that promote the sciences through scientific expeditions, like JASON, which uses live broadcasts to share the discoveries of research at sea with students and teachers. Past JASON expeditions have "taken" students on such missions as an exploration of the Titanic and the discovery of zooplankton in Monterey Bay.

In addition to formal K–12 education activities, NOAA conducts informal education through its support of marine sanctuaries and reserves, funds lesson plans and teacher professional development in ocean sciences, and supports a "Teacher at Sea" program, which allows elementary teachers to go aboard NOAA research and survey ships to deepen their understanding of the ocean.

Legislation

While this hearing is not designed to focus on any specific legislation, several bills have been introduced to strengthen STEM education in response to the various reports and commissions on U.S. competitiveness. Most of these bills seek to improve K–12 math and science education through teacher recruitment or training programs. For instance, S. 2198, *Protecting America's Competitive Edge (PACE) Act,* and H.R. 4434, introduced by Congressman Bart Gordon, authorize NSF to award scholarships to students majoring in STEM education who concurrently pursue their teacher certification, per the recommendations of the National Academy of Sciences' *Rising Above the Gathering Storm* report. S. 2197, PACE-Energy, also establishes a scholarship program for students in STEM fields and supports the creation of a part-time, three-year Master's degree in math and science for teachers at DOE, not NSF. In addition, S. 2197 creates other new K–12 programs at DOE, including incentives to help states create math and science "specialty schools" and new training and research opportunities for K–12 teachers and students at the National Laboratories.

In addition to the competitiveness bills, other relevant introduced legislation includes H.R. 50, the *NOAA Organic Act,* which establishes as a NOAA mission educating the public about the Earth's oceans and atmosphere and fostering the public's ability to understand and integrate scientific information into considerations of national environmental issues. The Science Committee passed H.R. 50 last session.

5. Questions for Witnesses

The panelists were each asked to address the following questions in their testimony before the Committee:

[4] The other program areas include Higher Education, e-Education, Informal Education and Minority University Research and Education.

- What are the one or two most important steps the Federal Government should be taking to improve K–12 science and math education and what is the role of your agency in taking those steps? What is the single most effective program your agency runs to help take those steps? How do you know that that program has been effective?
- In general, how does your agency evaluate its programs? Have you examined the evaluation techniques of other federal agencies and departments and, if so, do they have techniques that you have made use of or plan to make use of?
- How have you ensured that your agency's activities in K–12 math and science complement those of other federal agencies and departments in the following areas:
  1) attracting students to the teaching profession;
  2) providing pre- and in-service teacher training;
  3) developing curricula; and
  4) supporting informal learning.
- How do you decide how to strike a balance in your portfolio among K–12 math and science programs that are designed to encourage students who show great promise and interest, programs that are designed to help students who are struggling academically, and programs that are designed to attract girls, under-represented minorities or students from low-income families (whatever their level of proficiency)? Should every federal agency administer programs for each subgroup of students or are some agencies better served by targeting specific populations, such as those who are academically promising and/or under-represented?

Chairman BOEHLERT. The hearing will come to order.

I want to welcome everyone here this morning to what I think is an historic hearing. Never before have all the primary federal agencies with responsibility for science and math education appeared together before the Congress, either the House or the Senate. This is history-making.

We wanted to bring these five agencies together publicly to make a few key points. First, all five of these agencies have important roles to play in K–12 science and math education. Second, they each need to design their programs by drawing on their unique strengths and resources. We need not, and indeed should not, have a single, monolithic way of approaching education. And third, while we need a multiplicity of programs, those efforts need to be coordinated.

Coordination doesn't mean that every program has to fit a single mold, and coordination doesn't mean that agencies should not have some overlapping efforts. As with research funding, a strength of our system is that more than one agency may be working in a field. But coordination does mean that any overlap should be intentional and justified, and that agencies should be drawing on each other's expertise and experiences.

Moreover, every agency must be evaluating its programs, and must share both the evaluation methods and results, so that we can continue to improve both the way programs are evaluated and the evaluations themselves.

What the Committee is going to want to hear today is how each agency views its role in K–12 science and math education, how it coordinates that role with others, and how it evaluates its programs.

The Committee will be keenly interested in your answers, because every single one of us believes that K–12 science and math education is the ultimate key to our future prosperity and strength, and one might say survival as a Nation. This is, indeed, a national security issue of the highest magnitude. As the National Academy pointed out in its recent "Rising Above the Gathering Storm" report, improvement of K–12 education needs to be the keystone of an innovation agenda.

Over the next two months, this committee will develop and report out legislation designed to enhance our nation's efforts in this area. Mr. Gordon has already introduced legislation, as I am sure he will point out, and rightly so, and we will be doing so as well in the near future. I think Mr. Gordon and I are in complete agreement that a focus of that legislation needs to be doing a better job of attracting more top science students and math into teaching and enhancing the knowledge of current teachers in those areas.

I think there are a number of current programs we need to expand that already do that, such as the Noyce Scholarship Program at the National Science Foundation, I might add inadequately funded, but a good program, and I am sure there are other examples that could be expanded that we will hear about today. We don't have to reinvent the wheel, but we do need to be sure it can cover more ground.

One element of achieving that is, of course, ensuring that our education programs are adequately funded, and I would just note

that what I have said before: this committee is committed to seeking better funding for NSF's education programs. A lot of people are wishing all the time for improvements in education. Well, all the wishes in the world won't do the job if the resources don't support those wishes. The programs are underfunded in what, in most ways, is a very bold and forward-looking Fiscal Year 2007 budget proposal for science and math.

I know the—excuse me, I know the Administration shares our commitment to revitalizing science and math education, but it will take some more money and some more ideas beyond what has already been suggested. And I look forward to working with all of our witnesses today to build on the excellent foundation the President has founded. But I don't just like having a good solid foundation. I want to build on that foundation. Once again, let me stress, I view this as a national security imperative.

And I hope this will not be the last time the four of you appear before us together, because we need to work as a team. That has to be our approach, to pursue a coordinated, yet pluralistic approach to education, to ensure our nation's future success.

Mr. Gordon.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD L. BOEHLERT

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Coordination doesn't mean that every program has to fit a single mold, and coordination doesn't mean that agencies should not have some overlapping efforts. As with research funding, a strength of our system is that more than one agency may be working in a field. But coordination does mean that any overlap should be intentional and justified and that agencies should be drawing on each other's expertise and experiences.

Moreover, every agency must be evaluating its programs, and must share both the evaluation methods and results, so that we can continue to improve both the way programs are evaluated and the evaluations themselves.

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The Committee will be keenly interested in your answers because every single one of us believes that K–12 science and math education is the ultimate key to our future prosperity and strength as a nation. As the National Academy pointed out in its report *Rising Above the Gathering Storm,* improvement of K–12 education needs to be the keystone of an innovation agenda.

Over the next two months, this committee will develop and report out legislation designed to enhance our nation's efforts in this area. Mr. Gordon has already introduced legislation, as I'm sure he will point out, and we will be doing so as well. I think Mr. Gordon and I are in complete agreement that a focus of that legislation needs to be doing a better job of attracting more top science students and math into teaching and enhancing the knowledge of current teachers in those areas.

I think there are a number of current programs we need to expand that already do that, such as the Noyce Scholarship Program at the National Science Foundation (NSF). And I'm sure there are other examples of programs that could be expanded that we will hear about today. We don't have to reinvent the wheel, but we do need to be sure it can cover more ground.

One element of achieving that is, of course, ensuring that our education programs are adequately funded, and I would just note now what I've said before: this com-

mittee is committed to seeking better funding for NSF's education programs. They are underfunded in what in most other ways is a very bold and forward-looking fiscal 2007 budget proposal for science and math.

I know the Administration shares our commitment to revitalizing science and math education. But it will take some more money and some more ideas beyond what the Administration has suggested. And I look forward to working with all of our witnesses today to build on the excellent foundation the President has provided.

I hope this will not be the last time that all of you appear before us together because we need to work as a team to pursue a coordinated, yet pluralistic approach to education to ensure our nation's future success.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman. Before I begin my statement, I submit a letter signed by the majority of the Democratic Members of the Science Committee. This letter asserts the Minority Members' rights under the House Committee Rules to select additional witnesses to be called to testify on the pending subject matter, for at least one additional hearing.

Now, those are the magic words. Let me tell you what we are talking about. The Majority has the right to call all witnesses, or to set up all hearings. The Minority has no rights to set up a hearing, but the Minority does have a right to have one little witness. The Majority can have two witnesses, 20 witnesses, 40 witnesses, but the Minority is protected, in that they have one witness. Now, it seems if we are going to be talking about math and science education here today, that it wouldn't be unreasonable to have a teacher join this panel from a real world view. We were denied that opportunity, and so, for that reason, I will request that we have another opportunity to do that.

U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE

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March 30, 2006

The Honorable Sherwood Boehlert
Chairman, House Science Committee
U.S. House of Representatives
2320 Rayburn HOB
Washington, DC 20515

Dear Mr. Chairman:

Regarding the Full Committee Hearing on K-12 Science and Math Education across the Federal Agencies, scheduled for Thursday, March 30, 2006 at 10:00 AM, a majority of the Minority Members of the Science Committee assert their right under House Rule XI, Clause 2(j) (1) and Committee Rule No. 2, Clause (m) and request that additional witnesses, selected by the Minority, be called on the subject matter during at least one day of hearing thereon.

We believe it is important to have non-government witnesses testify, who can comment on the Administration's priorities and allocation of resources for improving K-12 science, technology, engineering and mathematics (STEM) education and on the appropriate roles of federal agencies in support of STEM education programs and activities.

We asked for a witness to join the March 30 hearing. Our preference was to hear from a Science teacher who is also a Board member from the National Education Association. Republican staff indicated that such a witness would be disruptive to the hearing and would likely cause Administration witnesses to pull out of the hearing. In deference to the Majority's request, we agreed that our witness could be held over until a second day of hearings on the matter could be arranged.

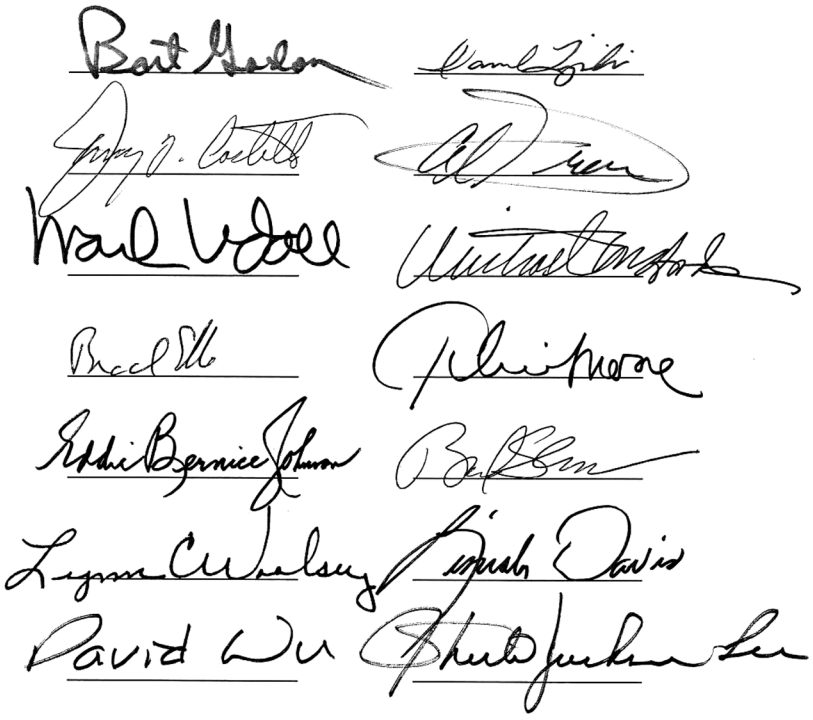
Our view is that we were owed a witness from March 30 and that we should get a second witness for the second day of hearings. Your staff seemed to be of a different view, but the end result was that your staff have vetoed our second witness and seem to have pulled the plug on the whole notion of a second day's hearing. This leaves the Committee record woefully lop-sided and incomplete as regards the Department of Education as a leader on math and science education issues and the ever diminishing role of NSF under the Administration's education policies.

This leaves us with no choice but to invoke Rule XI Clause 2(j) (1) and Committee Rule No. 2, Clause (m). We would have preferred to see a hearing put together with each side offering two witnesses (or the majority could offer 3 to the minority's 2). However, we will instead insist that a separate day of hearings with a slate of witnesses of our

choosing be held. We wish to draw your attention to the fact that this is the first time in memory that the Democratic Minority have been pushed into exercising this right. We take this step with some reluctance, but see no other way to move the Committee forward.

The signatures on this letter shall constitute compliance with the respective Rules of the House and the Committee. The form of this compliance, a letter signed by a majority of the Committee Minority, has been cleared with a Parliamentarian.

Sincerely,



I say that for all of you that are here, maybe here for the first time, there is no animosity between the Chairman and the Ranking Member, but we have certain responsibilities. Now, with that said, let me do what I normally do after the Chairman makes his remarks. I concur wholeheartedly and enthusiastically with his remarks. I compliment the Chairman and Congressman Ehlers, particularly on their leadership in going to the Administration and making them aware of the real need, and the strong support in Congress for additional STEM funding. They were leaders. They helped get this done, and I compliment them for that. And I am pleased that we are having this hearing today to review the efforts to improve the K–12 STEM education.

The importance of STEM education for the Nation's future well being has been stressed in many reports over the past few years, most recently by the Augustine report. We are all familiar with now, the National Academy's *"Rising Above the Gathering Storm."* The *Gathering Storm* report laid out specific recommendations for actions the Nation needs to take now to remain competitive in the 21st Century. The report's key recommendation focused on K–12 STEM education, and it identifies the area of greatest need: teachers.

The report points out that 69 percent of middle school students in the United States were taught by teachers with neither a college major in math, or certification to teach math. Similarly, 93 percent of these students receive instructions in physical sciences from teachers with no major or certificate in the field.

Two weeks ago, the Research Subcommittee held a hearing on undergraduate STEM education. One of the witnesses was Carl Wieman, a distinguished physics professor who received the 2001 Nobel Prize. Dr. Wieman is concerned about science education, and has put his money where his mouth is. He is using his Nobel award funds to improve the undergraduate physical science education programs.

He has said in the hearing, and I quote: "Unless you improve science education at the college level first, you are wasting your time and money on trying to make major improvements in K–12." I think Dr. Wieman and the Augustine report have it exactly right.

The K–12 STEM education priorities ought to be to improve the undergraduate education of new teachers, and to increase substantially the professional development opportunities for current teachers, in order to raise their subject knowledge and their teaching skills.

The second important message that came out of the Research Subcommittee hearing was strong agreement from the panel of witnesses that the National Science Foundation should be the major player in the federal efforts to improve STEM education. Unfortunately, the K–12 STEM education component of the President's American Competitiveness Initiative has different priorities, and assigns different agency roles.

It focuses most of the resources on curriculum development, and places all responsibility on the Department of Education, ignoring potential contributions from the National Science Foundation, or other federal agencies that support K–12 STEM education efforts.

I look forward to learning the rationale for these from Secretary Spellings and Director Bement, as well as other witnesses.

The Augustine report rightly states that laying the foundation for a scientifically literate workforce begins with developing outstanding K–12 teachers in science and mathematics, and I believe this is a goal that can and must be achieved.

I hope to come away from this hearing having gained confidence that the agencies represented here are developing plans and programs to help meet that goal.

Now, Mr. Chairman, let me just tell you the bottom line. Once again, I compliment you. I think you had a great deal of influence on getting the Administration to come forth with this additional STEM funding, but when you look at where they are spending it, 70 percent of these new dollars are being spent for math curriculum development. Yeah, we need that, but do 70 percent of the funds need to be in that particular area?

The other area of concern is, for over 50 years, the National Science Foundation has been a leader in K–12 education. We have an existing program that is acknowledged to work, yet over the last few years, the Administration has cut it 47 percent. So, if we are going to be taking this new money, it would seem that we could best spend it by funding existing programs that we know work. That is an opinion, rightly or wrong, that I would like for this panel to address.

And let me say to Secretary Spellings, this is not a reflection on you. From all that I—this is our first encounter. I don't know we really called this meeting, but our first encounter. From all that I have seen, read, and heard, you are bringing a common sense to Department of Education, and improving that situation there. That is a very important Department, but that is a big, unwieldy Department, and it seems to me, you have got your hands full, and it would be a good day's work just to make, you know, work what you have got going there. And so, it is not a reflection on you or your ability, or the importance of the Department of Education. It is trying to use, I think limited funds in a way that we know that works, and letting you use your skills to make the Department work better with the responsibilities that you have.

So thank you all for being here with us today.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

Mr. Chairman, I am pleased you have convened this hearing to review federal efforts to improve K–12 science, technology, engineering and mathematics education—or STEM education for short.

The importance of STEM education for the Nation's future well being has been stressed in many reports over the past few years, most recently by the Augustine report from the National Academies, *Rising Above the Gathering Storm.*

The *Gathering Storm* report lays out specific recommendations for actions the Nation needs to take now to remain competitive in the 21st century. The report's key recommendations focus on K–12 STEM education, and it identifies the area of greatest need—teachers.

The report points out that 69 percent of middle school students in the U.S. are taught by teachers with neither a college major in math nor certification to teach math. Similarly, 93 percent of these students receive instruction in physical sciences from teachers with no major or certification in the field.

While things are a bit better for high school students, we still find 31 percent of students nationally are taught math by teachers without majors or certification in math, and 63 percent by teachers without majors or certification in the physical sciences.

Two weeks ago the Research Subcommittee held a hearing on undergraduate STEM education. One of the witnesses was Carl Wieman, a distinguished physics professor who received the 2001 Nobel Prize in Physics. Dr. Wieman is concerned about science education and has put his money where his mouth is. He has been using his Nobel award to fund efforts to improve undergraduate physics education.

He said at the hearing, and I quote, "unless you improve science education at the college level first, you are wasting your time and money on trying to make major improvements in K–12 [education]."

I think Dr. Wieman and the Augustine report have it exactly right.

The K–12 STEM education priorities ought to be to improve the undergraduate education of new teachers and to increase substantially the professional development opportunities for current teachers, in order to raise their subject knowledge and teaching skills.

The second important message that came out of the Research Subcommittee hearing was strong agreement from the panel of witnesses that NSF should be a major player in federal efforts to improve STEM education. Unfortunately, the K–12 STEM education component of the President's *American Competitiveness Initiative* has different priorities and assigns different agency roles.

It focuses most of its resources on curriculum development and places all responsibility on the Department of Education, ignoring potential contributions from NSF or other federal agencies that support K–12 STEM education efforts.

I look forward to learning the rationale for these choices from Secretary Spellings and Director Bement, as well as from our other witnesses.

To gain the maximum advantage from the relatively small federal investment in K–12 STEM education, it is important to identify and concentrate on replicating programs that work. This is only possible if effective mechanisms are in place for program coordination, planning, and assessment across the government.

Although such mechanisms exist on paper, there is little evidence they actually work. The subcommittee charged with this role under the National Science and Technology Council has been invisible.

A new entity, the Academic Competitiveness Council, or ACC is now being established as a result of legislation passed this year. Chaired by the Secretary of Education, it was tasked to identify federal STEM programs, evaluate program effectiveness, identify duplication, and recommend how to integrate and coordinate these programs. In short, the ACC was tasked to do what the NSTC subcommittee was presumably responsible for doing.

I hope to hear what the status is of this new effort at coordination and planning and to find out whether there is any basis for hope that it may succeed. Without strong congressional oversight, I'm not confident the ACC will be any improvement.

The Augustine report rightly states that "laying the foundation for a scientifically literate workforce begins with developing outstanding K–12 teachers in science and mathematics." I believe this is a goal that can and must be achieved. I hope to come away from his hearing having gained confidence that the agencies represented here are developing plans and programs to help meet that goal.

Mr. Chairman, thank you, and I yield back my time.

Chairman BOEHLERT. Thank you very much, Mr. Gordon.
[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

I am pleased the Committee is holding this hearing today. Bolstering the science, technology, engineering, and math education of our children is one of the most important issues facing our nation. Without a strong education in these areas, our country will not thrive. I am thrilled that many of my colleagues and the Administration recognize the need and are taking steps to address K–12 STEM educational improvements.

Mr. Chairman, I strongly support the President's call to maintain the competitive ability of the United States in an increasingly innovative world economy. His *American Competitiveness Initiative* (ACI) requests focused funding on areas that will improve STEM education and promote domestic innovation and economic productivity. It is a bold and ambitious approach to keeping America at the forefront of research and education by increasing the numbers of highly qualified math and science teachers, expanding high school advanced placement offerings, and providing workforce skills training to some 800,000 workers annually.

While I am heartened by the commitment the Administration's request shows for the fundamental research budget at National Science Foundation (NSF), I would like to register my concern that the education programs at the NSF as well as other agencies have not been included in the ACI. NSF is the primary federal supporter of science and math education; it underwrites the development of the next generation of scientists and engineers. While the overall budget of NSF increases almost eight percent, the Education and Human Resources directorate experiences a modest 2.5 percent increase and a dramatic restructuring. This is a continuing, but distressing, trend for NSF to move away from their K–12 educational mission and to focus solely on graduate education and activities to broaden participation in STEM fields. Decreasing the role of NSF in education seems very shortsighted when we are currently facing the challenge of adequately preparing our students to enter science and technology fields.

The ACI dedicates new funds to a "Math Now" Initiative to improve math in elementary and middle schools. While I am certainly pleased the President is focusing on this area at the Department of Education, I believe we need to have a parallel "Science Now" Initiative to isolate and promote effective science teaching. Tackling the disciplines one by one does a disservice to our students. Even with our limited resources, we must find ways not to rob a child of science education because we believe they should learn other subjects first. Each child deserves a strong background in math, reading and science. A Science Panel could also examine the issue of high school sequencing of science course work. Because our nation is extremely transitory, coupled with the local structure of education, a student who changes school districts may miss a year of science because the course work is not offered in the same order. There must be an optimal sequence to offer such course work and a Science Panel could help determine this.

The emphasis today is coordination. It is imperative that the agencies work together on STEM education, acknowledging common goals and leveraging limited resources. I look forward to hearing from our witnesses how their agencies are coordinating their STEM education efforts, and about their unique strengths.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good morning. I want to thank the witnesses for appearing before our committee to review federal programs that support science, technology, engineering and mathematics (STEM) education at K–12 grade levels.

Building a high quality education system today is the key to ensuring a strong future for America. Today's hearing will closely examine the focus and priorities of current STEM education programs because the quality of K–12 math and science education has been a growing national concern.

Most recently, the National Academy of Sciences' report *Rising Above the Gathering Storm* pointed to the relatively poor performance of U.S. students in math and science as a threat to the Nation's long-term economic health. Numerous reports in recent years, including the Academy report, have called for renewed efforts to improve K–12 education, particularly by attracting top students into teaching. Further, studies suggest the need to improve the training of both current and future teachers to enrich their understanding of the math and science curriculum. As a

senior Member of the Science Committee, I have supported increased funding for federal K–12 math and science education efforts to ensure that our students—the future scientists, technologists, engineers, mathematicians, workers, and others responsible for our nation's future innovations, our national security, our economy, and our quality of life-receive a world class education in the sciences and mathematics.

The Department of Education and NSF are the two primary federal agencies with responsibility to improve K–12 math and science education. However, the President's *American Competitiveness Initiative* (ACI) requests $380 million for STEM education activities, all at the Department of Education. Does this imply that the other agencies that support STEM education do a poor job at administering effective education programs?

Further, STEM education activities across agencies are supposed to be coordinated by the Education and Workforce Development Subcommittee of the National Science and Technology Council's (NSTC) Committee on Science. However, I am unhappy to learn that little planning and coordination has been carried out by the subcommittee. I would like to know what has the subcommittee been doing since its establishment in 2003?

Last, I would like to express my concerns with the findings of a Government Accountability Office (GAO) report done last October that revealed 103 of 207, or almost half, of the current STEM education programs have never been evaluated, including seventeen programs that have been operating for more than fifteen years.

As an oversight committee, I hope we can work together to assist the federal agencies to coordinate their efforts to ensure their individual programs complement one another, without losing their effectiveness or focus. Our children's education is not only the key to their personal success, but also to the success of our country's economic growth.

I look forward to hearing the testimony from the witnesses.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman and Ranking Member.

I welcome the witnesses. Today's hearing is valuable because it gathers together leaders of several federal agencies with the potential to make major changes in STEM education in America.

The issue of K–12 education in science, technology, engineering, and mathematics (also called STEM), is of critical importance.

America is losing is competitiveness in these areas, as is evidenced by a loss of jobs in knowledge-intensive industries.

My District, the 30th District of Texas, contains a majority of individuals who belong to racial and ethnic minorities.

These minorities represent a tremendous untapped resource of domestic STEM talent.

The Federal Government can do more when it comes to encouraging minorities to pursue STEM careers.

I would like to see greater collaboration and cooperation among the federal agencies, especially with regard to minority outreach. Collaboration between government and industry should occur to a greater extent, and I would like to know how the Science Committee can facilitate those important partnerships.

Teachers who are well-paid, well-prepared and passionate about STEM should be in our classrooms, inspiring students at the elementary and middle school levels.

STEM should be presented within the context of the thrill of discovery and challenge of creativity, not only the drudgery of memorization.

Ranking Member Gordon has introduced several pieces of legislation to encourage teacher development and strengthen our STEM education workforce.

I have co-sponsored that legislation and urge Congress to move on those good efforts.

As the Science Committee strives to direct and encourage policies to strengthen federal efforts to improve STEM education, it is my hope that today's witnesses will benefit from this exchange of ideas and be able to work together, in partnership with Congress, to better serve America's youth.

Thank you, Mr. Chairman. I yield back the balance of my time.

[The prepared statement of Ms. Woolsey follows:]

PREPARED STATEMENT OF REPRESENTATIVE LYNN WOOLSEY

Mr. Chairman, thank you for holding today's hearing. Math and science education is a critical subject for our nation's future.

In *It's a Flat World, After All* Thomas Friedman explained that America's historical economic advantages have disappeared now that "the world is flat, and anyone with smarts, access to Google, and a cheap wireless laptop can join the innovation fray."

In the 1800s, economic competition was local. By the 1900s, it was national. And today, as we know, economic competition is international.

People in my hometown of Petaluma aren't competing for jobs just with people in San Francisco, or even in Chicago or New York—they are competing with people in New Delhi and Beijing.

Which means that for our country to continue to lead the world in innovation, we must make our education system the best in the world.

In particular, we must be the best in math and science, which are more important than ever as we move further into the information age. And so, I look forward to hearing what our witnesses have to say about their efforts in this area.

But, I must also remind everyone that at the same time that the President has touted his *American Competitiveness Initiative,* he has frozen funding for early childhood education, underfunded the *No Child Left Behind Act* by $55 billion, and cut student aid by $12 billion.

Those numbers represent our failure to help millions of low- and middle-income children realize their potential and their dreams.

And that's bad not only for those children and their families, but it is bad for American competitiveness.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Honda follows:]

PREPARED STATEMENT OF REPRESENTATIVE MICHAEL M. HONDA

Chairman Boehlert and Ranking Member Gordon, thank you for holding this important hearing today. I also thank the witnesses for making the time to be with us today. I only wish that it would have been possible to have some witnesses from outside the Administration who would be free to give us an independent assessment of the current STEM education programs that we have in place and the proposals that the President has put forth in his budget and State of the Union address. I believe that an outside perspective would have been very useful in informing the Committee, and I am disappointed that the Minority was not permitted one here today.

There are a number of major questions that I hope to hear answers to today. The President's *American Competitiveness Initiative* focuses almost exclusively on the development of curriculum for math, while the Augustine Report suggests that focusing on teacher education and professional development are the greatest areas of need. Why does this difference exist?

The budget request de-emphasizes the role of the National Science Foundation in K–12 STEM education, while at the same time evaluations have shown that the Math and Science Partnerships program has produced substantial improvements in student performance and all NSF programs score highly in assessments. What is the motivation for this change at NSF?

And while the ACI includes $380 million in new funding for STEM education programs at the Department of Education, at the same time the budget request cuts over $1 billion in funding for several programs that improve science and math achievement and improve the chances under-represented students will attend and graduate from college. How is this budget consistent with the President's statement in the description of the *American Competitiveness Initiative* that "the bedrock of America's competitiveness is a well-educated and skilled workforce"?

I hope that we will get some answers to the serious questions that have been raised, although I am skeptical that this panel of Administration-only witnesses will provide those answers. I believe that we will need to hold future hearings on this matter and bring in some independent, outside voices to provide additional perspective on these issues.

Chairman BOEHLERT. And now, for our distinguished facilitators. The panel consists of: Ms. Margaret Spellings, Secretary of the U.S. Department of Education, Madam Secretary; Dr. Arden Bement, Director of the National Science Foundation, Doctor; Ms. Shana

Dale, the Deputy Administrator of the National Aeronautics and Space Administration, welcome home; Brigadier General John Kelly, the Deputy Undersecretary for Oceans and Atmosphere of the National Oceanic and Atmospheric Administration, General; and Dr. James Decker, the Principal Deputy Director of the Office of Science at the U.S. Department of Energy, Dr. Decker.

It is good to see you all here, and it is good to see this team together, and it is so important that this team work well together, and unlike in the past, when I can recall days when we had to introduce people from the Department of Education to the National Science Foundation, including at the very top, supposedly working together, the first time they ever met each other. That is not the case with this panel. You work well together, and we want to help you work even better, more effectively.

So with that, we will go first to you, Madam Secretary.

STATEMENT OF MS. MARGARET SPELLINGS, SECRETARY, DEPARTMENT OF EDUCATION

Secretary SPELLINGS. Thank you, Mr. Chairman. I appreciate the opportunity to be here. Congressman Gordon, thank you for your comments. I look forward to our dialogue today.

Thank you to each Member of the Committee, and thank you for inviting me today. I would like to congratulate you first, Mr. Chairman, on your 24 years of service to this Congress and to the American people, and I hope that whatever your life holds next, that we will not lose your very strong voice for children and competitiveness, and all that we have to do together, so please bear that in mind.

I appreciate the opportunity to discuss the President's Competitiveness agenda today with the Committee that has been a leading advocate to ensure that America remains the world leader in innovation and research. While testifying before this committee is a departure from my normal Hill appearances, I think it underscores the need to rely on government-wide resources if we are going to give our students the skills to compete, work, and lead in the global economy, and I have no doubt that the House Education Committee could benefit from hearing from my colleagues on this panel today, as well.

As all of you know, our children aren't growing up in the same world we did. You can't pick up a newspaper or magazine these days without reading about global competitiveness, especially in math and science. While we sleep at night, accountants in India do our taxes, radiologists in Australia read our CAT scans, technicians in China build our computers. In a recent Newsweek cartoon, there is a—they poke fun at outsourcing NCAA office brackets even. As other nations race to catch up, there is mounting evidence that our students are falling behind, and I know you all have heard the numbers, but they do bear repeating.

Our 15 year olds rank 24th of 29 developed nations in math literacy and problem solving. Almost half of our 17-year-olds don't have the math skills to work as a production associate at a modern auto plant. We know that 90 percent of the fastest growing jobs require post-secondary education, and yet, fewer than half of our students graduate from high school ready for college level math or

science. Every year, a million students drop out of high school, and nearly five out of ten African-American and Hispanic ninth graders do not graduate from high school on time, in a day and time when most of the jobs require post-secondary education.

Wherever I go, like you, I hear from governors, business people, educators, and parents that our students are not prepared, and if we are going to move in a new, positive direction, we must make high schools more rigorous, and encourage students to take more advanced math and science classes. Employers today need workers with pocket protector skills, creative problem solvers with strong math and science backgrounds. Whether children and adults want to be auto mechanics or cancer researchers, they must have these skills.

The President's *American Competitiveness Initiative* will devote $380 million to strengthen K–12 math and science education, and importantly, it will build on the success of *No Child Left Behind,* which is getting results all across our country, and increase academic rigor across the board.

Overall, the Department of Education will increase funding for our programs in these critical areas by about 51 percent. The President has called for the formation of the National Math Panel, a coalition of experts to help us identify the best research on proven strategies to teach these skills, and his budget also includes $250 million for a new Math Now Initiative that will give elementary and middle school students the academic foundation necessary to succeed in rigorous math classes in high school, such as advanced placement.

Our challenge today is that nearly 40 percent of our high schools offer no such classes, and that must change, especially when we know that just taking one or two AP courses increases a student's chance of graduating from college on time. The President has called for $122 million to prepare 70,000 teachers to lead advanced placement and international baccalaureate classes in math/science, and critical foreign languages. His budget includes $25 million to help recruit 30,000 math and science professionals to become adjunct high school teachers in these critical areas.

This urgent work is before us, and we must do what works. As policy-makers, we must focus on results. We have looked at data to see what policies are most effective for students, and where we can save taxpayers' money, or operate more efficiently by eliminating and consolidating programs that aren't getting results for our students. According to the GAO, thirteen different government agencies, including yours and mine, spend about $2.8 billion on 207 different programs for math and science education, almost half of them receiving less than $1 million. These programs are in their own silos with little or no coordination between them, or linkage to *No Child Left Behind*'s goals of raising student achievement for all students. It is a thousand flowers blooming, and maybe even a few weeds throughout the government.

So, let us ask ourselves some pointed questions. What are our goals for these programs? Do we have a consensus on what the goals should be? Who is our client? Are we spending millions to train teachers who possess a strong math or science knowledge base already, or are we reaching the teachers who need the train-

ing the most? Do we want these programs to produce an educated workforce, Nobel prizewinners, or both?

Congress created the American Competitiveness Council, which I chair, to answer questions like these, and align our efforts around shared strategic goals. At the beginning of March, the President and I led the first meeting to begin the process of evaluating how well these math and science programs are working, and improve coordination between them. We must align our efforts with the principles of *No Child Left Behind.* By continuing to hold schools accountable for getting all students to grade level in reading and math by 2014, and by giving local policy-makers and educators the resources, authority, and research base to do what is best.

It is not just for reading and math. We will have science assessments in place by 2007, and the President has called for them to be a part of the accountability system as well. As leaders and policy-makers, as parents, it is our job to look down the road, and make sure our kids are prepared for the future. As the President said in the State of the Union: "If we ensure that America's children succeed in life, they will ensure that America succeeds in the world, and if we raise our expectations, our students will rise to the challenge."

Thank you, and I would be happy to answer any questions you may have.

[The prepared statement of Secretary Spellings follows:]

PREPARED STATEMENT OF MARGARET SPELLINGS

Mr. Chairman, and Members of the Committee:

Thank you for the opportunity to speak with you today about the importance of education to maintaining our global leadership, and the President's proposed serious and innovative reforms that will prepare our children to become leaders themselves.

THE CHALLENGE: TO INNOVATE EDUCATION

America has long been innovation's home. When faced with a challenge, we invent the answer: from the first telephone to global satellite communications; from the first computer to the World Wide Web; from the Wright Brothers to Neil Armstrong. To Americans, innovation means much more than the latest gadget. It means creating a more productive, prosperous, mobile and healthy society. Innovation fuels our way of life and improves our quality of life. And its well-spring is education.

Throughout his Administration, President Bush has made innovation and education top priorities. The President worked with you and your colleagues in the Senate, to pass the most far-reaching education reform in decades, the *No Child Left Behind Act* (NCLB). NCLB has brought high standards and accountability to public schools and sparked a mathematics and reading revival in the early grades.

While the United States is leading the world in science and technology and making strong reforms to its education system, the rest of the world is not standing still. America no longer holds the sole patent on innovation. Inspired by our example, countries such as China, India and South Korea have invested heavily in education, technology, and research and development. America now has billions of competitors throughout the world, challenging us to set our sights even higher.

Our educational leadership has been challenged as well, with many developed nations' students outperforming ours in international tests, particularly in math and science, an ominous sign for many American schools. These test scores are linked to a lack of challenging course work. According to some estimates, America's share of the world's science and engineering doctorates is predicted to fall to 15 percent by 2010.

This global challenge requires bold action and leadership. America has done it before. Following the Soviet Union's 1957 launch of Sputnik, the world's first satellite, Congress passed and President Eisenhower signed into law the *National Defense Education Act of 1958* (NDEA). NDEA encouraged more college and university students to pursue degrees in engineering and it brought the public and private sectors

together as partners to capture the interest, imagination and dedication of American students. And it worked. Within a decade, the number of science and engineering doctorates awarded in the United States annually had tripled, accounting for more than half the world's total by 1970.

Today, America faces challenges more difficult and complex than a single satellite. The spread of freedom is spurring technological innovation and global competition at a pace never before seen. This trend makes it increasingly important that our economy be more flexible and responsive, to make sure that we continue to lead in innovation and technological development and to make sure we have a workforce that has the skill sets necessary to do so.

Education is the gateway to opportunity and the foundation of a knowledge-based, innovation-driven economy. Employers are increasingly looking for workers who have analytical, technical and problem-solving skills.

We have to run to keep up. A high school diploma, once desirable, is now essential, and, increasingly, insufficient. About 90 percent of the fastest-growing occupations of the future will generally require some post-secondary education. It is therefore unacceptable that among all ninth-graders in public schools, about three in ten do not graduate on time; or that for black and Hispanic students the figure is about five in ten. If current trends continue, by 2012, over 40 percent of factory jobs will require post-secondary education, according to the National Association of Manufacturers. And yet, almost half of our 17-year-olds do not have the basic understanding of math needed to qualify for a production associate's job at a modern auto plant.

Improving education is critical not only to America's economic security, but also to our national security. Today, not one but 3,000 satellites circle the Earth. U.S. soldiers use the latest communications and surveillance technology to fight the global war on terrorism. Advanced math skills are used to identify and undermine terrorist networks. Government and the private sector engineer new ways to protect lives and infrastructure from harm. And the effort to spread freedom to other nations and cultures demands speakers fluent in languages such as Arabic, Farsi, Chinese, and Russian. Addressing these challenges will advance opportunity and entrepreneurship at home and promote democracy and understanding abroad.

Rigorous instruction, high standards and accountability are helping to raise achievement levels among American students, particularly in the early grades. As all students work to achieve proficiency in math and reading by 2014, an innovative education reform effort is needed.

America's civic, political and business leaders agree: To sustain our quality and way of life, we must act now. And President Bush is leading the charge by proposing investments and reforms through a number of key initiatives that I would like to outline today.

THE ANSWER: PRESIDENT BUSH'S EDUCATION AGENDA

President Bush's answer to America's challenge begins with the *American Competitiveness Initiative.* This multi-agency Initiative will commit $5.9 billion in FY 2007, and more than $137 billion over the next 10 years, to strengthen education, promote research and development and encourage entrepreneurship. In the research arena, it will increase our investment in physical science and engineering research, the results of which will fuel technological innovation for decades to come. In the education arena, the initiative will bring together leaders from the public sector, private sector and education community to better prepare our students for the 21st century. The initiative will place a greater emphasis on math instruction from the earliest grade levels. It will ensure that high schools offer more rigorous course work, including Advanced Placement and International Baccalaureate courses in math, science and critical-need foreign languages. It will inform teachers of the most effective, research-based approaches to teaching math. It will encourage professionals in those fields to become teachers themselves. And it will evaluate all federally funded math and science education programs to ensure the most effective use of the taxpayers' dollars.

The President's High School Reform initiative will help ensure that a diploma becomes a ticket to success for all graduates, whether they enter the workforce or go on to higher education. It will bring high standards and accountability to high schools by aligning their academic goals and performance with the *No Child Left Behind Act.* Through assessments and targeted interventions, it will help educators raise achievement levels and close the achievement gap. It will also help alleviate the dropout problem by focusing more attention on at-risk students struggling to reach grade level in reading or math.

Finally, the President's *National Security Language Initiative,* announced on Jan. 5, 2006, will help more American students master critical-need foreign languages to advance global competitiveness and national security. This joint project, in collabo-

ration with the Department of State, Department of Defense and the Director of National Intelligence, will train teachers and aid students in those fields.

THE CHALLENGE: KNOWLEDGE OF MATH AND SCIENCE

In this changed world, knowledge of math and science is paramount. In the words of *BusinessWeek,* "It's a magnificent time to know math." "Math entrepreneurs" are translating the world into numbers—which translates into big salaries. According to the Bureau of Labor Statistics, new and replacement job openings requiring science, engineering or technical training will increase by more than 24 percent, to 6.3 million, between 2004 and 2014.

Of all of the recommendations contained in the National Academies' report, *Rising Above the Gathering Storm,* the highest priority is to vastly improve K–12 math and science education. Schools must help students develop the skills they will need to compete and succeed in higher education and the workforce, which are increasingly connected in this changed world. All Americans must be technically adept and numerically literate—regardless of their chosen occupation—so that they can make informed decisions and enjoy advancement in their careers. And this technically and numerically literate population must also yield additional practitioners of math, science, and engineering to meet the needs of academia and industry well into the future. Industry must do its part to ensure that career opportunities provided to those with training in math, science and engineering are as stable and financially rewarding as other jobs, such as medicine, law and finance.

We clearly have a long way to go. High school test scores in math have barely budged since the early 1970s. And less than half of high school graduates in 2005 were ready for college-level math and science course work, according to ACT.

In 1983, the landmark *A Nation at Risk* report recommended that high school students be required to take a minimum of three years of math and three years of science to graduate. Yet today, only 22 states and the District of Columbia require at least this amount to graduate in the class of 2006. Even fewer require high school exit exams (which are often administered in 10th or 11th grade, leading many employers and universities to discount the results). Just one State—Alabama—calls for current students to take four years of both science and math to graduate.

A major part of the answer is teacher training. When we compare the U.S. education system with that of the top performing countries, we find several significant differences, most notably that a much lower proportion of U.S. math and science teachers actually have a degree in the area in which they are teaching. Because our elementary schools employ generalist teachers who are required to teach all academic subjects, most have degrees in education and have completed little or no course work in math or science. Three out of four fourth-grade math and science teachers in the U.S. do not have a specialization in those subjects. And students from low-income communities are far less likely than their more affluent peers to have teachers certified in the subject they teach. With two-thirds of our math and science teachers expected to retire by 2010, we have a challenge to produce new teachers to fill that gap, but we also have an opportunity to change the way in which new teachers are trained so that future teachers will have greater content knowledge in math and science.

Strengthening math and science standards is an economic imperative, for the Nation and for individual citizens. According to Department statistics, students who take advanced math courses in high school (such as trigonometry, precalculus and calculus) are far more likely to earn a Bachelor's degree. Additionally, students from low-income families who acquire strong math skills by the eighth grade are 10 times more likely to finish college than peers of the same socioeconomic background who do not.

Still, old attitudes about math die hard. A recent survey commissioned by the Raytheon Company found that 84 percent of middle school students would rather clean their rooms, take out the garbage or go to the dentist than do their math homework. According to the Business Roundtable, just five percent of parents say they would "try to persuade their child toward careers in science, technology, mathematics or engineering." Many people still view math and science as "nerdy" subjects with little relevance to the "real world." Like it or not, that world has changed forever.

THE ANSWER: AMERICAN COMPETITIVENESS INITIATIVE

President Bush's *American Competitiveness Initiative* seeks to improve learning and instruction in mathematics and science.

The Department of Education's proposals within this Initiative are as follows:

- *National Math Panel:* Based on the influential National Reading Panel, the National Math Panel would convene experts to evaluate empirically the effec-

tiveness of various approaches to teaching math, creating a research base to improve instructional methods for teachers. It would lay the groundwork for the Math Now program for grades K–7 to prepare every student to take and pass algebra;

- *Math Now for Elementary School Students:* Like the successful and popular Reading First program, Math Now for Elementary School Students would promote promising, research-based practices in mathematics instruction and prepare students for more rigorous math course work in middle and high school;
- *Math Now for Middle School Students:* Similar to the current *Striving Readers Initiative,* Math Now for Middle School Students would diagnose students' deficiencies in math proficiency and provide intensive and systematic instruction to enable them to take and pass algebra;
- *Advanced Placement-International Baccalaureate (AP–IB) Incentive Program:* The AP–IB Incentive Program would train 70,000 additional teachers to lead AP–IB math and science courses. It would increase the number of students taking AP–IB tests to 1.5 million over the next five years with the goal of tripling the number of passing test-takers to approximately 700,000;
- *Adjunct Teacher Corps:* The Adjunct Teacher Corps would provide funding to match contributions from States and the private sector to train 30,000 qualified math and science professionals to become adjunct high school teachers by 2015; and
- *Including Science Assessments in NCLB:* NCLB requires every State to develop and administer science assessments once in each of three grade spans by the 2007–08 school year, and including these assessments in the accountability system will ensure students are learning the necessary content and skills to be successful in the 21st century workforce.

OTHER MATH AND SCIENCE INITIATIVES

- *Academic Competitiveness Grants and SMART Grant Program:* This higher education grant program was a key component of the *Higher Education Reconciliation Act.*
- This program will build on the success of the Pell Grant program and benefit more than 500,000 students in need.
    - Academic Competitiveness grants will provide increased funds for low-income students who take a rigorous academic curriculum in high school. Grants in the amount of $750 will be awarded to qualified first-year college students who completed a rigorous high school program; grants in the amount of $1,300 will be awarded to second-year students who completed a rigorous program and who maintain a 3.0 average in college.
    - SMART grants will go to college juniors and seniors studying math, science or critical-need foreign languages who also maintain a 3.0 GPA. This will encourage more students to go into fields that improve America's security and competitiveness.
- *Mathematics and Science Partnerships:* This program supports the *American Competitiveness Initiative* by providing state formula grants to help improve students' academic achievement in rigorous math and science courses. It also assists teachers by integrating proven, research-based teaching methods into the curricula.
- *Expanded Teacher Loan Forgiveness:* This popular program offers up to $17,500 (up from $5,000) in loan forgiveness for highly qualified math, science and special education teachers serving challenging, low-income schools and communities.

ACADEMIC COMPETITIVENESS COUNCIL

The *Deficit Reduction Act of 2005,* signed into law by the President on February 8, 2006, created an Academic Competitiveness Council (ACC) chaired by the Secretary of Education, and consisting of Federal Government agencies with education programs in science, technology, engineering, and mathematics (STEM). Its mission under law is to identify all federal education programs with a math or science focus, determine the effectiveness of each program, identify areas of overlap, and recommend ways to efficiently integrate and coordinate in the future. The Council will also ensure that these programs, which focus on elementary and secondary education and teacher training, are aligned with the principles of *No Child Left Behind,* as appropriate.

The first ACC meeting took place on March 6, 2006, at the White House with the President and the respective Secretaries and directors of the agencies with STEM education programs. The Department of Education is now working with the Office of Management and Budget to form a working group with the appropriate senior staff from each of these agencies to begin taking inventory of their various STEM education programs. A report to Congress is due February 2007.

THE CHALLENGE: ACCELERATING OUR SCHOOLS' PROGRESS

Innovating and improving America's schools will not occur overnight. It took time for eight other developed nations to surpass America's high school graduation rate among adults aged 25 to 34; and it will take time for the United States to regain its leadership. We must start by accelerating our progress.

A comprehensive problem demands a comprehensive solution, extending from kindergarten through high school graduation. The good news is that educators and policy-makers are learning more and more about what works. A half-century ago, the United States turned the threat of Soviet competition into proof of our ability to improve our schools and quality of life. Just four years ago, the United States turned a growing achievement gap into the bipartisan *No Child Left Behind Act.*

The law set a course for proficiency for all students in the core subjects of reading and math by the year 2014. Students in grades three through eight are now learning under high standards. Teachers are using proven instructional methods in reading. Schools are being held accountable for results. Parents have more information and choices. And states have more flexibility to spend federal K–12 education resources, which have increased by 41 percent since 2001.

The early results are in. Across the country, academic achievement has risen significantly in the earliest grades, with math scores at all-time highs, including among African American and Hispanic students. In the last two years, the number of fourth-graders who learned their fundamental math skills increased by 127,000 according to Department data. Long-term trends show that more reading progress was made among nine-year-olds between 1999–2004 than in the previous 28 years combined. Meanwhile, according to the Nation's Report Card, the achievement gaps in reading and math between white and African American nine-year-olds and between white and Hispanic nine-year-olds are at all-time lows. Educators use terms like "amazing," "stunning" and "remarkable" to describe the progress on long-term NAEP.

No Child Left Behind has set the goal of every child achieving, but the states and schools themselves have done the heavy lifting to implement curriculum standards and assessment protocols that they will use to meet these standards. For the first time, all 50 states have unique accountability plans in place, with real consequences attached. The results can be seen in schools like Maryland's North Glen Elementary. In 2003, just 57 percent of North Glen's students were proficient in reading, while 46 percent were proficient in math. Those numbers have skyrocketed to 82 percent and 84 percent, respectively.

Another example is Charles L. Gideons Elementary School in Atlanta. The number of its students meeting Georgia's standards in reading has increased by 23 percentage points since 2003. For math the news is even better: a 34 percentage-point improvement during the same period. The National Math Panel will examine schools like this one that have made significant progress to determine "what worked" in improving mathematics education and performance. If we better understand what worked at these model schools, we can then use programs like the new Math Now program to disseminate these principles and practices to teachers across the country.

A district-wide success occurred in Garden Grove, California. Three-fourths of the Garden Grove Unified School District's students do not speak English. Nearly 60 percent are from low-income families. Nevertheless, all but two of the district's 67 schools met or exceeded their Adequate Yearly Progress goals under the law.

The *No Child Left Behind Act* was designed to improve achievement. But it has also shown us what is achievable as a nation. Educators, administrators and public officials are working together, united behind a worthy goal. Now it's time to apply the Act's successful principles to our nation's high schools.

There is not a moment to waste. Governors and business leaders are united in calling for urgent reform. Every year approximately one million students drop out of high school, costing the Nation more than $260 billion dollars in lost wages, taxes and productivity over the students' lifetimes. A high school graduate can expect to earn about $275,000 more over the course of his or her lifetime than a student who doesn't finish high school; a college graduate with a Bachelor's degree can expect to earn about $1 million more. Dropouts are also three-and-a-half times more likely to be arrested, according to reports. A key goal of the President's *High School Re-*

form Initiative is to address the academic needs of at-risk students so that they stay in school, improving their quality of life and that of their fellow Americans.

THE ANSWER: THE PRESIDENT'S HIGH SCHOOL REFORM INITIATIVE

The President's *High School Reform Initiative* would hold high schools accountable for providing high-quality education to all students. And it would help educators implement strategies to meet the needs of at-risk high school students. The proposed program would make formula grants to states to support:

- The development, implementation and evaluation of targeted interventions designed to improve the academic performance of students most at risk of failing to meet state academic standards; and
- Expanded high school assessments that would assist educators in increasing accountability and meeting the needs of at-risk students.

Interventions would be designed to increase the achievement of high school students; eliminate achievement gaps between students from different ethnic and racial groups and income levels; and help ensure that students graduate with the education, skills and knowledge necessary to succeed in post-secondary education and in the technology-based global economy.

A key strategy would be the development of individual performance plans for students entering high school, using eighth-grade assessment data in consultation with parents, teachers and counselors. Specific interventions could include programs that combine rigorous academic courses with vocational and technical training, research-based dropout prevention activities, and the use of technology-based assessment systems to closely monitor student progress. In addition, programs that identify at-risk middle school students for assistance would help prepare them to succeed in high school and enter post-secondary education. This includes college preparation and awareness activities for students from low-income families.

The President's proposal also would require states to develop and implement reading and mathematics assessments in two additional grade levels in high school, building on the current NCLB requirement for testing once in grades 10–12. The new assessments would inform strategies to strengthen school accountability and meet the needs of at-risk students.

ADDITIONAL SUPPORT:

- *Striving Readers:* First funded in 2005, this program would be expanded significantly to reach more secondary students reading below grade level, which puts them at risk of dropping out. Students would benefit from research-based interventions coupled with rigorous evaluations. Schools would benefit from activities and programs designed to improve the overall quality of literacy instruction across the entire curriculum.

THE CHALLENGE: PROMOTING FREEDOM AND UNDERSTANDING

America faces a severe shortage of people who speak languages that are critical to its national security and global competitiveness:

- According to the Center for Applied Linguistics, less than one-fourth of public elementary schools report teaching foreign languages, even though a child's early years are the best years in which to learn a new language.
- Less than one percent of American high school students study Arabic, Chinese, Farsi, Japanese, Korean, Russian or Urdu-combined.
- Less than eight percent of undergraduates in American universities take foreign language courses, and less than two percent study abroad in any given year.

While only 44 percent of U.S. high school students were studying a foreign language in 2002, learning a second or even a third foreign language is compulsory for students in the European Union, China, Thailand and elsewhere.

More than 200 million children in China study English. By comparison, only about 24,000 elementary and secondary school children in the United States study Chinese. Many students in other nations begin learning another language before they're even 10 years old. They will have an edge over monolingual Americans and others in developing new relationships and business connections in countries other than their own.

THE ANSWER: THE PRESIDENT'S NATIONAL SECURITY LANGUAGE INITIATIVE

Critical-need foreign language skills are necessary to advance the twin goals of national security and global competitiveness. Together with the Department of State, Department of Defense and the Director of National Intelligence, the Department of Education proposes to offer grants and training for teachers under President Bush's National Security Language Initiative.

The Initiative would increase the number of Americans who speak and teach foreign languages, with an emphasis on critical-need languages. It will strengthen and refocus the Foreign Language Assistance Program, and will initially enable 24 school districts across the country to create partnerships with colleges and universities to develop critical-need language programs. Among the critical-need languages targeted under the initiative are Arabic, Chinese, Korean, Japanese, and Russian, as well as languages in the Indic, Iranian and Turkic families.

The National Security Language Initiative will also provide funding to create a Language Teacher Corps, with the goal of having 1,000 new critical foreign language teachers in U.S. schools by the end of the decade. And it will enable the creation of an "e-Learning Language Clearinghouse" and expanded Teacher-to-Teacher seminars to assist foreign language teachers anytime, anywhere.

CONCLUSION:

Our schools helped make the 20th century the "American Century." The 21st century remains to be claimed. But Americans have never backed down from a challenge. This changing world offers another opportunity for Americans to shine, and the President's *American Competitiveness Initiative* and the rest of his education agenda will help set the course.

America's schools have made great progress in improving academic achievement in the early grades. But like athletes or musicians, children of all ages must work hard each and every day if they wish to compete, perform and succeed, and their schools must show them the way. The President's education agenda will help prepare the students of today to become the successful leaders—the pioneers, discoverers and Nobel Prize winners—of the next American Century.

I look forward to working with Congress on implementing these bold initiatives.

Thank you for the opportunity to testify this morning. I am happy to answer any questions you have.

BIOGRAPHY FOR MARGARET SPELLINGS

On January 20, 2005, the United States Senate confirmed Margaret Spellings as the eighth U.S. Secretary of Education.

During President George W. Bush's first term, Spellings served as Assistant to the President for Domestic Policy where she helped craft education policies, including the *No Child Left Behind Act.* She was also responsible for the development and implementation of White House policy on immigration, health, labor, transportation, justice, housing, and other elements of President Bush's domestic agenda.

Prior to her White House appointment, Spellings worked for six years as Governor George W. Bush's Senior Advisor with responsibility for developing and implementing the Governor's education policy. Her work included the Texas Reading Initiative, the Student Success Initiative to eliminate social promotion, and the Nation's strongest school assessment and accountability system. She also made recommendations to the Governor for key gubernatorial appointments. Previously, Spellings served as Associate Executive Director of the Texas Association of School Boards.

Born in Michigan, Spellings moved with her family at a young age to Houston, Texas, where she attended public schools. She graduated from the University of Houston with a Bachelor's degree in political science.

As the mother of two daughters, one school-age and one college-age, Spellings has a special understanding of the issues facing parents and students today. Her daughter Mary is a freshman in college, and her daughter Grace attends a public middle school. Spellings is the first mother of school children to serve as U.S. Secretary of Education.

Chairman BOEHLERT. Thank you very much, Madam Secretary. Dr. Bement.

STATEMENT OF DR. ARDEN L. BEMENT, JR., DIRECTOR, NATIONAL SCIENCE FOUNDATION

Dr. BEMENT. Chairman Boehlert, Ranking Member Gordon, and Members of the Committee, I appreciate the opportunity to testify before you on topics of great importance, the National Science Foundation's role in improving K–12 science and math education, as well as the ways our efforts complement those of other federal agencies.

Before I begin, Mr. Chairman, I want to thank you for your years of service on this committee, and for your strong and steadfast support for the National Science Foundation, as well as the educational activities that you have fostered over the years. Your service in the House may be coming to an end, but your contributions will live on forever.

If I may briefly touch on some of the areas where NSF programs make a unique contribution to ensure that every student has the opportunity to learn challenging science, technology, engineering, and math. As you know, we are proposing a realignment of our Education and Human Resources Directorate to establish a Division of Research on Learning in Formal and Informal Settings. This realignment will make programs supporting a range of activities work better together. The programs will focus on new materials and curricula, teacher preparation, new pedagogical techniques, educational activities outside of the classroom, new technologies applied to education, and research on learning.

In line with the Administration's focus on the vital national priority of K–12 STEM education, NSF will also initiate a new effort in 2007 called Discovery Research K–12. This program will focus research on three well-defined grand challenges: first, developing effective science and mathematics assessments; second, improving science teaching and learning; and third, introducing cutting edge discoveries into classrooms to improve STEM content and enrich the learning experience.

This last challenge is also being addressed through the Research and Related Activities Directorates, that participate with the EHR Directorate through specifically developed programs, such as graduate student involvement in the classroom. It is important to note that NSF programs support all subgroups of students, from those holding great promise to those struggling academically, and from those under-represented in STEM fields, to those from low income families.

NSF considers advice from a diverse set of outside sources, in order to strike a balance among the programs reaching out to various groups. For over 50 years, NSF has engaged prominent scientists, mathematicians, and educators in the development of K–12 instructional materials. From this experience, we realize that education systems are complex. Change sometimes comes slowly, and there are few, if any, quick fixes.

As with all basic research, many of NSF's investments in research and education require years to develop, and thus, outcomes can only be judged retrospectively. Nevertheless, assessing the performance of our programs is critical to all of the Foundation's strategic planning efforts. NSF employs multiple, mixed methods approach to evaluation. The effectiveness and impact of our invest-

ments are determined by using both qualitative and quantitative techniques, including external assessment by Committees of Visitors, and the Advisory Committee for Government Performance and Results Act Performance Assessment, and by using the analytical Program Assessment Rating Tool developed by OMB.

Our science education programs have additional evaluation requirements. All EHR solicitations require every education portfolio, program, and project to have a sound, data-driven, standards-based evaluation. Selected education programs have an online data collection system, to monitor program activities on an annual basis. Third party evaluations are also used to determine the impact of various programs, and in any given year, approximately one third of the education programs will be evaluated.

NSF is not alone in this awareness of the need to evaluate the effectiveness of its programs. Through interagency groups organized under the auspices of the National Science and Technology Council, NSF is taking a leadership role, along with the Department of Education, to share effective evaluation activities and practices.

This multi-agency working group on evaluation is part of a larger interagency group co-chaired by NSF and the Department of Education, focusing on education and workforce development. Through this working group, EHR has prepared and distributed a packet of NSF-evaluated resources to the member agencies.

Most recently, NSF has collaborated with the Department of Education on the MSP programs, defining program linkages necessary to manage our two parallel, but separate programs for greatest effectiveness. NSF has also participated with the Department of Education in both the Title I Taskforce and the Title I Toolkit, which aimed to improve mathematics learning, and identify resources for state and district leaders.

And in conclusion, in line with the Administration's American Competitiveness Initiative, NSF has specific missions to prepare and sustain a world-class STEM workforce for the future, and to foster the scientific literacy of our students and our citizens. We look forward to contributing significant advances to these larger national efforts.

Thank you, Mr. Chairman, for the opportunity to testify, and I will be happy to respond to your questions.

[The prepared statement of Dr. Bement follows:]

PREPARED STATEMENT OF ARDEN L. BEMENT, JR.

Chairman Boehlert and Members of the Committee, I appreciate the opportunity to testify before you on topics of great importance, the National Science Foundation's (NSF) role in improving K–12 science and math education as well as the complementary efforts with those of other federal agencies.

NSF believes that federal agencies must work in concert to ensure that every student has the opportunity to learn challenging science, technology, engineering, and mathematics (STEM). Today, I will describe examples of NSF"s unique contributions to our nation's larger effort to strengthen K–12 education. NSF"s investments in discovery, learning, and innovation have a longstanding record of boosting the Nation's economic vitality and competitive strength.

Today's young people face a world of increasing global competition. We depend on the excellence of U.S. schools and universities to provide students with the wherewithal to meet this challenge and to make their own contributions to America's future. This larger context provides a rationale for setting "bolstering K–12 education" as one of NSF"s four priorities for fiscal year 2007.

To maintain America's preeminence in science and engineering, we must augment our nation's research enterprise by fostering innovation in K–12 science and mathematics education. Sustained federal support will be critical to a comprehensive approach, including:

- Research on STEM learning for both teachers and students;
- Development of challenging STEM instructional materials;
- Assessment of student and teacher knowledge;
- Evaluation of project and program impacts; and
- Implementation of proven STEM interventions in the Nation's schools.

NSF Education and Human Resource (EHR) Directorate Programs

The Foundation's K–12 STEM education programs are administered primarily through the Education and Human Resource (EHR) Directorate, although programs in the Research and Related Activities Account also support K–12 education and outreach activities. Within the EHR directorate, all programs focus on educational research, development, and evaluation in the STEM disciplines.

For example, within EHR's proposed Division of Research on Learning in Formal and Informal Settings, programs will support a range of activities, including research on: (1) learning; (2) developing and testing new materials and curricula; (3) new pedagogical techniques; (4) content and pedagogy education for K–12 teachers; (5) educational activities outside of the classroom; and (6) the application of new technologies to education.

These programs are vital cogs in our nation's K–12 STEM education machinery. The role of the NSF in K–12 science and mathematics education is to support research and development pilot-studies in the areas of cognitive science, education, curriculum development, and teacher professional development resulting in the production of materials and practices which can be evaluated empirically and then made available by NSF and/or other agencies. Examples of projects of which the NSF is proud include the Merck Institute for Science Education's summer institutes and the University of Pennsylvania Science Teachers Institute's Master's programs. Examples of other interesting programs and projects follow.

- In line with the Administration's focus on the vital national priority of K–12 STEM education, NSF will invest in a new effort in 2007. **Discovery Research K–12** focuses research on three well-defined challenges: (1) developing effective science and mathematics assessments for K–12; (2) improving science teaching and learning in the elementary grades; and (3) introducing cutting-edge discoveries into K–12 classrooms. The program builds on our previous efforts in curriculum development, capacity building, and teacher preparation, and will provide additional information on how to strengthen K–12 science and math education.
- EHR's new **Research and Evaluation on Education in Science and Engineering** program will fund two types of projects. *Synthesis projects* will identify areas where the knowledge base in either evaluation or education research is sufficient to support strong scientific claims, identify areas of importance to education research and practice, and propose methods for synthesizing findings and drawing conclusions that will inform our work across the K–12 landscape. *Empirical projects* will identify areas that have the potential for advancing discovery and innovation at the frontiers of STEM learning.
- In 2007, we will also increase funding for the **Graduate Teaching Fellowships in K–12 Education** program, or GK–12, in order to support an estimated 1,000 graduate fellows. This program has been particularly successful in encouraging effective partnerships between institutions of higher education and local school districts by pairing graduate students and K–12 teachers in the classroom.
- The **Robert Noyce Scholarship program** encourages talented STEM majors and professionals to become K–12 mathematics and science teachers. For example, the Dowling College Noyce program is addressing the critical shortage of science and math teachers in the Long Island and New York City areas by providing scholarships for math and science majors in the teacher-training program. Also with Noyce funding, Wayne State University and Detroit Public Schools are increasing the number of individuals with strong science and mathematics backgrounds who are teaching in Detroit schools through their "Teaching for the Future" initiative. All Noyce Scholars are paired with fac-

ulty mentors who work with the Scholars during their college years as well as their early careers.

- Through the **Master Science Educators** program, the State of Oregon has trained 166 volunteer 4–H Wildlife Stewards who work in partnership with 4–H Extension and local schools across the state. These volunteers have assisted over 13,400 students and nearly 450 teachers in creating, using, and sustaining wildlife habitat education sites on school grounds for improving science learning. The program has won 18 State, regional, and national awards including the 2005 Wildlife Society National Group Achievement Award.
- Through the **Math and Science Partnership** (MSP) program, NSF assumed important responsibilities to build capacity for implementing the President's *No Child Left Behind* vision for K–12 education. NSF's MSP is a research program to develop and assess the impact of innovative partnerships between higher education departments of mathematics and science, schools of education, and local school districts on improving K–12 student achievement in mathematics and science. NSF is currently evaluating data collected from the on-going MSP projects to identify promising materials and methods that can be disseminated across the country through the consolidated MSP program at the Department of Education.

This extensive list of examples underscores that NSF programs support all subgroups of students—from those holding great promise to those struggling academically and from those under-represented in STEM fields to those from low-income families. NSF considers advice and information gathered from a diverse set of outside sources, including direct indications of Congressional interest; studies produced by the National Research Council; workshops and national conferences sponsored by NSF; reviews conducted by the National Science Board; and NSF's own strategic planning and budget reviews by the Office of Management and Budget (OMB) in order to strike a balance among the programs reaching out to various groups of students.

To maximize our reach, we also support complementary enrichment activities that support school-based STEM curricula and standards and provide opportunities for in-depth learning and engagement beyond the school day. We also hope to interest young people in science at an early age and strive to help maintain that interest.

- For example, "PEEP and the Big Wide World," is an award-winning animated series that gives wings to the innovative idea of teaching science to preschoolers. This show is the newest addition to The Learning Channel's and Discovery Kids' commercial- and sponsor-free programming block, "Ready Set Learn!" Actress Joan Cusack narrates the show, which breaks new ground by teaching toddlers basic scientific concepts and skills like measuring, comparing, and estimating.
- In another example, NSF is funding a demonstration project called NSF Academies for Young Scientists, which engages K–8 students in out of school STEM learning while helping teachers develop and adopt strategies that effectively retain students' interest in STEM and prepare them for secondary-level work.
- The need for steady, sustained investment is illustrated by the success of *Connected Mathematics,* a middle-school curriculum now estimated to have between 20 and 25 percent of the middle-school textbook market. It is the best selling set of materials for that market by its publisher. The project, supported long-term by NSF and Michigan State University, is paying off with a documented improvement in student mathematics achievement on district and state tests.

For over 50 years, NSF has engaged prominent scientists, mathematicians, and educators in the development of K–12 instructional materials. From this experience, we realize that education systems are complex. Change sometimes comes slowly, and there are few, if any, quick fixes. Supporting the research and development that enables the development of creative, sound STEM education models and strategies requires steady-stream resources. As part of this iterative process, NSF encourages proposals to refine educational questions and problems that need addressing, create model experiments, identify appropriate test beds and partners, and finally to observe and evaluate the changes over time.

Integration of Research and Education

By supporting hands-on, inquiry-based learning and direct exposure to contemporary scientific methods and discoveries, NSF makes additional important contributions to K–12 education. We value highly the integration of research and education, a concept permeating all of our programs.

This agency-wide priority is being addressed through the Research and Related Activities (R&RA) Directorates in partnership with the EHR Directorate. We reflect the need for this integration in our merit-review process through a criterion known as "Broader Impacts." Therefore, research grants commonly include specific educational activities for K–12 students.

In some cases, Foundation programs purposefully mandate the integration of research and education. For example, NSF's CAREER program, which provides stable and enabling research funding for junior investigators, explicitly requires educational activities, many of which involve K–12 students.

On the other hand, K–12 teachers gain hands-on experience in science through NSF's Research Experiences for Teachers program. Supported by R&RA Directorates, this program places K–12 teachers in the laboratories of NSF-supported researchers. The educational components of NSF-supported Science and Technology Centers also improve K–12 education through activities, such as workshops, curricula development, and research internships for students and teachers.

Numerous other programs within our R&RA Directorates target the improvement of K–12 education. Some examples follow.

- Science of Learning Centers, which are large-scale, long-term Centers, extend the frontiers of knowledge on learning of all types and create the intellectual, organizational, and physical infrastructure needed for the advancement of learning research.
- Geosciences Teacher Training improves the quality of geosciences instruction at middle and high school levels.
- Centers for Ocean Science Education Excellence promote ocean education as an exciting vehicle to interest students in science and enhance science education.

Program Assessment

As with all basic research, many of NSF's investments in research and education require years to develop and, thus, outcomes can be judged only retrospectively. Nevertheless, assessing the performance of our programs is critical to all of the Foundation's strategic planning efforts.

NSF employs a multiple, mixed-methods approach to evaluation. The effectiveness and impact of our investments are determined in multiple ways using qualitative and quantitative techniques, including external assessment by Committees of Visitors and the Advisory Committee on Government Performance and Results Act (GPRA) Performance Assessment, and by using the analytic Program Assessment Rating Tool (PART) developed by OMB. PART assesses program performance in four areas: purpose, strategic planning, program management, and program results. It also complements and reinforces GPRA, emphasizing the link between budget and performance. Resulting PART ratings inform the budget process and highlight areas in need of improvement.

Our science education programs have additional evaluation requirements.

- All EHR solicitations require every education project to have a sound project-level evaluation.
- Selected education programs have a program-specific on-line data-collection system to monitor program activities and outputs, such as the number of students obtaining STEM degrees, on an annual basis and to document trends over time.
- Third-party program or thematic evaluations are also used to determine the impact of various programs. These studies are conducted so that in any given year approximately a third of the education programs will be engaged in evaluation planning and evaluation capacity building efforts, another third will be involved in on-going evaluation studies, and the other third will have recently completed their independent evaluation studies.

Interagency Coordination

NSF is not alone in its awareness of the need to evaluate the effectiveness of its programs. Notably, the Academic Competitiveness Council (ACC), which is led by Secretary Spellings and includes representatives from federal agencies with STEM

education programs, had its initial meeting on March 6th. The ACC will identify and assess federal math and science education programs and make recommendations for coordinating federal spending on STEM education. In addition, through interagency groups organized under the auspices of the National Science and Technology Council, NSF is taking a leadership role along with several other agencies, including the U.S. Department of Education (ED), to share program successes and develop government-wide strategies for addressing educational needs as well as making information and programs more accessible to the external community.

NSF also works with other federal agencies in a variety of other ways. For example, Dr. Donald Thompson, the Assistant Director for Education and Human Resources, is part of the "Tiger Team," along with his counterparts at the National Institutes for Health (NIH), the National Aeronautics and Space Administration (NASA), ED and DOE. The team focuses on STEM education issues that the agencies can collaboratively address, including creating better science assessments. Additionally, NSF has had a particularly active collaboration with ED since the early 1990's. The results include the co-funding of major studies, such as the National Research Council's *Adding it Up: Helping Children Learn Mathematics* (2001) and *Learning and Understanding: Improving Advanced Study of Science and Mathematics in America's High Schools* (2002), as well as active participation in Department of Education initiatives, such as the Mathematics and Science Initiative (2000–2005) that planned and executed Mathematics and Science Summits for the Nation.

Most recently, NSF has collaborated with ED on the MSP programs—defining program linkages necessary to consolidate the programs at the Department of Education. NSF has also participated with ED in the Title I Taskforce on improving the learning of mathematics in Title I schools as well as the co-development of a pilot version of a Title I Toolkit (2005–present) to identify resources for state and district leaders on improving mathematics teaching and learning in Title I schools.

In summary, NSF complements the efforts of the other agencies through our focus on research and development for education in order to strengthen the infrastructure in STEM education. These efforts include attracting students to the teaching profession; providing pre- and in-service teacher training; developing curricula; supporting informal learning; and funding education research. Other agencies, especially ED, have a greater responsibility for implementation.

Conclusion

In line with the Administration's American Competitiveness Initiative, NSF has specific missions to prepare and sustain a world-class STEM workforce for the future and to foster the scientific literacy of all of our citizens. Ideally, all students should have access to a series of challenging STEM opportunities that begin at the elementary level and continue seamlessly as they progress through their secondary school careers.

Further, the Nation's competitiveness depends on fostering creativity and innovation in all Americans. NSF takes this idea very seriously, and all of our programs seek to broaden participation in STEM by attracting and retaining under-represented groups in the STEM enterprise. All proposals to NSF must address two criteria: intellectual merit *and broader impact.*

We look forward to continuing to contribute our important parts of the larger K–12 education equation. I hope the breadth of the provided examples signifies the importance of this issue to NSF.

Thank you, Mr. Chairman, for the opportunity to testify on a topic of great importance to the Nation. I would be happy to respond to any questions you might have.

BIOGRAPHY FOR ARDEN L. BEMENT, JR.

Arden L. Bement, Jr., became Director of the National Science Foundation on November 24, 2004. He had been Acting Director since February 22, 2004.

He joined NSF from the National Institute of Standards and Technology, where he had been Director since Dec. 7, 2001. Prior to his appointment as NIST Director, Bement served as the David A. Ross Distinguished Professor of Nuclear Engineering and head of the School of Nuclear Engineering at Purdue University. He has held appointments at Purdue University in the schools of Nuclear Engineering, Materials Engineering, and Electrical and Computer Engineering, as well as a courtesy appointment in the Krannert School of Management. He was Director of the Midwest Superconductivity Consortium and the Consortium for the Intelligent Management of the Electrical Power Grid.

Bement served as a member of the U.S. National Science Board from 1989 to 1995. The board guides NSF activities and also serves as a policy advisory body to

the President and Congress. As NSF Director, Bement will now serve as an ex officio member of the NSB.

He also chaired the Commission for Engineering and Technical Studies and the National Materials Advisory Board of the National Research Council; was a member of the Space Station Utilization Advisory Subcommittee and the Commercialization and Technology Advisory Committee for NASA; and consulted for the Department of Energy's Argonne National Laboratory and the Idaho National Engineering and Environmental Laboratory.

Bement joined the Purdue faculty in 1992 after a 39-year career in industry, government, and academia. These positions included: Vice President of Technical Resources and of Science and Technology for TRW Inc. (1980–1992); Deputy Under Secretary of Defense for Research and Engineering (1979–1980); Director, Office of Materials Science, DARPA (1976–1979); Professor of Nuclear Materials, MIT (1970–1976); Manager, Fuels and Materials Department and the Metallurgy Research Department, Battelle Northwest Laboratories (1965–1970); and Senior Research Associate, General Electric Co. (1954–1965).

He has been a Director of Keithley Instruments Inc. and the Lord Corp. and was a member of the Science and Technology Advisory Committee for the Howmet Corp. (a division of ALCOA).

Bement holds an engineer of metallurgy degree from the Colorado School of Mines, a Master's degree in metallurgical engineering from the University of Idaho, a doctorate degree in metallurgical engineering from the University of Michigan, an honorary doctorate degree in engineering from Cleveland State University, and an honorary doctorate degree in science from Case Western Reserve University. He is a member of the U.S. National Academy of Engineering.

Chairman BOEHLERT. Thank you very much, Doctor. Ms. Dale.

STATEMENT OF MS. SHANA L. DALE, DEPUTY ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Ms. DALE. Thank you, Chairman, Ranking Member Gordon, and Members of the Committee, for the opportunity to come before you today, and talk about the Nation's goals in regards to enhancing science, technology, engineering, and mathematics education (STEM).

To begin with, I would like to thank you, Chairman Boehlert, for your outstanding leadership of this committee, and for your longstanding and very effective support of math and science education. We all owe you a debt of gratitude. Thank you.

NASA shares the concerns of the President, Nation, and this committee regarding the need to increase public understanding of scientific inquiry, and to maintain America's capability to continue as a world leader in science and technology. Related to these overarching issues, we have very specific concerns about NASA's ability to carry out its bold mission goals over the long haul, which is directly tied to the health of America's science and math education system. Our aerospace workforce is aging, and much of the talent in our science and engineering workforce is approaching retirement.

Accordingly, we are preparing the pathway for the next generation with great anticipation, and while NASA does not have the primary mission of education, we believe that through our unique mission, workforce, and facilities, we can certainly make a positive difference in helping our colleagues in the Department of Education, and those in other federal agencies like the National Science Foundation, to improve STEM education.

NASA, through the genuine excitement that our mission and research activities generate, is committed to inspiring student interest in STEM careers across the broad spectrum of American edu-

cation. NASA's educational activities are designed to engage, educate, and employ our nation's talented youth. As contributors to achieving the Nation's goals, NASA is committed to three primary objectives which can support improvement of STEM education in our country.

First, we intend to strengthen NASA and the Nation's future workforce by identifying and developing the critical skills and capabilities needed to ensure achievement of the Vision for Space Exploration and other important science and aeronautics research goals.

Second, we hope to attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty related to science and math. In this regard, we are quite proud of the fact that the JFK School of Government at Harvard recently chose the NASA Explorer Schools Program as one of the top 50 government innovations of the year. The Explorer Schools establishes a three year partnership between NASA and school teams of teachers, administrators, and students from diverse communities across the country to help improve teaching and learning in science, math, and technology. The Explorer Schools Program is now entering its fourth year, and we thank the Committee for your strong support for this effort.

Finally, NASA seeks to engage all Americans in our missions through hands-on, interactive, educational activities that engage students, educators, families, and the general public in ways that will increase America's science and technology literacy. Whether it is through using the Internet as a means of engagement and education, or our partnerships with the country's great science centers and museums, we are constantly striving to engage the public in our exploration and research activities in new and exciting ways.

I look forward to discussing with you the full range of NASA's STEM activities, including our collaboration with our fellow agencies through the Academic Competitiveness Council that Secretary Spellings chairs, and again, I thank you for the opportunity to appear before you today.

[The prepared statement of Ms. Dale follows:]

PREPARED STATEMENT OF SHANA L. DALE

Chairman Boehlert and Members of the Committee, thank you for the opportunity to speak with you today about the Nation's evolving goals to enhance the quality of science, technology, engineering and mathematics (STEM) education.

NASA shares the concerns of the President, Committee, and Nation regarding the lack of public understanding of scientific inquiry; an aging aerospace workforce; a shrinking pipeline of students with science and engineering skills; a shortage of mathematics, science, and technology teachers; and, a threat to America's capability to continue as a world leader in science and technology.

Not only are these fields at risk, but STEM education is required for many careers in the 21st century workplace and the analytical and critical thinking skills learned through these fields of study are essential in numerous career fields.

For nearly 50 years, NASA's journeys into air and space have developed humankind's understanding of the universe, advanced technology breakthroughs, enhanced air travel safety and security, and expanded the frontiers of scientific research. These accomplishments share a common genesis: Education.

As a critical component of achieving NASA's mission, the Agency's education activities reflect a diverse portfolio of Elementary and Secondary Education, Higher Education, e-Education, Informal Education, and Minority University Research and Education Programs (MUREP). Through its unique mission, workforce, and facilities, NASA is leading the way to inspire interest in STEM careers, as few other or-

ganizations can. Our efforts have also made significant impacts in engaging underserved and under-represented communities in STEM.

Accordingly, we are preparing the pathway for the next generation with great anticipation. These "explorers and innovators of the new millennium" must fully represent our nation's vibrant and rich diversity. Furthermore, we will support our nation's universities, colleges and community colleges by providing exciting research and internship opportunities that "light the fire" and "fuel the passion" for a new culture of learning and achievement in STEM.

NASA's educational activities are designed to inspire, engage, educate, and employ our nation's talented youth. As contributors to achieving the Nation's goals, NASA is committed to three primary objectives to help improve the state of STEM education in our country:

- **Strengthen NASA and the Nation's future workforce—**NASA will identify and develop the critical skills and capabilities needed to ensure achievement of the *Vision for Space Exploration,* science, and aeronautics.
- **Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty—** NASA will focus on engaging and retaining students in STEM education programs to encourage their pursuit of educational disciplines critical to NASA's future engineering, scientific, and technical missions.
- **Engage Americans in NASA's mission—**NASA will build strategic partnerships and linkages between STEM formal and informal education providers. Through hands-on, interactive, educational activities, NASA will engage students, educators, families, and the general public to increase America's science and technology literacy.

Education is led by the Assistant Administrator for Education, who has agency authority for ensuring a balanced portfolio to achieve our three outcomes. The Assistant Administrator for Education ensures all aspects of NASA are maximizing their potential to highlight the Agency's people, resources, and facilities in support of the Nation's education efforts to develop the skilled workforce necessary to achieve the Agency's goals and objectives.

The success of NASA's education portfolio depends upon strategic planning across the Agency. Close coordination through high-performing teams is required among NASA's Office of Education, Mission Directorates, Centers, the Office of Human Capital Management, the Office of Diversity and Equal Opportunity, and other Mission Support offices to ensure that workforce requirements are identified and met, and that education efforts are aligned and focused on building the future workforce.

Evaluation of NASA Education Programs

The Assistant Administrator for Education ensures a rigorous evaluation of the Agency's education portfolio. The portfolio is routinely evaluated to document performance, validate that planned outcomes have been achieved, drive improvements in program implementation, and ensure the integration of our education programs in our missions. Direct linkages between NASA's scientific and engineering activities and the Agency's education efforts ensure that they are unique, provide hands on experience, and not redundant with the programs of other federal agencies.

The objectives for NASA's education evaluation are to ensure that (a) program activities are adequately documented, (b) the extent to which intended outcomes have been achieved is determined, (c) necessary improvements to program operations are identified, and (d) information is available to support data-driven decision-making about the individual and collective components of the education portfolio. It is also critical that NASA K–12 education programs in both formal and informal environments reinforce and augment local, State, and national learning improvement goals.

Three complimentary components form the core of the NASA education performance measurement approach toward which the Agency is working. The first component, Evaluation, ensures that performance results of all NASA-supported education activities are documented. The evaluation process ensures that all required data are collected in a systematic manner by project managers who are accountable for performance reporting linked to pre-defined outcomes. The second component, Review, is designed to verify and validate performance. Through the review process, evidence pertaining to project effectiveness and impact will be collected, analyzed, and reported. NASA will make extensive use of independent, credible evaluators to conduct validation studies. The final component, Assessment, will inform decisions about the total Agency education portfolio in terms of NASA's unique contribution to K–12 student learning and teacher training at both pre- and in-service levels. Decisions made through the assessment process will include factors such as gaps or

redundancies in the portfolio, emergent career needs of NASA, direct linkage to the learning and professional development needs of the education community, and budget priorities maximizing the use of limited resources.

Collaboration and Coordination with Other Federal Agencies

As the Agency has strengthened its portfolio and evaluation criteria, we have recognized the need to engage new partners and alliances in achieving our collective goal. Through partnerships, NASA's Office of Education is continually and collaboratively engaged with other federal agencies, including the Department of Education, the National Science Foundation (NSF), the Department of Commerce, as well as with the state coalitions, the District of Columbia, Puerto Rico, and the U.S. territories. Collaboration and coordination takes place in a number of forums. For example, the Assistant Administrator for Education serves as NASA's representative on the Subcommittee on Education and Workforce Development, under the President's National Science and Technology Council (NSTC) Committee on Science.

Shortly after the State of the Union, the Assistant Secretary of Education, Henry Johnson, invited NASA and others to discuss potential collaboration opportunities. We are currently reviewing our portfolio of educational programs to assess NASA's participation. In addition, I serve as the NASA member on the Academic Competitiveness Council, chaired by Secretary Spellings, whose inaugural meeting on March 6th identified a plan of action to respond to the 2005 enacting legislation to address STEM education across the Federal Government. This initiative will enable us collectively to implement quality programs focused on our future.

Increasing the number of students involved in NASA-related activities at the elementary and secondary education levels will inspire more students to pursue higher levels of study in STEM courses. To meet this country's future needs, we have to tap into the talent that is before us.

Budget for NASA Education Programs

The FY 2007 budget request for NASA's Education programs is $153.3 million. NASA's Education budget request sustains our commitment to excellence in science, technology, engineering and mathematics (STEM) education to ensure that the next generation of Americans can accept the full measure of their roles and responsibilities in shaping the future and meeting the workforce needs to implement the *Vision for Space Exploration.*

The Agency's ability to fulfill its mission requirements is coming under increasing pressure as it competes for limited resources. This is particularly true in education where the continued growth in Congressionally-directed items is eroding NASA's ability to carry out its educational objective of contributing to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals. For FY 2006, more than one-half of the funding available for NASA's education efforts will be applied to these Congressionally-directed items. NASA acknowledges the Congress' commitment to STEM education and will honor Congressional direction before funding programs NASA requested in the budget. However, the redirection of funding has resulted in delays and/or cancellation of planned scholarships, grants, cooperative agreement notices, and other support for the education community across the Nation. It has had a direct impact in NASA's ability to meet existing commitments to students, teachers, faculty, universities and institutions. In implementing our new education framework and strategy, NASA is working with recipients of the Congressionally-directed items to align these initiatives toward overall Agency goals and priorities (workforce, pipeline, and public benefit). We look forward to working with the Congress to capture the strengths of these institutions and through peer-review processes have a strategic, focused impact in the areas cited by the National Academies, the Administration and the Congress to further the Nation's competitiveness. NASA seeks the assistance of Congress in reducing earmarks in the FY 2007 budget process.

NASA Education Programs

Let me illustrate a few examples of the unique innovative projects that NASA makes available to support students across our nation:

Our **Educator Astronaut Program** selects outstanding educators to become permanent members of the Astronaut Corps. The program uses the visibility and educational opportunities created by the activities of the Educator Astronauts to inspire greater K–12 STEM achievement, promote STEM careers, and elevate public esteem for the teaching profession. In selecting our Educator Astronauts, we identified hundreds of our country's top educators. We have captured their energy through the Network of Educator Astronaut Teachers. They are now in communities all across

America, engaging their schools and communities in NASA education activities and informing them of NASA resources (content, people, and facilities).

The **NASA Explorer Schools** form three-year partnerships with NASA. Focused on under-served or under-represented populations, the program is designed for education communities at the 4–9 grade levels. We assist middle schools improve teaching and learning in STEM education through significant structural (professional development, stipends, grants) and curricular support based on NASA resources.

The **Science Engineering Mathematics and Aerospace Academy Program (SEMAA)** reaches K–12 minority students that are traditionally under-represented in careers involving STEM. Students meet during school, after school or on Saturday mornings and during the summer to engage in hands-on, interactive learning sessions that are specifically designed for each grade level.

Between the International Space Station, the space shuttle, sounding rockets and high altitude balloons, NASA's **Education Flight Projects** provide hands-on experiences to inspire and motivate students to pursue studies and careers in STEM through participation in NASA research applications. NASA is using its unique assets like the C–9 better known as "The Vomit Comet" to allow students to study microgravity; we're launching student experiments more than 25 miles above the Earth on sounding rockets; and our astronauts make phone calls from 240 miles above Earth's atmosphere to students to involve them in current research aboard the International Space Station. All these opportunities take advantage of our flight hardware projects provide real, hands-on experiences to inspire the minds, imaginations, and career ambitions of America's young people.

Teacher training for Worlds beyond Our Own captures the excitement and discovery surrounding planetary exploration. NASA and the Johns Hopkins Applied Physics Laboratory developed workshops and materials to assist educators in capturing the excitement surrounding NASA's New Horizons mission to Pluto that launched in January 2006. New Horizons is the fastest spacecraft ever launched from Earth, on board one of America's most powerful rockets, and will be traveling the farthest distance of any NASA spacecraft to begin its primary mission. Students will grow up with this project. Today's elementary school students will be in college when this spacecraft encounters Pluto.

In addition to in-service workshops based on our missions, NASA is committed to the pre-service training of our future educators. Our 11th annual **Pre-Service Teacher Conference** was keynoted by one of America's finest and most recognized teachers, Jaime Escalante. The conference was created to help undergraduates and aspiring teachers develop the confidence and skills to effectively teach mathematics and science using cutting-edge technology and educational materials only NASA can provide. Over 500 students and faculty from approximately 55 schools, representing 35 states participated this year.

Museums and Science Centers are developing activities and materials to inspire, educate, and engage students, educators and the general public. They are also hosting professional development opportunities for formal and informal education professionals across the Nation. For example, NASA and the Children's Museum of History, Natural History, Science and Technology in Utica, N.Y. unveiled two new exhibits at the museum last year. The exhibits "Why We Explore" and "Space Station Imagination" provide an overview of the history and future of space exploration. Astronaut Ed Lu, a veteran Space Station astronaut, who spent six months aboard the International Space Station, hosted the unveiling.

NASA's Great Moonbuggy Competition allows high school and college students' to race into the future and cross the surface of the Moon without leaving the Earth. Teams from the United States and Puerto Rico design human-powered vehicles to compete in NASA's annual Great Moonbuggy Race. The race was inspired by the lunar rover vehicles astronauts drove on the Moon during three Apollo missions. This year's event, which is open to the media and public, runs April 7–8 at the U.S. Space & Rocket Center in Huntsville, Alabama.

Conclusion

We must encourage every segment of our population—girls and boys alike—from every walk of life, of every color and creed, to reach out and prepare for the opportunities of the 21st century. Building a pipeline of science and engineering talent to serve in the coming decades as we implement the *Vision for Space Exploration* to continue America's preeminence in space and aeronautics research and development can and must be done. NASA's mission is one of dreams, vision and exploration—

characteristics that are ingrained in the American spirit and the underpinning of innovation and economic competitiveness. Our investment in STEM education is to nurture the next generation of Eileen Collins, Carl Sagan, Norm Augustine, and Neil deGrasse Tyson.

I would like to commend the Committee for their efforts to improve K–12 STEM education. NASA looks forward to continuing to serve as a contributor to STEM education as well as other national needs. Again, thank you for the opportunity to participate in this important dialogue. I would be happy to answer any questions you may have for NASA.

BIOGRAPHY FOR SHANA L. DALE

Nominated by President George W. Bush and confirmed by the United States Senate, Shana L. Dale began her duties as Deputy Administrator of the National Aeronautics and Space Administration on November 14, 2005.

As Deputy Administrator, Dale serves as the Agency's second in command and oversees the day to day work of NASA's functional offices, such as the Office of the Chief Financial Officer, Office of General Counsel and Strategic Communications.

Before coming to NASA, Dale was Deputy Director for Homeland and National Security for the Office of Science and Technology Policy (OSTP), Executive Office of the President. She co-chaired the National Science and Technology Council's Committee on Homeland and National Security and supervised work of the subcommittees. Dale previously served as the Chief of Staff and general counsel at OSTP. In this position, she led and managed the staff officials involved with homeland and national security, legislative affairs, press operations, legal and ethical issues, the federal research & development budget, and internal budget and administration.

Earlier in her career, Dale served as the Assistant Vice Chancellor for Federal Relations at the University of Texas System, Federal Relations Office in Washington. In addition, Dale has 10-plus years of service on Capitol Hill including her tenure as Staff Director to the House Subcommittee on Space and Aeronautics. Dale also served on the Board of Directors for Women in Aerospace for four years.

Prior to serving as Staff Director, Dale was the Republican Assistant Legislative Director and counsel on the Space Subcommittee. She was appointed to the Committee on Science, Space and Technology in March 1991, as the Republican counsel on the Subcommittee on Science. Dale also served on the House Public Works & Transportation Committee.

Before moving to Washington, Dale was employed in private practice in San Diego, California. She received her Bachelor's with honors in management information systems from the University of Tulsa and her law degree from California Western School of Law. She is a member of the bars of California and the District of Columbia, and is admitted to practice before the United States Supreme Court.

Chairman BOEHLERT. Thank you very much, Ms. Dale. General Kelly.

STATEMENT OF BRIGADIER GENERAL JOHN J. KELLY, DEPUTY UNDER SECRETARY FOR OCEANS AND ATMOSPHERE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Brigadier General KELLY. Chairman Boehlert, Ranking Member Gordon, Members of the Committee, I appreciate the opportunity to discuss with you NOAA's evolving education role.

Before I start, I also would like to join my colleagues in thanking you, Mr. Chairman, for your service to the Nation, and most specifically, for the wise advice and support you have given us in NOAA these many years.

While NOAA is one of the smaller agencies with a federal science role, we believe our education activities have been successful in helping prepare students for careers in science, and in teacher professional development.

As a science mission agency, the core competencies of science, technology, engineering, and mathematics are essential for us to do our job. Internally, we require highly educated scientists, and externally, an informed public who understands and knows how to

use observations and forecasts to make wise decisions that affect both our daily life and the economy. Consequently, we aim to educate the public and K–12 students in oceanic and atmospheric sciences, support and train science teachers, and provide scholarships and professional development opportunities to graduate and undergraduate students. NOAA's educational activities are varied, and based on six authorizations. The Administration's proposed NOAA Organic Act would consolidate diverse mandates and provide permanent NOAA-wide educational authority.

In 2003, Vice Admiral Lautenbacher, my boss, the Under Secretary of Oceans and Atmospheres, set environmental literacy as a NOAA-wide priority. Since then, we have established an Education Council, reconstituted and recently energized NOAA's Office of Education, and appointed a Director of Education, all designed to develop a coherent strategy for NOAA, and to ensure the most effective use of our limited education funds. Our priorities include developing core performance measures, and improving coordination and collaboration within NOAA and with other federal agencies. NOAA is focusing on suggestions made in the GAO's report on STEM education, and I will briefly highlight some of the programs directed at these activities, with an emphasis on K–12.

The Teacher at Sea Program, run by our Office of Marine and Aviation Operations, has given 430 teachers from 47 states and three countries unique opportunities to do science on NOAA research and survey vessels. Participating teachers repeatedly tell us how these hands-on experiences help them inspire students, and foster a lifelong interest in science and education careers.

Our JASON project uses multimedia tools and cutting edge technology to engage middle school students in science, and provides teacher professional development activities. Our Office of Ocean Exploration and Research has developed over 200 hands-on lesson plans correlated to the National Science Education Standards. In 2004, 300,000 copies of those lesson plans were provided to teachers.

NOAA has worked with the American Meteorological Society to provide supplemental classroom materials, instructional resources, and training to more than 100,000 teachers, to help them fulfill the Earth science certification requirement for *No Child Left Behind.* We also strive to leverage public interest surrounding current events into educational opportunities. In 2005, after the tragic Indonesian tsunami, we developed, produced, and distributed a tsunami education resource kit that was made available to 8,000 K–12 teachers.

We are also working with TERC, a private education research company, to assess the degree to which ocean sciences are currently represented in state science education standards, and to promote recognition of Earth science as a rigorous high school level laboratory science course. We are also taking steps to encourage minorities and women to pursue advanced STEM degrees. In 2001, we established the educational partnership program to provide financial assistance to Minority Serving Institutes. To date, more than 2,000 students have been provided research opportunities at that program's Cooperative Science Centers.

The Sea Grant, John A. Knauss Marine Policy Fellowship Program has placed more than 550 graduate students at federal science agencies, and in Congressional offices for one year fellowships focused on ocean, coastal, and Great Lakes issues. The program has an exceptional record for attracting women. Since the year 2000, 71 percent of the Knauss fellows have been women. And I would like to note that program participants are now serving on several Congressional committee staffs, including the House Science Committee.

NOAA's informal education programs have also introduced students to oceans and atmospheres by providing educational opportunities outside of the classroom. Our 13 marine sanctuaries and 27 estuary reserves provide children with hands-on learning in natural laboratories. Our Science on the Sphere Program, a suspended, six foot diameter globe used at many science centers and museums, to show animations of the oceanic, atmospheric, and land systems, provide a unique opportunity for visitors to get an increasing understanding of how the planet and its natural processes operate as a system.

We believe the best way to ensure the Nation's scientific leadership and global competitiveness is to excite students at an early age, and provide opportunities for them to pursue science careers. NOAA is dedicated to making tools and learning experiences available to students, which we believe ultimately will enable them to better help our mission and serve the Nation.

Thank you for this opportunity to speak, and I again look forward to entering into a dialogue with you later.

[The prepared statement of Brigadier General Kelly follows:]

PREPARED STATEMENT OF BRIGADIER GENERAL JOHN J. KELLY

Mr. Chairman, and Members of the Committee, thank you for inviting me to discuss the National Oceanic and Atmospheric Administration's (NOAA's) education program. I am Jack Kelly, Deputy Under Secretary for Oceans and Atmosphere. NOAA supports and appreciates the actions taken by Members of the Committee to focus on academic excellence through Science, Technology, Engineering and Mathematics (STEM) education programs.

As a federal science agency that relies on a highly trained scientific and technical workforce, NOAA has a vested interest in encouraging young people to become interested in science and eventually pursue higher education and careers in science fields. NOAA believes that federal science agencies have a unique role to play in ensuring an integral connection between science and education.

As was articulated in *Blueprint for Change: Report from the National Conference on the Revolution in Earth and Space Science Education* (Barstow, 2002): "NASA, USGS, NOAA and other agencies have. . .[a] treasure trove of satellite imagery, animations, interactive maps and other visualizations for ready access by schools and the general public. The Internet helps students see how Earth's forces affect their daily lives and provides. . .links for further exploration. Such efforts should be continued and expanded, including developing related educational materials to help teachers and students take better advantage of these resources."

NOAA's mission is directed at serving our nation's need for oceanic and atmospheric information to support economic, social, and environmental prosperity. Fulfilling this mission requires more than the delivery of accurate and precise scientific information; it also demands a public that is sufficiently empowered to translate scientific information into appropriate actions to protect lives, property, and the environment.

NOAA's education programs are focused on enhancing STEM education activities in subject areas where NOAA has unique expertise and where public responsiveness to warnings, forecasts, and stewardship efforts is important for meeting its mission. NOAA not only conducts scientific research and monitoring, but also manages marine areas that provide real world, practical connections between science and the en-

vironment. Public programs in these natural laboratories build a stewardship ethic by showing how individuals' actions have direct impact on the environment. Because NOAA's mission is highly applied and directly related to decisions people make day to day, our education programs can highlight relationships between science and resource management decisions and forecasts and warnings. Further, NOAA's data and information services are provided on a consistent basis and have direct relevance to the events the general public experiences daily. This relevance makes the information of strong interest to educators as demonstrated by the roughly 6,000 requests from teachers, students and librarians for NOAA education materials that are received each year by the NOAA Outreach Unit in Silver Spring, MD.

In 2003, Vice Admiral Conrad C. Lautenbacher, Jr., U.S. Navy (Ret.), Under Secretary of Commerce for Oceans and Atmosphere, recognized a need to develop a formal education program in NOAA, reconstituted the NOAA Office of Education, and appointed a Director of Education, and established an Education Council. One of the primary goals of the office and council is to develop performance measurements for each education program in the agency to quantify their effectiveness. These entities are also responsible for coordinating education activities within NOAA and with other federal agencies, and serving as a single contact source for all education issues for NOAA. We also note that, while NOAA has authorities under specific programs, passage of the Administration's proposed NOAA Organic Act would provide permanent, NOAA-wide authority to disseminate information and conduct education and outreach.

NOAA invests in strategic education activities directed toward K–12 formal education and teacher professional development, opportunities for students pursuing STEM-related careers, and informal education activities in order to achieve our mission goals and promote development of a highly competent national workforce to support our future professional requirements.

In this testimony, I will focus on three areas where NOAA conducts education activities relevant to K–12 formal education and teacher professional development, higher education opportunities for students pursuing STEM-related careers, and informal education activities.

K–12 Formal Education and Teacher Professional Development

NOAA activities to enhance classroom-based STEM-related education are broadly focused on efforts to improve the degree to which NOAA-related disciplines are addressed in education standards, are infused in science curricula, and are present in teacher professional development. This multi-faceted approach is critical because reports suggest that few teachers are empowered to teach in STEM-related fields. *Before It Is Too Late: A Report to the Nation from the National Commission on Mathematics and Science Teaching for the 21st Century,* reports that more than one in four high school mathematics teachers and nearly one in five high school science teachers lack even a minor in their main teaching field. Furthermore, more than 12 percent of all new hires enter the classroom without any formal training; another 14 percent start work without meeting the teaching standards of their states.

Ocean Literacy is a joint public and private partnership effort to address deficiencies in the K–12 education standards highlighted by the U.S. Commission on Ocean Policy. This project represents the collective effort of numerous partners including NOAA and other federal entities, the National Geographic Society, Centers for Ocean Sciences Education Excellence, and the National Marine Educators Association, to bring together the ocean community to identify the knowledge required to be considered ocean literate in accordance with the National Science Education Standards for K–12 education. This collective effort resulted in a definition of ocean literacy comprised of seven essential principles, supported by detailed fundamental concepts, which educators can use to fulfill the eight national science education standards and meet the science requirements of the *No Child Left Behind Act,* when those requirements take effect.

NOAA is building on its involvement in this effort by funding TERC, a private education research company, to assess the degree to which ocean sciences are currently represented in state science education standards. NOAA is also working with TERC to promote recognition of Earth science as a rigorous laboratory science course at the high school level. Although there are no nationally-recognized or nationally-adopted science education standards, in 1996 the National Research Council published recommended *National Science Education Standards,* which have formed a framework for the standards developed in some states. Earth science education is one of the three essential science areas addressed in the *National Science Education Standards* (NRC 1996) and preliminary results of an assessment commissioned by NOAA suggest that Earth science is included in every state's education standards. However, evidence shows that only 24 percent of our nation's students

take a high school Earth science course prior to graduation, and Earth science is often times viewed as a less-rigorous course intended for non-college bound students. NOAA is supporting activities of TERC to revolutionize high school Earth science education by developing a model lab-based high school Earth system science course featuring a combination of field work, classroom experiments, and computer access to data and visualizations.

Through a partnership with the National Science Teachers Association (NSTA), NOAA provides supplemental education materials and improves teacher content knowledge in science topics relevant to NOAA's mission. Specifically, NOAA has already supported the development of classroom materials related to corals and estuaries, and several others related to climate and weather topics are in development. The concepts presented in these classroom materials will be reinforced by on-line and in-person teacher professional development courses and symposia offered through NSTA to their members. By partnering with the largest professional organization of science teachers in the United States, NOAA expands the impact of our science education activities by leveraging NSTA's expertise and extensive network of teachers.

NOAA partners with the American Meteorological Society (AMS) to create supplemental material for use in K–12 classrooms. NOAA has provided support to AMS's DataStreme Atmosphere and DataStreme Oceans programs, which train K–12 teachers in oceanic, atmospheric, and hydrologic sciences through pre-college teacher training and instructional resource material development. To date, over 100,000 teachers have received NOAA-relevant AMS training and instructional resources, which may help some teachers fulfill their Earth Science certification requirements and achieve "highly qualified" status under the *No Child Left Behind Act.*

The JASON Project receives support from NOAA to use multimedia tools and cutting-edge technology to engage middle school students in scientific research and expeditions led by leading scientists. Dr. Bob Ballard, discoverer of the sunken ocean liner *Titanic,* has transmitted his discoveries to millions of students in classrooms around the country, via satellite and Internet broadcasts. The JASON Project also provides on-site and on-line teacher professional development supported by the National Science Teachers Association.

NOAA's Office of Ocean Exploration and Research (OE) has developed over 200 hands-on, inquiry-based lessons correlated to the National Science Education Standards. Scientists and educators explain the science behind each NOAA Ocean Exploration expedition for classrooms. The lessons are designed to introduce educators to ocean scientists and explorers, their research and explorations, and tools and resources that will interest students in NOAA-related science and exploration efforts. In 2004 alone, the Ocean Explorer Web site had requests for over 300,000 downloads of pages of these lessons. In 2005, the Education Section of the site tripled in bandwidth used due to dramatic increase in site usage. Formal evaluations conducted on this professional development program indicate that participating teachers felt better empowered to expose their students to "real" science. As a result, students report "discovery of a potential career area." Through the OceanAGE (Another Generation of Explorers) section of the Ocean Explorer Web site, students can interact virtually with the likes of Bob Ballard and Shirley Pomponi through video-based interviews as they learn why these premier ocean explorers chose careers in ocean science.

NOAA education also leverages public interest surrounding current events into educational opportunities. In 2005, after the Indonesian tsunami, NOAA developed and produced a tsunami education resources kit for K–12 teachers by compiling existing education materials and simulation models from across NOAA. To date, NOAA has distributed 8,000 kits to teachers nationally. This year, NOAA has produced a Hurricane Education packet in response to heightened national interest after Katrina and the record breaking 2005 tropical storm season. NOAA anticipates distribution of approximately 10,000 packets at the National Science Teachers Association meeting next week.

NOAA's local and regional facilities and fleet of ships and aircraft offer unique locations and platforms for teacher professional development opportunities. Since its inception in 1990, NOAA's Teacher at Sea program has enabled more than 430 teachers, from 47 states and three countries, to participate in real research and experience life at sea. Administered by NOAA's Office of Marine and Aviation Operations, the program gives teachers the chance to go to sea aboard NOAA research and survey vessels.

STEM–Related Higher Education Opportunities

NOAA actively serves students with a variety of opportunities to develop academic excellence and scientific rigor. Many graduates of these education programs

continue their professional careers in the sciences and work for NOAA or partner institutions. The collective efforts of all these opportunities are aimed at increasing the size and diversity of the pool of future candidates for STEM-related professional positions.

NOAA's Educational Partnership Program began in 2001 and provides financial assistance, on a competitive basis, to Minority Serving Institutions (MSIs) to increase programs and opportunities for students to be trained and graduate in sciences that directly support NOAA's mission. The program consists of four core components: Cooperative Science Centers, Environmental Entrepreneurship Program, Graduate Sciences Program, and the Undergraduate Scholarship Program.

- Four Cooperative Science Centers have been designated at MSIs with graduate degree programs in NOAA-related sciences. To date, NOAA has provided formal training and research opportunities for 2,050 students at these centers. External teams of scientists have reviewed the centers to determine the effectiveness of student recruitment, training and graduation.
- The Environmental Entrepreneurship Program provides financial assistance to increase the number of students at MSIs who are proficient in both environmental studies and business enterprises. The Program facilitates linkages among MSIs, NOAA, and the private sector.
- The Graduate Sciences Program offers training and work experience to exceptional female and minority students pursuing advanced degrees in the environmental sciences. NOAA provides program participants with tuition, a housing allowance, travel expenses, and a salary for an annual 16-week work period at a NOAA facility, and the students are mentored by scientists while performing research. After completing the program, participants commit to employment at NOAA based on the length of their training. To date, the Graduate Sciences program has hired 27 graduates as NOAA scientists.
- The Undergraduate Scholarship Program has sponsored 69 students majoring in NOAA-related sciences at MSIs to obtain tuition assistance and participate in two ten-week summer internships. Forty-one students have completed the program, with 28 going on to graduate school.

The Dr. Nancy Foster Scholarship Program, named in honor of the late, distinguished NOAA scientist and Assistant Administrator, recognizes outstanding scholarship and encourages independent graduate level research—particularly by female and minority students—in oceanography, marine biology, and maritime archaeology. Congress authorized the Program, as described in the *National Marine Sanctuaries Amendments Act of 2000,* soon after Dr. Foster's death in June 2000, as a means of honoring her life's work and contribution to the Nation. To date, 22 students have received scholarships, 18 of whom were women.

The National Sea Grant program offers several opportunities for graduate students through the John A. Knauss Marine Policy Fellowship. The Knauss fellowship, established in 1979, provides a unique educational experience for graduate students who have an interest in ocean, coastal, and Great Lakes resources and in the national policy decisions affecting those resources. The program places highly qualified graduate students at NOAA, NASA, the Department of the Interior, NSF, and Congressional offices for a one-year paid fellowship. The program is named in honor of one of Sea Grant's founders, former NOAA Administrator John A. Knauss. Since its inception, there have been over 550 Knauss fellows and annual program participation by females has averaged 71 percent since 2000.

The Ernest F. Hollings Scholarship Program recruits and prepares students for public service careers with NOAA and other natural resource and science agencies as well as for careers as teachers and educators in oceanic and atmospheric science. This year, the first Hollings Scholars are expected to participate in summer internships with NOAA labs and facilities. The Hollings Scholarship Program currently funds more than 100 students in ocean and atmospheric sciences, math, computer science, social science, and education.

Informal Education

NOAA's informal education activities provide educational experiences that typically involve taking students to unique settings outside of the classroom. Informal education combines well established educational methods with the excitement of hands-on activities and field experiences and develops life-long interest in the ocean and atmosphere. NOAA's informal education activities include hosting school children, community groups, and the general public at NOAA sites, supporting hands-on experiences in NOAA-related sciences, and increasing the inclusion of NOAA-related topics at science centers, museums, and aquaria.

NOAA is uniquely positioned to allow citizens to experience directly how a federal science agency manages our nation's natural resources and the importance of those resources. NOAA has 13 marine sanctuaries and 27 estuarine research reserves that provide students and the general public with hands-on experiences within these natural laboratories. These outdoor and engaging educational experiences provide direct application of the multi-disciplinary science NOAA conducts, and promote stewardship. School field trips to these sites enrich and supplement the classroom curriculum. Education coordinators at each site offer a variety of educational experiences tailored for the local community and school districts.

Programs such as Sea Grant, the National Marine Sanctuaries, and the National Estuarine Research Reserves offer comprehensive education programs that provide NOAA with the critical connection to the needs of the local communities that these place-based programs serve. These programs provide topically relevant and standards-based education programs and materials founded on an integration of NOAA's multi-disciplinary approach to understanding and predicting changes in the Earth's ecosystem.

Infusion of NOAA-related science topics into public venues for learning about science further promotes our ability to reach broad and diverse audiences and increase understanding of Earth system dynamics. One example of how we are increasing coverage of NOAA topics in museums, science centers, and aquaria is through public exhibits of NOAA's Science On a Sphere, a 3–D visualization tool of NOAA's global data. In June 2004, an evaluation of Science On a Sphere conducted at the Maryland Science Center indicated Science On a Sphere is a powerful and effective data visualization tool that engaged the public. Visitors reported significant increases in knowledge on Earth system dynamics and increases in their understanding about interconnections of these dynamics after viewing the Science On a Sphere exhibit. This program is providing us with an unprecedented opportunity to incorporate NOAA data and increase understanding about the Earth as an ecosystem.

NOAA's Need for STEM Education Improvements

In conclusion, thank you for this opportunity to describe NOAA's education programs with your committee. The successful performance of NOAA's mission depends on having access to the best meteorologists, oceanographers, cartographers, biologists, chemists, and engineers to conduct our work. Like many science-based agencies, many of NOAA's senior scientists are eligible for retirement this year. NOAA needs to attract well-qualified and trained candidates utilizing a variety of scholarship and fellowship programs that support education and training in NOAA-related sciences. The best way to ensure NOAA's scientific leadership and global expertise in oceanic and atmospheric research, observations, and forecasting, and environmental and ocean health, is to have the best and the brightest students, from a diversity of backgrounds, become fascinated with science education and the environment in which we live. NOAA's education program actively supports this objective.

That concludes my statement, Mr. Chairman. Thank you for the opportunity to present testimony on this topic. I am happy to respond to any questions the Committee may have.

BIOGRAPHY FOR BRIGADIER GENERAL JOHN J. KELLY, JR., (USAF RET.)

Brigadier General (USAF retired) John (Jack) J. Kelly, Jr. serves as the Deputy Under Secretary of Commerce for Oceans and Atmosphere, National Oceanic and Atmospheric Administration (NOAA). He is responsible for the day-to-day management of NOAA's domestic and international operations. In addition, General Kelly is the United States principal representative with the World Meteorology Organization (WMO) and is responsible for U.S. interactions with the WMO.

General Kelly has 39 years of experience in all facets of the weather field, including 21 years at the senior executive level in both government and private industry. He has broad experience in leading science-based service organizations, introducing change, and using and implementing technology and science.

General Kelly served as senior advisor on weather services for the Department of Commerce and conducted a bottom-up review of the NOAA National Weather Service (NWS) operation, plus NOAA and NWS management, planning, and budget policies and processes. He was NOAA's Assistant Administrator for the Weather Service from 1998 to January 2004.

In the private sector, General Kelly was Director of Weather Systems for GTE Information Systems from 1994 to 1996. There he directed GTE's weather and aviation services business line and was responsible for client satisfaction and interface,

strategic planning, business development and sales, profit and loss, and program management.

General Kelly retired from the Air Force in 1994 after serving for 31 years. His duties covered the entire spectrum of the weather field, from operational forecaster to chief scientist, to staff officer. He retired as Director of Weather Headquarters, U.S. Air Force.

General Kelly holds a Bachelor's degree in chemistry from Seton Hall University and a Master's degree in public administration from Auburn University. He also completed leadership programs at the Air Force Command and Staff College and the Industrial College of Armed Forces. General Kelly is an American Meteorological Society Fellow and has received numerous U.S. and international awards.

Chairman BOEHLERT. Thank you very much, General. Dr. Decker.

STATEMENT OF DR. JAMES F. DECKER, PRINCIPAL DEPUTY DIRECTOR, OFFICE OF SCIENCE, U.S. DEPARTMENT OF ENERGY

Dr. DECKER. Mr. Chairman and Members of the Committee, thank you for the opportunity to testify today about the Department of Energy's role in math and science education, and the K–12 education programs in the Office of Science.

Now, Mr. Chairman, I would like to add my thanks to you for your long service to the Nation as a Member of Congress, and leadership that you have displayed here on this committee. Thank you.

I want to begin with a short personal story. Nearly 50 years ago, the Soviet Union surprised the world by launching Sputnik, the first ever satellite in space. Sputnik was a great shock to this country, and led to a major effort to gain the lead in space by making major new investments in science and engineering. The Sputnik challenge was the main reason I chose a career in science. I grew up in a very small rural town in upstate New York, didn't have a clue about careers in science, never met a scientist, but I was fortunate to have very good science and math teachers, and I liked science. The Sputnik challenge, which came along when I was in high school, had two features that attracted me to a career in science. First, it was a science and technology challenge that was important to the country. Second, I thought there would be jobs in science. The promise of jobs should not be underestimated as a key factor in a student's career choice.

Many of my colleagues have similar stories about why they chose a career in science. It was a result of good science and math teachers, a national challenge, and a promise of employment. The Sputnik challenge resulted in a large influx of students into science, engineering, and mathematics from which the country benefited for nearly 50 years. That generation of scientists has reached retirement age.

The Department of Energy is largely a science and technology agency. This gives us a strong vested interest in STEM education. The Department and its laboratories today face the challenge of an aging scientific and technical workforce that must be rebuilt, and we are very concerned about the pipeline that produces the talent needed to fill our critical need. The Department's primary contribution to the science education pipeline is through the support and training of graduate students. It is a natural byproduct of our support of research in universities, and also, many graduate students

supported by other federal agencies receive a portion of their training at the Department's scientific user facilities.

The Office of Science also provides some direct support for K–12 target STEM education programs for in-service K–12 teachers, and undergraduates training to be K–12 teachers. These programs use the scientific personnel and research capabilities of the Department's laboratories to engage teachers in an environment aimed at making the connections with the science and technology principles they teach. The capabilities at the laboratories are used to build teachers' content knowledge and skills through a research experience and a continuing mentorship by laboratory scientists and master teachers.

We hope through this program to train teachers who can act as agents of change in their school districts, to help raise the quality of STEM teaching and the level of student achievement. What we are finding is that the teachers who participate in these programs at the national labs are becoming teacher-leaders in their education communities.

We are pleased that the National Science Foundation has joined us in supporting these programs. The Department's laboratories have not only enthusiastically participated in the Office of Science-sponsored education programs, but on their own, they have, for many years, conducted programs for both K–12 students and teachers, largely through volunteer efforts of the scientific staff. These laboratory programs touch tens of thousands of students and teachers every year.

Finally, I want to mention the National Science Bowl, sponsored by the Office of Science, because it is the type of event that brings recognition of academic achievement in STEM fields, and inspires students to become more interested in STEM. The National Science Bowl is a highly regarded educational event that continues to grow every year in reputation among students, educators, science coaches, and volunteers. More than 1,800 high schools from across the Nation participate regionally in fast-paced problem solving events, with the highest performing team from each region coming to Washington, D.C. to participate in the national event.

This annual event has generated student enthusiasm for learning about science by engaging 110,000 students during its 16 year history. The National Science Bowl has been so successful that in 2002, we initiated the Middle School Science Bowl, and it has also become a great success. This year, the finals for the National Science Bowl will be held April 27 through May 1 here in Washington. I would like to invite all the Members of this committee, as well as the witnesses to observe the finals.

As we as a Nation attempt to address the issue of attracting more students into careers in science, engineering, and mathematics, as outlined in the President's American Competitiveness Initiative, we should learn from the Sputnik experience, and recognize the power of those inspirational challenges that capture the imagination of young students. The American Competitiveness Initiative, that focuses on the Nation's competitiveness in the global economy, and the President's Advanced Energy Initiative can begin to focus the attention of the Nation on two important challenges that are intimately linked.

These initiatives represent two examples where there are clear national challenges, a commitment by the President to seek funding to attack those challenges, and an opportunity to attract the young talent into scientific and technical fields that will be essential to address those challenges. The Department of Energy remains committed to its role in training the next generation of scientists, engineers, and teachers to take on these challenges.

And again, thank you, Mr. Chairman, and Members of the Committee, for inviting me to testify today, and I would be happy to answer any questions.

[The prepared statement of Dr. Decker follows:]

PREPARED STATEMENT OF JAMES F. DECKER

Mr. Chairman, thank you for the opportunity to testify today about the Department of Energy's (DOE) role in math and science education and the K–12 education programs of the Office of Science. The DOE's most significant contribution to education, broadly defined, over the years has been through our support of graduate students pursuing advanced degrees and by providing opportunities for undergraduate students and K–12 teachers to utilize our research facilities and work with the scientific and technical staff at the laboratories, which are unique places for research, learning, and collaboration. Our long history of support of programs for students and teachers has helped establish a culture at the National Laboratories where mentoring and learning are encouraged and supported. For more than 30 years, the DOE National Laboratories have provided mentor-intensive research internship and fellowship opportunities for undergraduate and graduate students studying in science, technology, engineering, and mathematics (STEM) fields. Since 1989 we have also supported programs that bring K–12 teachers into the National Laboratories to work with researchers and build content knowledge and skills that they then take back to their classrooms.

The two most important ways the Federal Government can improve science and math education is to help ensure that there is a highly qualified teacher in every classroom and second, to help ensure that students have the opportunity in their schools to study science and math every day of the school year and every year throughout their K–12 education. The *No Child Left Behind Act* has put great emphasis on providing a qualified teacher in every classroom. Providing opportunities for professional development for STEM teachers is an area where DOE and the National Laboratories have played and will continue to play a valuable role.

The role of the Department and particularly the Office of Science in STEM education is complementary to the efforts of other federal agencies. Our collaboration with the National Science Foundation (NSF) in various programs is especially productive and effective in bringing students from NSF funded programs to our National Laboratories; strengthening transfer of teacher research experiences to classrooms; curriculum development that strengthens our mission, and increasing science literacy. In contrast, work on specific curricula is more a responsibility of State and local education communities across the country.

I would note here that, the Department of Energy's overall role in K–12 education is small. In the Office of Science, for example, our current budget for the Office of Workforce Development for Teachers and Scientists (WDTS) is just over $7 million. For Fiscal Year 2007 we have requested almost $11 million—a significant increase, though WDTS is small relative to the programs of other more education-focused federal agencies. In addition, however, it should also be noted that the National Laboratories conduct independent, overhead-funded K–12 education programs that reach out to thousands of students every year. With annual spending of roughly $8 million dollars these are truly community-based programs, developed and sustained by strong local support and participation.

The Office of Science and STEM Education

The DOE Office of Science sponsors fundamental research programs in basic energy sciences, materials and chemical sciences, nanoscale science, climate change, genomics, life sciences, fusion energy sciences, high energy physics, nuclear physics, and advanced scientific computing. The Office of Science supports a diverse portfolio of research at more than 275 colleges and universities nationwide. This year, we are funding the work of about 23,500 scientists, including more than 10,000 Ph.D.s, graduate students, undergraduates, and postdoctoral researchers at the Nation's institutions of higher learning.

The Office of Science is also the steward of 10 world-class laboratories with unmatched capabilities for solving complex interdisciplinary scientific problems, and we fund research at DOE's seven other National Laboratories as well. The DOE National Laboratory system is the most comprehensive research system of its kind in the world and the backbone of American science. The Office of Science also builds and operates the world's largest suite of scientific facilities and instruments, used annually by more than 19,000 researchers to extend the frontiers of all areas of science.

The Office of Science has played a fundamental role in training America's scientists, engineers, and teachers for more than 50 years. Today we offer a range of workforce development programs for teachers and scientists to provide opportunities for scientific discovery and to ensure that this nation has the scientific workforce we will need in the 21st century.

In science, the mission of research and the mission of education are inextricably linked. There is no more powerful spur to interest in science than hands-on experience in cutting edge research in a well-equipped laboratory. I believe the DOE has played a valuable role in math and science education at the K–12, undergraduate, and graduate levels by providing young scientists and teachers with in-depth exposure to the world of science through hands-on experience at our advanced facilities. While other Offices within the Department support undergraduate and graduate research, the Office of Science, through its Office of Workforce Development for Teachers and Scientists, supports the majority of programs that target K–12 education.

Preparing K–12 Teachers for the Classroom

It is widely recognized that the most effective means for improving student performance is through the training and continued support of the professional development of elementary and secondary school teachers (Educational Leadership, March 2002). In a survey of thousands of STEM graduate students, conducted by the NSF in 2002, 84 percent of those surveyed stated that they had chosen to pursue a STEM field career by the time they left high school. This suggests that K–12 teachers play a critical role in increasing the size and quality of the science, technology, and engineering workforce. Unfortunately, various studies including the Glenn Commission Report, *A Report to the Nation from the National Commission on Mathematics and Science Teaching for the 21st Century,* 1999; *Rising Above the Gathering Storm,* 2005, from the National Academy of Sciences Committee on Prospering in the Global Economy of the 21st Century; and "Tapping America's Potential: The Education for Innovation Initiative," 2005, led by the Business Roundtable have indicated that the teaching pool in mathematics and science is inadequate to meet the current needs in K–12 schools across the Nation.

According to the Glenn Commission Report, classes in K–12 math and science are often taught by unqualified and under-qualified teachers who have little or no formal training in math or science (citing Linda Darling-Hammond, *Supply, Demand, and Quality in Mathematics and Science Teaching.* Briefing for the National Commission on Mathematics and Science Education for the 21st Century, Washington, D.C., September, 1999.):

> More than one in four high school mathematics teachers and nearly one in five high school science teachers lack even a minor in their main teaching field.
>
> About 56 percent of high school students taking physical science are taught by out-of-field teachers, as are 27 percent of those taking mathematics. These percentages are much greater in high poverty areas. Among schools with the highest minority enrollments, for example, students have less than a 50 percent chance of getting a science or mathematics teacher who holds both a license and a degree in the field being taught.

This finding is troubling because research indicates students who are taught by well-prepared science, math, and technology education teachers achieve at higher levels in class performance and on standardized exams. Citing *What Matters Most: Teaching for America's Future,* 1996, by the National Commission on Teaching and America's Future, and state studies correlating National Assessment of Educational Progress rankings with teacher qualifications, the Glenn Commission notes:

> Evidence of the positive effect of better teaching is unequivocal; indeed, the most consistent and powerful predictors of student achievement in mathematics and science are full teaching certification and a college major in the field being taught. Better math and science teaching is therefore grounded, first of all, in improving the quality of teacher preparation and in making continuing professional education available for all teachers.

The *No Child Left Behind Act* requires States to fill the Nation's classrooms with teachers who possess content knowledge in the field in which they teach and requires, beginning in school year 2007–08, that states measure students' progress in science at least once in each of three grade spans (3–5, 6–9, 10–12) each year. The measuring of students' performance in science over several years also has the potential to provide a valuable measurement of the effectiveness of federally funded teacher training programs and efforts to increase the number of qualified teachers in the classroom.

DOE K–12 In-Service Teacher Professional Development Programs

All of the studies cited emphasize the importance of well-prepared science and math teachers in the classroom. As noted earlier, since 1989 DOE has played a role in providing professional development for K–12 teachers. Since the early 1950's, DOE and its predecessor agencies have been major contributors to the preparation and training of the next generation of scientists. DOE continues this effort through mentor-intensive research experiences at the National Laboratories for students, teachers, and faculty at all levels of education.

The Office of Science created its current in-service teacher professional development program targeting the Nation's K–12 STEM teachers in 2004. The primary goal of the Laboratory Science Teacher Professional Development (LSTPD) program is to create a cadre of STEM teachers who have the proper math and science content knowledge and scientific research experience to perform as leaders and agents of positive change in their local and regional education communities. In developing this program our WDTS office reviewed the best practices in teacher professional development identified by the National Academy of Sciences, the American Association for the Advancement of Science, and the American Institutes for Research. Several professional development models for teachers were also considered, including: the National Board for Professional Teaching Standards, "Five Core Propositions" and Loucks-Horsley and colleagues' "Fifteen Strategies for Professional Development." A primary expected outcome of the program is that teachers who participate will better educate and inspire students to study and become more involved in academic and extracurricular STEM activities, eventually raising student achievement on standardized tests and ultimately leading to more well-prepared students pursuing STEM majors in college. To achieve these results, the program provides K–12 classroom teachers with long-term, mentor-intensive professional development through scientific research or research-like opportunities at the National Laboratories over a three-year period.

Each teacher selected for the program makes a three-year commitment. Teachers are recruited nationwide and apply through an online system. Teachers are selected from a wide variety of demographic and educational backgrounds and are chosen on the basis of their qualifications as teachers of science and whether the National Laboratory they have chosen can provide the necessary developmental support in the particular subject-matter area where the teachers have identified a need. Participants' program placement is based upon their self-identified areas of content knowledge that need strengthening and on the laboratory's ability to meet that need. Participants receive a weekly stipend and housing allowance for the period they are at the laboratory. They also receive monetary support to help them extend what they have learned to their classrooms, purchase supplies for laboratory equipment and technology, connect students via classroom activities to National Laboratory research, continue contact and collaboration with other participant teachers and laboratory scientists, make return visits to the laboratory, and communicate their experiences at professional conferences and in publications.

The participants can choose from two different types of laboratory experiences. The first is primarily a Laboratory Research Experience where the teacher conducts research under the guidance of a lab scientist. This experience is most popular among high school teachers and is eight weeks long. The other is a more modest approach, known as the Research Institute Model, where teachers work in small groups doing mock research projects under the guidance of educators and lab scientists. This approach, which runs four weeks, is most popular with elementary and middle school teachers.

All LSTPD teachers are provided guidance and mentorship by a "Master Teacher." The Master Teacher not only has experience and a proven record of teaching excellence, but s/he is also familiar with the National Laboratory environment. The Master Teacher helps the participating teachers prepare a three-year professional development plan, guided by initial evaluation of the teachers' command of subject matter in the courses that they teach. This reflection and collaboration process has been shown in educational research to be fundamental to successful implementation of teacher professional development. The teacher assessments and delivered outputs

will ultimately track the effects of the program on student science and math achievement.

The LSTPD program has funded 115 teachers to participate in a pilot program that began in 2004; the first cohort will complete the three-year program this summer. The FY 2007 budget request for the program will increase the number of teachers participating to more than 300, and the Office of Science is in the process of planning to offer the program at all 17 DOE laboratories in the summer of 2007. Although the program is new and small, it has already had positive impact on its participant teachers, as described later in this testimony.

DOE Program for Future K–12 Teachers

The Office of Science also funds the Pre-Service Teacher (PST) summer internship program for undergraduate students who are working toward teacher certification in K–12 science, mathematics, and technology. The program places between 40 and 60 undergraduate students at one of seven National Laboratories. This program allows future science and math teachers an opportunity to work with and learn from DOE scientists, researchers, and mathematicians before they enter K–12 classrooms to teach science and math. Participants spend ten weeks with scientists or engineers working on projects related to the laboratory's research programs and build content knowledge and skills through their research experience.

Participants also attend professional enrichment activities, workshops, and seminars that help them apply what they learn to their academic programs and the classroom, help them understand how to become members of the scientific community, and help them improve their communications skills. Each participant has well-defined outcomes that include a research abstract, research papers, poster presentations, and an educational module that develops their laboratory experience into something they can use in the classroom. A Master Teacher reviews each of the participant's outcomes, and the participants' science abstracts are graded and published in Workforce Development for Teachers and Scientists annual peer-reviewed *Journal of Undergraduate Research.*

Program Evaluation

Evaluation of the Office of Science's teacher professional development programs is a two-part process which can generally be divided into short-term collection and review of teacher and student outcomes and longer-term teacher and student outcomes that are formally reviewed and assessed by outside organizations. Short-term evaluation occurs each year and is both "formative" in that it generates small adjustments in how the program is being conducted and "summative" in that hard data are used to determine whether the program is addressing what it is intended to address.

The LSTPD program, for example, requires teachers to self-identify their weaknesses in science and to define how they will address those weaknesses in their research experiences. Teachers also document in a portfolio how their experiences in the laboratory influence their classroom teaching and how they provide leadership in their schools and in their districts. This information is generally formative in nature.

Additionally, there are tangible outcomes that each teacher produces that can be objectively evaluated. These range from research papers based on their research performed at a National Laboratory to lesson plans that attempt to transfer the content knowledge they have gained at a National Laboratory to their students in the classroom. This information is summative in nature.

Both the formative and summative data are compiled and reviewed by the WDTS staff and a yearly meeting of all 17 laboratories is convened to discuss outcomes of the teachers and what adjustments, if any, should be made. At a certain point, programs are evaluated by an outside organization. This evaluation is done after the program has operated long enough to demonstrate its proposed outcomes and with enough participants to yield a sample size sufficient for reliable evaluation.

Initial Evaluation of LSTPD

Initial evaluation of the LSTPD program has relied on self-assessments of the participating teachers and assessments of the teachers by laboratory education staff. The evaluation of the LSTPD is in part based on components completed by the participants: 1) a content knowledge self-assessment; 2) a professional development plan; 3) a professional practice inventory; and 4) an education module that is submitted by each participant. Several teachers have also submitted research abstracts, papers, and posters related to their research at the National Laboratories. As indicated above, the program requires the teachers to collect data that will support the program evaluation, and those data become useful to the participants in their classrooms and in their own professional development.

An independent educational testing and evaluation company, WorldViews, LLC, conducted an external evaluation of the pilot year of the program and provided its report in May 2005. The report stated:

> The LSTPD Program in its pilot year was an overall success. Significant credit goes to the LSTPD Program managers and participating science mentors at each of the participating laboratories, and the Office of Science LSTPD leadership and staff. A variety of professional development models were employed to a wide range of audiences.

These professional models include those of the National Board for Professional Teaching Standards and Loucks-Horsely's "Fifteen Strategies for Professional Development." WorldViews, LLC, conducted its evaluation based upon interviews, work samples and surveys, basing success on statistically significant increases in teacher work sample quality and respondents' evaluations of the program to pre- and post-measures.

Other yearly evaluation indicators of LSTPD program success include: 1) a less than five percent attrition rate for the three-year program; 2) one-third of the middle school teachers in the LSTPD program at DOE's Jefferson Laboratory have opted to move from the mock research institute format of teaching to one based on their independent research experience with scientists and researchers at the laboratory, the embedded research model; 3) a number of LSTPD teachers have won national education awards, including recognition as Albert Einstein Distinguished Educator Fellows, Milken Educator Award Winners, and Expert Environmental Teachers; and 4) LSTPD teachers are becoming science teacher-leaders in their communities and in their professional circles.

Evidence of this leadership by LSTPD teachers comes from their presentations of professional development workshops at several national conferences. Teachers from the LSTPD program at the National Renewable Energy Laboratory in Golden, CO, provided two workshops to teachers at the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) national conference in Denver, CO. Teachers from Argonne National Laboratory provided a workshop at the National Science Teachers Association (NSTA) regional conference in Chicago, IL. Additionally, LSTPD teachers will be providing workshops at the national NSTA conference in April 2006. Several LSTPD teachers are applying to participate in collaborative projects with the Department of Education's Teacher-to-Teacher Corps. LSTPD teachers from Lawrence Berkeley National Laboratory have also created an applied physics summer class targeted at high-school students who do not have the opportunity to take physics at their schools.

Full Evaluation of the LSTPD Program

A full evaluation of the impact of this program will be done in 2008. At that time, the evaluation will cover at least 500 participants who have finished a full three years in the program. Evaluation at the five year point in the program allows enough time to reliably track not only the impact on the quality of the teaching, but also any impact on students. Evaluation will include but not be limited to: 1) evidence of improved content knowledge through testing of teachers, review of teacher work portfolio, technical/scientific publications and presentations, classroom assessments by outside evaluators; 2) evidence of leadership, shown by teachers organizing/presenting workshops and instituting new classes or programs in their respective school systems such as AP courses, science fairs, Science Bowls; 3) and evidence of impact on students, as shown by more students taking advanced or elective science and math courses and participating in science fairs and Science Bowls, more students pursuing science, math, and engineering majors, and improved standardized test scores. This evaluation will be repeated in year ten of the program.

Evaluation of Pre-Service Teacher program

The PST program gives undergraduates planning to become science or mathematics teachers the opportunity to experience how science is performed and to improve both their direct knowledge of the scientific process and their communications skills. The evaluation of the PST program is primarily based on the quality of the participants' submitted research papers, abstracts, and oral presentations, as a measure of their knowledge gained and skills acquired during the program. The submission rate of these required deliverables is better than 95 percent for each year of the program since it began in the summer of 2000. The abstracts are graded by an outside panel of educators who are all Albert Einstein Distinguished Educator Fellows. PST participants have typically scored slightly above the mean grades in abstracts compared to participants in similar internship programs for other undergraduate students at our National Laboratories. The PST participants, as a group,

have also been more likely to have their research papers accepted for publication in the *Journal of Undergraduate Research* compared to other undergraduate students in similar internships at our National Laboratories. PST participants have also presented their work at the American Association for the Advancement of Science national conference.

Continued Evaluation of DOE Programs

In addition to evaluation of students' deliverables, all of the National Laboratories are also evaluated by WDST staff to determine that they are meeting the program criteria and guidelines, such as conducting mentor training sessions and providing academic, professional, and social activities for their interns. Each National Laboratory's education office is also evaluated every year on its execution of all of its education program elements, as well as all other Office of Science-administered programs, by a panel of Einstein Fellows and the Office of Science WDTS office.

For the past four years, particularly in teacher training, the WDTS has been working with the National Laboratories to help them align their education programs with the main principles of *No Child Left Behind* (NCLB) The WDTS office is currently compiling an inventory of all the DOE education activities through the programs and the Laboratories and their respective funding levels. This inventory will include evaluations that were done on our education programs and will support DOE participation in the Academic Competitiveness Council (ACC).

The ACC, which was established by the *Deficit Reduction Act of 2005* (P.L.109–171, Sec. 8001) and signed by the President on February 8th 2006, is reviewing science and math education programs across federal agencies. At the Council's first meeting its Chair, Secretary of Education Margaret Spellings stated, "Currently, there are more than 200 programs that focus on math and science, spread across 13 agencies, all of whom were represented today. Our goal is to gauge effectiveness and better coordinate these programs. Over the next several months, we will be looking at the data to see what policies are working for students, and where we can use taxpayers' dollars more efficiently. One of the best ways to do that is to align programs with the principles of NCLB, focusing on accountability, assessment, scientifically based research, local control, and results for students."

K–12 Programs Led by the National Laboratories

The scientific and technical staffs at the National Laboratories have not only enthusiastically participated in the Office of Science-sponsored education programs, but have also initiated independent overhead-funded programs to engage K–12 schools in their respective communities. Each laboratory has a number of outreach programs to their local schools. For example, Lawrence Berkeley National Laboratory (LBNL) offers a popular nanoscience lecture series at the lab on several Saturdays throughout the year. Pacific Northwest National Laboratory and LBNL have been instrumental in helping their respective States establish State teaching standards and guiding the design of various statewide initiatives in science education. Thomas Jefferson National Accelerator Facility has a training program for local K–12 science teachers which has shown a significant impact on student achievement.

Most of the laboratories offer short eight-week summer internships for high-school students. Fermi National Laboratory in Chicago has the Lederman Education Center through which it offers a number of workshops, training programs, and science kits for K–12 students and teachers. Brookhaven National Laboratory has a Science Center that offers similar programs and hosts over 25,000 guests per year. The Lawrence Livermore National Laboratory has the Edward Teller Center that offers training for teachers on various technical subjects, such as DNA isolation and gene duplication, that teachers might wish to perform in their schools but do not have the training to do so. Most of the National Laboratories also host educational websites that provide a rich set of resources and extensive activities for educators and students at all levels.

Working with Other Federal Agencies

Federal agencies develop education programs based on their respective strengths. The Department of Energy's strength is our scientists and engineers and research capabilities at the National Laboratories, and we play to that strength in both our own support of K–12 education and in leveraging our activities with other agencies such as the NSF. We do not believe it is DOE's role to support curriculum development, and we are seldom involved with school systems directly. The exception is the individual local programs at some of the National Laboratories. We also recognize that DOE's contribution to K–12 education programs is quite modest relative to some other federal agencies. Our strength is in actually "doing" the exciting and cutting edge science, and what we offer to K–12 education is the opportunity to transform teachers of science into "teacher scientists." We believe that we can excite to-

morrow's future young scientists and engineers by helping to form motivated and knowledgeable teachers today.

DOE meets regularly with other federal agencies like NSF, NASA, NIH and NOAA to discuss their math and science education programs. We work through the National Science and Technology Council and with our Albert Einstein Distinguished Educator Fellows, who work in Congress and other federal agencies for one year. The Office of Science has a strong relationship with the NSF in support of science and mathematics education, and we collaborate broadly. In 1999, for example, DOE began a partnership with the NSF "Collaboratives for Excellence in Teacher Preparation" and the National Laboratories to pair future teachers with a Master Teacher and a laboratory scientist to build content knowledge and skills through a summer research experience at the National Laboratories. This allows NSF"s undergraduate pre-service teachers to have access to the same opportunities as our own PST program students.

In 2000, the DOE partnered with NSF to support a new module for the popular NSF-supported *Active Physics* curriculum. This helped the DOE meet its goals for energy education under its Rebuild American program in line with the National Science Education Standards. The "Home Module to Active Physics" followed the content, design, and pedagogical format of the NSF-supported Active Physics Curricula, helping student understand energy conservation and the relationship of energy and matter.

As mentioned above, the DOE also meets with the Department of Education periodically. In a recent meeting regarding alignment with NCLB, the DOE agreed to coordinate some of the activities of the teachers participating in the DOE Laboratory Science Teacher Professional Development Program to help the Department of Education in its Teacher-to-Teacher training program. We will provide some of the teachers the Department of Education needs, teachers who are highly trained in the subjects that they teach and are teacher leaders in their communities.

DOE does not support K–12 education programs designed to target a particular gender, minority, or economic class. The LSTPD teachers and PST undergraduates are selected from broad geographical regions, representing both rural and urban populations. These in-service and future teachers are building science and math content knowledge and teaching skills that have the potential to positively impact the education of the diverse student groups they teach, irrespective of gender or socioeconomic differences.

Inspiring Young Minds in Science and Mathematics

The National Science Bowls

To inspire young minds and promote science literacy and enthusiasm for math and science, DOE conducts the National Science Bowl® and the National Middle School Science Bowl. These annual events have generated student enthusiasm for learning about science by engaging over 110,000 students over the years.

The National Science Bowl® is a highly regarded educational event that continues to grow every year in reputation among students, educators, science coaches, and volunteers. It is a very exciting educational experience—an annual "grassroots" program in which more than 1,800 high schools from across the Nation participate in regional events, with the highest performing team from each region then coming to Washington, DC, to participate in the national event. The regional and national events are primarily volunteer programs where several thousand people (teachers, parents, and even undergraduates from local colleges) dedicate weeks of their time to support educational events and reward students for their enthusiasm and commitment to STEM.

Since its inception in 1991, more than 110,000 high school students have participated in regional tournaments leading up to the national event. In Washington, students meet many DOE and non-DOE scientists and are given a rare chance to learn firsthand about the wide variety of careers in science. The 2006 National Science Bowl(r) will be held April 27–May 1, 2006, here in Washington, DC, and you are all invited to come and observe this exciting educational event.

It is well recognized that the middle-school years are critical in attracting and retaining student interest in science and math. There are two events at the Middle School Science Bowl: an academic event in mathematics and science, and an activity to design, build, and race hydrogen fuel cell model cars. The academic event is a fast-paced question and answer format where students solve problems about Earth, life, physical, and general sciences and mathematics. The model hydrogen fuel cell car competition challenges students to design, build, and race model hydrogen fuel cell cars to help them understand the future energy challenges that our nation is facing. Students who win in regional events enjoy a trip to a National Laboratory and participate in a final three-day event designed to capture their interest and re-

ward them for their hard work. The inspiration students receive by interacting with scientists and engineers at this age can be a very positive, even a transforming experience and lead them into STEM careers.

Other Inspiring Programs: The World Year of Physics

The activities associated with the celebration of the World Year of Physics is another example of a series of programs that the Office of Science has sponsored to inspire and capture the interest of young minds in science inside and outside of the classroom. In 2005, in coordination with researchers at universities nationwide and the DOE National Laboratories, DOE celebrated the 2005 World Year of Physics through a year-long program of activities and materials highlighting how physics enables advances in science and contributes to our quality of life. In celebration of the centennial of Albert Einstein's "miracle year," 1905, when he published four papers that laid the foundations of much of physics as we know it today, the Office of Science co-sponsored a new PBS NOVA program, "Einstein's Big Idea." The NOVA program aired on PBS stations nationwide in October 2005. Library guides about the program were distributed to 16,000 libraries nationwide, and teacher's guides were sent nationwide to 15,000 high-school physics teachers, 3,700 middle school physics teachers, and 400 middle school science chairs. Several of the National Laboratories held special lectures, symposia, and education events for local middle and high school students and the surrounding communities.

A DOE/Office of Science website was also created to educate the public about the significance of Einstein's revolutionary work, describe the role of physics in various science and technology fields, publicize events, and highlight the work of DOE-sponsored physicists. The "DOE Physicists at Work" website continues to profile the work of young physicists conducting research in the universities and National Laboratories funded by the Office of Science. Several activities coordinated by the American Physical Society were also co-sponsored by the Office of Science. These included the PhysicsQuest, an outreach event held on the grounds of the Institute for Advanced Studies in Princeton, NJ, that took over 100,000 middle school students through a series of experiments on a hunt to finding Einstein's "missing treasure," and Physics on the Road, a project that provided materials and equipment for teams of students and faculty from colleges and universities to perform physics demonstrations at schools and other public venues across the Nation.

Conclusion

The Department of Energy's strength with regard to education is in using its scientists, engineers, and research facilities at the National Laboratories to provide transforming fellowship, internship, and post-doctoral programs. The multi-disciplinary, team-centered, scientific culture of the National Laboratories is an ideal setting for teachers to make the connections between the science and technology principles they are asked to teach. The extensive mentoring expertise of our laboratory scientists provides the basis for lasting relationships that allow teachers to remain connected to the scientific community once they return to the classroom.

By incorporating K–12 STEM teachers into the scientific community of the National Laboratories, teachers are provided many of the tools they need to improve their professional performance, their leadership abilities in the STEM education communities, and most importantly, their students' achievement. While the laboratories are not positioned to support the training of the thousands of STEM teachers in need, the modest numbers of teachers who are building content knowledge and leadership skills at our National Laboratories will become agents of reform and change, not only taking their skills back to the classroom, but also teaching those skills to other teachers through workshops and seminars.

There is a growing recognition that the standard of living we enjoy and the security of our nation rests on the quality of the science and technology education we provide America's students from elementary through graduate school. The DOE and the Office of Science remain committed to its role in training America's scientists, engineers, and teachers to help ensure that we will have the scientific workforce we will need to stay on the cutting edge of science and technology and to maintain our nation's competitiveness in the 21st century.

This concludes my testimony. I would be pleased to answer any questions you may have.

BIOGRAPHY FOR JAMES F. DECKER

James F. Decker is the Principal Deputy Director of the Office of Science (SC) in the Department of Energy (DOE). He has held this position since 1985, and has con-

currently served as Acting Director for approximately six years on five separate occasions between April 1987 and March 2002.

As Principal Deputy Director, Dr. Decker is the senior career executive who directs the day-to-day technical and management activities of an organization that is the third largest federal sponsor of basic research in the United States and is viewed as one of the premier science organizations in the world. The SC fiscal year 2005 budget of $3.6 billion funds programs in high energy and nuclear physics, basic energy sciences, magnetic fusion energy, biological and environmental research, and computational science. SC, formerly the Office of Energy Research, also provides management oversight of 10 DOE non-weapons laboratories, supports researchers at more than 275 colleges and universities nationwide, and builds and operates the world's finest suite of scientific facilities and instruments used annually by more than 19,000 researchers to extend the frontiers of all areas of science.

Dr. Decker has held several other positions within DOE. In 1973 he joined the Office of Fusion Energy, Office of Energy Research, as a plasma physicist. He subsequently became the Director of the Division of Applied Physics, where he was responsible for all theoretical fusion and basic experimental plasma physics research, the magnetic fusion energy computer network, and evaluation of novel fusion concepts. Dr. Decker later served as a Special Assistant to the Director of the Office of Energy Research, and as the Director of the Scientific Computing Staff.

Before joining DOE, Dr. Decker was a physicist at Bell Telephone Laboratories where he conducted research in plasma physics and worked on ion implantation for integrated circuit development.

He received a B.S. degree from Union College in 1962, a M.S. degree from Yale University in 1963, and a Ph.D. in physics, also from Yale University, in 1967.

Dr. Decker has received several awards from DOE as well as two Presidential Meritorious Rank Awards. He also is a member of several high-level domestic and international science policy advisory committees.

Dr. Decker was born near Albany, New York. He is married and has two children.

DISCUSSION

Chairman BOEHLERT. Thank you, and I want to thank all of our distinguished panel of witnesses for your kind opening remarks, but General Kelly, yours were particularly meaningful to me as a two striper who was a clerk in the MP during my years in the Army, I never had a General say such nice things about me. Thank you, sir.

Brigadier General KELLY. You are welcome.

Chairman BOEHLERT. I won't tell my colleagues what some of them said. I would like each of you, this is a thought question, but I would like each of you, other than the Secretary of Education, to describe briefly why you are in the education business. What does your agency bring that is unique to the table? I will start you, Dr. Bement.

Dr. BEMENT. Yes, the reason we are in the education business is that the future of science and technology depends on a well educated workforce, and that has to be nurtured all the way back to kindergarten, and even before kindergarten, and if any element of that pipeline or that progression is not nurtured, the whole column collapses, so we have to be fully engaged.

The primary effort that we bring to bear is in evidence-based teaching, improving content, combining content with pedagogy, developing instructional materials and instrumentation, developing methods for evaluating assessment tools in terms of their reliability, their credibility, and their validity, so that we can measure real changes based on whatever baseline we establish, and determine real changes, not only in teacher performance, but also in student performance. So that, fundamentally, is what we are all about.

In addition, the Foundation also has a responsibility, especially under the ACI, the American Competitiveness Initiative, to develop the STEM workforce for the future. That means in addition to investing in the best science and math education the Nation can provide, it is also important that we fill the ranks, that we build capacity among our workforce in understanding and being able to solve problems that require math and science education.

Chairman BOEHLERT. Now, one of the things, if I were helping you with your answer, I would point out that NSF is peer-reviewed, and that is a real strength that I think you bring to the table, as opposed to just formula grants based upon numbers.

Ms. Dale.

Ms. DALE. I would say the first element is self-serving on the part of NASA. We have a workforce that is nearing retirement, and we need to be continually interested in making sure that we have a pipeline of students that are interested in STEM education, and we are actually working on the higher education programs and projects that continue these students on in the process, whether they go into NASA or somewhere else in the aerospace community, or into another high-tech area.

I think what NASA uniquely brings to the table is, frankly, our missions actually inspire kids. As you have no doubt heard before, NASA Administrator Griffin has talked about the impact of particular projects when he was a kid. Now, obviously, Sputnik, and then, the development of the Apollo program, and those programs actually have an impact on kids along the way to start to enter science, technology, engineering, mathematics fields.

In particular, one recent example is the New Horizons project launched to Pluto. We had the first student-built instrument on a planetary mission on that project. That is incredibly engaging for young people. These are students at the University of Colorado at Boulder who actually had the opportunity to build this. So, providing opportunities for students to actually have hands-on experience and build hardware for spacecraft, I think is our unique niche in this one.

Chairman BOEHLERT. Thank you. General Kelly.

Brigadier General KELLY. Thank you, Mr. Chairman.

I, too, would say there is a self-serving part of it, and that is, we need scientists to replace people who have the color of the hair that I have, and the other thing is, we have a large number of scientists, and—I didn't want to go down that path. The one thing that is true about scientists are the vast majority of them love to work with children, and love to impart their love of science to children, so we have a workforce that wants to do it.

The unique thing that I believe NOAA brings to the table is we are what I will call scientific practitioners. We don't deal with abstract science. We use science to solve real world problems, be they an ocean problem, be they making a weather forecast, and so, we have an opportunity to bring students into the workplace, work with scientists, and see how one can use science to help the citizens of the country.

And another reason, and I said it in my testimony, is that if you are going to make effective use of many of the products that NOAA

produces, you need to know something about science, and so, an educated public is important, and so, we work to do that.

Chairman BOEHLERT. Dr. Decker.

Dr. DECKER. We also have a very vested interest in science and technology. If you look at the Department's missions in energy, national security, environmental cleanup, and in science itself, science and technology is obviously critical to success in accomplishing the Department's missions, and clearly, we want the best scientists and engineers working on our problems.

A second reason why we are really interested in the science education, I think, is the capabilities that we can bring to the problem through our national laboratories. They are a great resource. We have used them to bring students and teachers into the laboratories to give them a research experience, to improve their content knowledge, that they can take back to their classrooms. And that resource has been recognized, I think, by other agencies. NSF has joined us in supporting programs to bring teachers into our laboratories, and NIH has also recently joined us in bringing students into our laboratories.

Chairman BOEHLERT. Thank you very much. Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

My father was a farmer, and after World War II, he, like a lot of folks, took advantage of the GI Bill, and went to MTSU, it was Middle Tennessee State Teachers College at that time, and got a degree in agriculture. I came along, and farming wasn't enough, you know, to pay all the bills, so he became a teacher. And he taught high school science, and coached the girls' basketball. Now, my father was a decent, good man and a bright guy, but I don't know what he knew less about, teaching girls—or coaching girls' basketball or teaching high school science. And he—it would have been difficult for him, Mr. Decker, to, I think, inspire you, because he didn't have the background in science that he needed to teach that course. And so, I concur with *Gathering Storm,* and most every report we see, is that it is—the place you start is with the teachers, and educating the teachers.

Now, Commissioner, or Secretary Spellings, I voted for *No Child Left Behind,* to the chagrin of many folks at home. Unfortunately, I think it has been underfunded and overregulated, although you are bringing some flexibility and common sense to it, and I congratulate you for that. But I am concerned that the President's American Competitiveness Initiative is also underfunded, and I am afraid, potentially, not properly prioritized, as I mentioned earlier. Of the $380 million that is being presented, $250 million of that is designated for developing math coursework for elementary and mid schools. That is 70 percent. Now, that might be a good figure if you had a bigger overall figure, and I wish you did, but we won't get into that today.

And so, I guess my question to you is with most all the reports saying that we need to put our attention on encouraging students to go into collaborative math/science education programs in college, as well as taking existing teachers and raising their skill level, it seems that, and not just in math, but across, you know, in math/science, and other areas, it seems that what this program is doing

is focusing on developing a better syllabus for teachers, only in those sort of math/science area—or the math areas.

Can you enlighten me?

Secretary SPELLINGS. Yes, sir, I can. Thank you for the opportunity to do that.

Let me first say that I completely agree with you that the teacher is key and essential, and that is, you know, where we are losing the battle, no doubt about it. That is why the President has called for ramping up advanced placement classes, and pre-advanced placement classes—many of those courses are taught in middle schools—so that we can make sure that folks like your dad have the necessary competencies.

Mr. GORDON. That is a very small part of the money that you are spending.

Secretary SPELLINGS. It is $122 million of the $380 million initiative. Let me speak to Math Now. And I do want to come back to advanced placement, because we know it is a scalable, proven model. We need to get beyond kind of these onesies and, you know, anecdotal incubators of program, into something that is more widespread, more scalable, and aligned to state standards and the requirements of *No Child Left Behind,* in my opinion.

With respect to Math Now, one of the things that I observe as we go around through schools is that in our elementary and middle schools, we lack a compelling research base, like we have in reading, not about particular curriculum products, but about the core tenets of effective practice. We need to develop that, and we need to fund those things just as we have done with Reading First.

Mr. Chairman, I agree with you about the competitive nature of those grants. The perfect model, I think, is a large program that is scalable and competitive, just like we have done in reading with Reading First. We ought to do that notion in math.

The important thing about the math/science partnership that we at the Department of Education run is that it is aligned to *No Child Left Behind.* While it is a formula grant, we said get your kids on grade level by 2014, and so, it is a combination of these things.

Mr. GORDON. Am I incorrect in the way I am reading this, that $250 million of the $380 million is designated for development of math coursework for elementary and middle schools?

Secretary SPELLINGS. It is to establish—help to establish a research base and fund programs that are based on that, whether they are—some of the activities that NSF has developed a research understanding around or——

Mr. GORDON. Isn't' that a relatively narrow focus?

Secretary SPELLINGS. No, sir. I believe that one of the things that is—that we are so challenged with is that the reason that we lose kids, and have a lack of students studying in our high schools is that we are not getting the pipeline right. We are not getting our elementary and middle school curriculum right. We are not seeding enough higher thinking, higher order thinking early enough, which needs to be done in that sixth through eighth grade kind of period.

Mr. GORDON. But is a teacher that doesn't have the background, even if they have a better syllabus, I mean—it looks to me like what you are trying to do is—and it is not that we shouldn't be

doing this, but just in terms of priorities, $250 million of the $380 million is going to develop a better syllabus for only in math and only in elementary and in middle schools.

Secretary SPELLINGS. That is also for teacher training, absolutely. Just like Reading First. Reading First is the—a model that says get a research base, get a program that is tied to that research base, and use that information to train your teachers, and that is what we mean to do with Math Now, pointed at elementary and middle schools.

Mr. GORDON. Well, I compliment you on this program. Once again, I think it is underfunded and too narrow in scope, and I hope that we will have a chance to work more on it, and I——

Secretary SPELLINGS. Thank you.

Mr. GORDON. I hope that you will call upon the expertise of the National Science Foundation that has had fifty years of well accepted and good programs.

Chairman BOEHLERT. Thank you very much. Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman.

Where is Sputnik when we need it? I have said that in a lot of different speeches over the years, and that is the basic problem. I have been in this business for 40 years now, starting in 1966, when as a very young physics professor, concerned about what was called, pardon me, mathematical illiteracy and scientific illiteracy at that point, I asked myself what can a young, insignificant physics professor do, and I decided to devote my energies to training future teachers in both science and how to teach science. And that has served me well in this position now.

But the big problem is grabbing the public's attention. As an example, a recent poll I saw said almost all parents agreed that having proper math and science education was an important issue in today's world. Sixty percent of them said they thought their children already had an adequate training in math and science. In other words, they just don't get it. They don't see the problem. So, we have a lot of work ahead of us.

Secretary Spellings, I am going to address most of my questions to you, although I have many questions for everyone, but—and I really appreciated the work you have done, both in the White House, and in the Department. You have been a breath of fresh air in Washington in many ways, and I hope the bureaucracy doesn't beat you down.

But I have several questions to pose to you, and in thinking about this problem, what can you do in your Department? NSF has a long history of working with us. They have good programs. They have done a superb job. You are breaking new ground with the Department of Education, and the question is what is an appropriate and effective federal role in this issue of math/science education, because as you know, there is a great aversion in certain segments of the public to the Federal Government doing too much. It seems to me, and I am asking your opinion on these, that teacher training is a very important thing that we can do. That seems to be the biggest problem at the moment. Developing teachers' acquaintance with and familiarity with and confidence in their ability to do math and science and to teach it.

My question is, should the Federal Government also, then, apply, develop some teacher training standards to be used throughout the country, so that we have some sense of uniformity in this country? Something else, I think the Federal Government should do it. It is a very important thing. It is not determining curriculum, but we have a unique problem, because we are such a mobile nation, and as you know, both math and science are sequential in nature, and yet, we have different programs all over the country which use different sequences. So, it is very well possible for a math student, who is enrolled in a school where they teach percentage in the fall and fractions in the spring, transfers midyear, and get two semesters of one of those, let us say fractions, and no training in percentages at all. It seems to me it makes sense to develop a national sequencing of math and science programs that all curricula would have to meet. We wouldn't specify the curricula, but at least, let us unify the sequence, because so many people move so often, and I have an urban district. It is not uncommon for children to go to four different schools in one year. The national average is one change every four years, and we have to address that problems.

Reviewing and approving curriculum material, at least saying what is good and appropriate and what is not, seems to me to be a federal role, maybe not done by your Department, but perhaps supported by your Department. AAAS does that. To a certain extent, other agencies, but most teachers, I find, and school boards, and administrators, don't know which are the good math programs, which are the poor ones, which are the good science programs, and which are the poor ones. Another possibility is standardized teachers' tests or credentialing. There is—that is done on a voluntary basis. Maybe that has to be extended.

And another major problem that we face on a national level is the inconsistency of graduation requirements and university and college entrance requirements, and I, time after time, I come across cases where students are really in tough shape, because what they had in high school doesn't match what they need in their higher educational institution, and could your Department serve as an agency to develop some standard approach in that nationwide?

I would appreciate your reaction to these.

Secretary SPELLINGS. Thank you, Mr. Chairman. I think you have some very unique perspectives, since you serve both on this committee, and on the House Education Committee, which really gives you an understanding of *No Child Left Behind,* and all that that is about, as well as the needs here and the interests here.

You asked, I think, the most powerful question, really, at the beginning, and that is, what is the proper and appropriate federal role, and then, there are these various offshoot issues, including teachers, alignment, and all of the things that you mentioned, which I would love to speak to you.

But I think firstly, with *No Child Left Behind,* we said that we expected every state to develop standards in math and science, that we expected them to develop measurement systems around those standards, and that we expected every child to get to grade level by 2014. So, I wonder about curriculum products that federal agencies develop, are they aligned to state standards? We have built a tremendous appetite, as you know, for getting to that goal line, but

if those things are not coordinated with and aligned with, I am afraid that we are building a road to nowhere, maybe a little bit, with federal products that are not aligned with those goals.

Also, *No Child Left Behind,* as you know, is a powerful driver of this focus on results, and I think that ought to be our watchword throughout the government. My other observation, and you talked about it, it is what I call the tell us what to do, and we will do it phenomenon. I mean, this lack of understanding about what are the core principles, what are the core elements to effective curriculum products? Like we have done in reading, phonemic awareness, phonics, alphabetic principle, and the like. What are those correlates in math, and I think we do have—and science. The sequencing issue. I do think we have a responsibility to do those sorts of things, and I think the National Math Panel, that will be a joint effort of all of us, can be a part of that.

Finally, I think what we need to do, and most powerfully, particularly as we look at the results before us, we must go to scale on some effectiveness programs. We, you know, this is from my state days, the programs that were funded by the Department of Education or NSF in the old days, brought many times, our most capable teachers together, who were teaching four and five AP classes, largely at magnet schools, for summer institutes. They loved getting together, fed on each other, perhaps it helped them stay in the classroom longer. But what we need to work on is Representative Gordon's dad, the people who are in our classrooms today, teaching out of field. How are we going to get them and their skills ramped up and ratcheted up very quickly? That is, to me, the raging fire.

The other thing, I think, and I know you know, and this body voted on it yesterday as part of the Higher Ed Reauthorization, is the need to get more expertise in the classroom from the community broadly. Why can't a NASA scientist teach in our schools? How can we find ways to engage—I know IBM has committed 1,200 of their mid-career professionals into the teaching professions. How can we get other expertise from the community into our classrooms?

Finally, let me address some of the particular things that you mention. I spoke to the teacher issue. We need to make sure our client is the teacher who lacks the skill, not our most capable, most engaged teachers. The sequence issue, the National Math Panel can, I think, be helpful, and I completely agree with you about the lack of alignment between high schools and higher education, and my hope is that through the Academic Competitiveness Grants that you all just authorized as part of the reconciliation, which will provide additional Pell aid, and requires me as Secretary to define a rigorous course of study, determine who has taken that, and describe for each State, actually, each State will determine one, and make some linkages, finally, between the expectations of our higher education and the kind of student and preparation that is coming out of our high schools. We have put some incentives for students, and for the system on the table, $790 million worth of resources this very year, and I think that can be a powerful tool in doing that.

Chairman BOEHLERT. Thank you very much. The gentleman's time has expired. Madam Secretary, this committee doesn't build bridges to nowhere—well, committee. We chart a pathway to the future.

Ms. Hooley.

Ms. HOOLEY. Thank you, Mr. Chair.

Secretary Spellings, first of all, I want to thank you for your openness and your willing to look at some common sense reform of *No Child Left Behind,* particularly growth models, and I would love to work with you and share with you some of this information that I have.

I have a couple of questions. As you know, I am sitting at this table. We have a lot of agencies that have been very supportive of STEM education efforts, and they have done a great job. And in fact, when there was the Program Assessment Rating Tool, or PART, if you looked at what NSF did, all of their programs, 10 of their programs, have been assessed, and they all received the very highest rating.

So, my question is, on the basis of past performance alone, why the NSF has not been included in the education component of the American Competitiveness Initiative, and why are NSF's K–12 STEM education programs targeted for a seven percent cut in this '07 budget.

The second question is we find that elementary school math and science curricula frequently focuses on exploration and observation of natural objects and emphasis of trial and error. However, as students move into junior high and high schools, the curriculum tends to shift to textbook-dominated, with little emphasis on exploration. Why does this shift occur, and is that decision based on scientific findings?

And then, the third question that I have for the entire panel is what needs to be done to recruit and train more math and science teachers? What programs have worked, what programs have not worked, and what role can this committee help—play in helping this cause?

Thank you.

Secretary SPELLINGS. Thank you, Congresswoman. I look forward to visiting with you offline about the growth model notion, too. I am very excited about the prospects that that might have——

Ms. HOOLEY. Great.

Secretary SPELLINGS.—for *No Child Left Behind* as well. Let me first say the National Science Foundation absolutely is part of the Academic Competitiveness Initiative, as all the agencies represented here are, and I think they would tell you that. We are working closely together, as part of the Academic Competitiveness Council, that was recently created, and as well, on other initiatives that Dr. Bement spoke to in his opening statement, so that we are absolutely working together, and intend to do more of it, and appreciate the opportunity to talk together today.

With respect to exploratory, the exploratory aspect of curricula, those decisions, and those observations, as you said through local textbook adoptions and so forth, are largely made at the state level, and we at the Department of Education, and to my knowledge, I don't know that anyone here opines on the worth of that, but those

are local decisions, local curriculum decisions, set around local standards and so forth, and so——

Ms. HOOLEY. Do we have any—but I think it would help if we had some scientific basis about this is the best way to teach math or science. I mean, really—or not.

Secretary SPELLINGS. Well, and that is what I think we are trying to get at with the National Math Panel. What are the correlates? What is the proper sequence? What are the proper techniques? What are the correlates to what we know best about reading instruction that can be applied to math? As local school boards evaluate, and states evaluate curriculum products and textbooks, what ought they be looking for as the key elements of success? And I don't think at the federal level, we have done a very clear job of helping them understand that.

With respect to teacher recruitment, I think we have to work on lots of fronts. I think we have to get additional resources from the community broadly. We have to train our existing teachers, who are teaching out of field, and help, many times, not at their election, obviously, get them the skills necessary. If they are teaching biology when they are certified in math, let us help them get biology-certified through advanced placement and other models. And I think we obviously need to expand programs like Troops to Teachers, Teach for America, and all those sorts of things that have helped us get new career professionals into our schools.

Ms. HOOLEY. Okay. Thank you. Anyone else want to respond to that last question about what do we do to recruit math and science teachers?

Dr. BEMENT. Yes. Thank you. Let me draw examples from two programs within the National Science Foundation. One, the Math and Science Partnership. This is the largest program we have ever engaged in that brings higher education together with K–12 education in order to improve content proficiency, and also, to get more STEM faculty at the universities or institutes of higher learning engaged with education, as far as pre-service education is concerned.

Now, just to give you the numbers, we are currently engaging 1,000 STEM faculty at 150 institutions of higher learning. We have 50 corporate partners that are involved in this as well, and it is all to improve content. The other thing that I would like to touch on is our Teacher Professional Continuum, because it is not enough to prepare teachers and get them to the school. It is a question of can you retain them over a long period of time, because the turnover in well-trained teachers is a waste in the system, and it is something that we have to deal with, and while salaries is often held up as a major issue as far as retention, there are a lot of other issues as well. It has to do with resources. It has to do with professional development over time. So our Teacher Professional Continuum starts right from the stage of recruitment, and takes each of the various steps, to determine how we could reduce the barriers, and how we can improve the retention of teachers through professional development, and through those two means, getting higher education faculty involved in content development, and also in retaining teachers, we feel that we are making a contribution.

Ms. HOOLEY. Yes.

Ms. DALE. I was just going to add real quick that obviously, it will be a longer-term process, in terms of developing the best ways to recruit math and science teachers into the area. One thing, and I know we have talked about this previously, but given a workforce in the science agencies that you see up here, that are nearing retirement, I think this should probably be a much more active effort getting these scientists and engineers that are retiring, and figuring out ways in which they can transition into being science and math teachers throughout the country.

Ms. HOOLEY. Thank you.

Chairman BOEHLERT. The gentlelady's time has expired. Mr. Reichert.

Mr. REICHERT. Thank you, Mr. Chairman.

Chairman BOEHLERT. And we have 11 minutes on this vote, so the chair's intention is to have Mr. Reichert conclude his time, and then have a wee pause, as we dash over and dash right back. We will try not to inconvenience you too much.

Mr. REICHERT. Thank you, Mr. Chairman. I will make this quick. I do have to say, however, I am not one of the professors or scientists on the committee. My background is law enforcement. I was afraid of science. My son, however, graduated with a major in math economics, and a minor in biology. My grandson and granddaughter are thoroughly involved in and excited about science. They are eleven and nine years old, so there is some progress being made, at least in our family.

I want to say that, just a couple of quick questions. Are the scientists or engineers providing the research experiences required to undergo any sort of training? There has been discussion about that.

Secretary SPELLINGS. Do scientists——

Mr. REICHERT. Are the scientists or engineers providing the research experiences required to undergo any sort of training?

Secretary SPELLINGS. In teacher licensure and teacher participation?

Mr. REICHERT. Yes.

Secretary SPELLINGS. Most states, and *No Child Left Behind,* through the Highly Qualified Teacher Provisions, requires content knowledge for teachers. It leaves to states to describe how they do that, through their State licensure programs and the like, so it does vary around the country, to the extent that happens, but the law does require that they have a content basis, as opposed to a pedagogical basis.

Mr. REICHERT. Anyone else? You each run math and science partnership programs, and these programs were specifically designed by Congress to enhance coordination between NSF and the Department of Education. How are you coordinating your activities?

Dr. BEMENT. Well, let me say several ways in which we are coordinating our activities, and let me first emphasize that it occurs at every level within the two agencies. At the agency level, at the program level, and also, at the project level.

And at the agency level, we are very much involved in cosponsoring studies, like at the National Academy of Sciences, for example, on education. I am involved in a very important board in the Department of Education. And at the program level, the Math and

Science Partnership between NSF and the program at the Department of Education is very much intertwined. For example, two-thirds of the partners that we support in the 31 states are very closely coupled with the state math and science partnership programs that are supported by the Department of Education, so there is a direct transfer of not only information, but knowledge, between the two programs.

Furthermore, we both have an MSPNet, Math and Science Partnership Net, which disseminates information from both of our programs to the general public, and beyond that, we are working with the Department on their Math Panel, and also, their Science Panel, to exchange experience, and I would say that in some of the toolkits that they are developing, some of the information and evidence that goes into the construction of those toolkits is coming out of the NSF Math and Science Partnership program, so we are linked in many ways, all the way from the agency level to the project level.

Mr. REICHERT. Thank you.

Secretary SPELLINGS. Let me answer the question this way, and that is, and I love that NSF's motto is "Where Science Begins," and Dr. Bement talked about the four million students that are touched by their programs. We have 40 million students in our K–12 system broadly, and so, I think, you know, we look to NSF to incubate and provide information about some things that work, and then, we at the Department of Education, aligned around *No Child Left Behind*'s requirements for results for all students, try to help get those to scale through state math and science partnerships and the like. So it is very much a hand-in-glove sort of effort.

Mr. REICHERT. Thank you. I yield, Mr. Chairman.

Chairman BOEHLERT. Six minutes to go. Well, we are going to have to go over and vote. Would you like to be recognized? You can get it in like in three or four minutes?

Mr. MCCAUL. Thank you, Mr. Chairman.

Chairman BOEHLERT. You are recognized.

Mr. MCCAUL. And I will be very brief. I was meeting with the President yesterday in the White House, Madam Secretary, and he said what a great job you are doing, and I always think that that is important to hear what your boss is saying.

Secretary SPELLINGS. Thank you for that.

Mr. MCCAUL. I think you have great security.

Secretary SPELLINGS. And thanks for that, too.

Mr. MCCAUL. And thank you for the work you are doing. I am from Austin, and had the University of Texas and I want you to comment just real briefly, because our time is limited, on the advanced placement program, as it has worked in Texas, and how the Administration intends to apply that nationwide through the new initiative the President has talked about. And then lastly, the private sector angle, which you have referenced to, I think it is so important that we integrate that with the public school system.

Secretary SPELLINGS. Thank you for that medium speed pitch over the plate question. As you know, advanced placement, particularly since Bush served as governor of Texas, has been a huge priority of not only the government officials, but also the private sector and the philanthropic sector, like through the O'Donnell Foundation, and we have seen tremendous improvement, particularly

with our minority students. The President was in town, in Dallas, at Townview Magnet School, just a few weeks ago, and saw just these tremendous kids, so-called at-risk kids, all of them knocking the top off these advanced placement tests. We have learned that providing incentives not only for students, but for teachers to get interested and participate in those programs, has provided major, major value added, and the results are there. Since you are from Austin, also my hometown, I also want to put in a plug for the U-Teach Program that the National Academies report is so high on as well, which has people first as mathematicians and scientists, and then teachers, and that, too, has been very supported by the private sector and the philanthropic sector as well, so——

Chairman BOEHLERT. Madam Secretary, I am going to ask you to pause, as we go over to vote, but the Texans love it, and I just want to refer to Dr. Decker, who had the advantage of being born in upstate New York and raised in upstate New York. We will take a wee pause.

[Whereupon, at 11:20 a.m., the Committee recessed, to reconvene the same day at 11:53 a.m.]

Mr. EHLERS. [Presiding] Please. By that, I mean please sit down.

Okay, we have an unusual situation. There was supposed to be one vote. It is turned into two votes, because the Minority Leader is taking this opportunity for a privilege motion on the floor. So, I—other vote, I would come back, Mr. Boehlert would vote, and then come back, but he is detained there, and so I will preside in the meantime.

It is a bit unusual. There are no Minority Members here. I would be happy to recognize any if they show up, but I will proceed with various questions in the meantime.

First of all, I want to thank all of you very much for being here, and one comment I would make, which is not a question, but I know it is a concern to Secretary Spellings, because we have talked about it before, and also to some of you. You have all done a fantastic job of developing good educational programs, which are of great value to many different schools. I could pull in a number of other members from other departments, they are doing the same thing. I can pull in the American Chemical Society, and a number of professional societies. They are doing the same thing.

I developed an idea some years ago, unfortunately could not persuade enough people here to pass it into law, but I proposed that one legitimate good program the Federal Government could do would be to develop a website in which all of these different programs that are developed by you, by the private sector, by educational institutions, would all be on that website, and then, there would be reviews from users, just as amazon.com has reviews from readers. Teachers who use the programs would write in their reviews, give anywhere from one to five stars, and would—and you would have a complete system, or a good catalog, so any teacher teaching a topic could go to that website, say today, I am going to talk about guppies, or today, I am going to deal with the gas laws in my high school chemistry class, whatever, just type in the issue, there might be five or six special programs that would come up. The teacher could read the reviews, download everything she needed for the one she picks as the best, and we could go on with this.

Everyone I have talked to thinks this is a wonderful idea. It could be done either in the National Science Foundation or the Department of Education. My idea originated to do it as using the Eisenhower Clearing House, which existed at that time, which has fallen on bad times. It doesn't matter how it is done, but I—it really bothers me that all of you are doing this great work, and much of it, it just gets publicized by word of mouth from one teacher to another. We have to, as a government, systemize that, so that every teacher everywhere in this country has access to all these programs, and can take advantage of all the good work you do.

Okay, you can tell that my dad was a pastor, because I have just given you a sermon, and now, go forth and do good work.

Dr. BEMENT. Amen.

Mr. EHLERS. Yeah, amen. So, try to set this up and make it a working element.

I have several additional questions. One problem that I think we have in education is that every program, and not just yours, but every program, tries to aim at every student, from the most gifted to the most challenged. Now, how do you balance your programs, to make sure that our top students are getting what they need to be encouraged to go on, while still making sure that the equity is such that students who cannot succeed without special attention can still make the grade in your different programs? And this time, we will start right to left, so Dr. Decker, do you have any comments or ideas on that? How do you meet the needs of every student? What ideas do you have?

Dr. DECKER. Dr. Ehlers, actually——

Mr. EHLERS. Could you turn on your microphone, please?

Dr. DECKER. It is on.

Mr. EHLERS. Well, just pull it closer to you, then.

Dr. DECKER. Oh, okay. Sorry. Yeah, the programs that we run are mostly aimed at teachers, and what we have seen through our way of choosing teachers for those programs, we have done it by their national programs, we are selecting teachers from different areas of the country, urban areas, rural areas, and we are, I think, through that program, sort of affecting students at all levels. The diversity of students, the poor students, the good students, and that has been kind of our approach to it. We really focus on the teachers.

Mr. EHLERS. And what about your program in Argonne Laboratory? You have two things going on. What was it, Dardene School at Argonne, but also Leon Letterman was doing some things out of Fermilab. Weren't they aimed at students?

Dr. DECKER. Yeah, the—I am not familiar with the one at Argonne. The Letterman School, I think really is sort of an—if I remember right, it is——

Mr. EHLERS. I guess it is on Fermilab, both of them.

Dr. DECKER. Yeah, that is—correct.

Mr. EHLERS. That is aimed at students, correct?

Dr. DECKER. Yeah, that focuses on—it is more of an institute that focuses, really, on the good students, if I recall correctly, and at this point, I don't believe that the Department directly supports that school.

Mr. EHLERS. Okay. General Kelly.

Brigadier General KELLY. That is a tough question, Chairman Ehlers.

As I mentioned in my testimony, we have six different mandates which require us to tackle the total spectrum of education. We try to encourage the best and the brightest, and at the same time, we have got programs to attract females, under-represented minorities, and students from low income families, regardless of their academic ability. So, you will find ours is an eclectic mix, and we haven't been able, I don't—first of all, I don't think we can just focus on—given the existing authorizations, on the best and the brightest of the youth. We have got to take a much broader approach to it.

Mr. EHLERS. I totally agree, and let me just—an editorial comment. That is essential for the survival of manufacturing in this country, because we need workers who understand the basic principles of mathematics and science in the workplace, or they simply won't have jobs, and we can't compete. Ms. Dale.

Ms. DALE. Achieving the right balance, in terms of under-represented students, students that are really gifted, et cetera, is actually one of the charges that Secretary Spellings has given us, within the context of the Academic Competitiveness Council, which she chairs, and it is something that we will actually be grappling with over the coming months. And I would like to take this opportunity to thank Secretary Spellings and her leadership at the Department of Education, because I think what she is doing, in terms of, you know, a separate Tiger Team with NASA, NSF, Department of Education, Department of Energy, the agencies that you see up here, that have been meeting for quite some time to gain synergies within education, but also, this Competitiveness Council.

It is extremely important to pull all these elements together within the Federal Government, and focus on; do we have unnecessary duplication? Are we actually creating the right synergies, and also, another thing that is critically important within NASA, do we have the right evaluation tools? And I think we do in some of our programs, but not all, and we will be looking for best practices as we go through this interagency coordination.

Specifically within NASA, we have a mix of how we target. In terms of the best and the brightest, we target them through a graduate research program, and also, our undergraduate research program, and those are opportunities for both internships, and also, money for fellowships. We are also targeting intensely under-represented communities, those that are not typically represented in science, technology, engineering, and mathematics, and that comes through a whole host of programs in NASA, including Explorer Schools, SEMAA, which is the Science, Engineering, Mathematics Aerospace Academy, the Minority Undergraduate Science and Technology Scholarship Program, and several other. But I think it is something that we will continue to grapple with under Secretary Spellings' leadership.

Thank you.

Mr. EHLERS. Thank you. Dr. Bement.

Dr. BEMENT. Yes, thank you, Dr. Ehlers.

I will cite three programs to give an example. One is our ATE program, which focuses on community colleges, and tries to bridge

from community colleges to secondary education and K–12 schools, and also, the bridges between community colleges and four year colleges or universities, and to, again, provide content preparation, and reduce the loss of students through lack of retention.

The second program would be a series of programs in broadening participation to get more under-represented minorities, more women, more persons with disabilities, to enter the STEM field, and then, to provide them support, either scholarship support or motivational support, all the way through to the doctorate, if necessary, a bridge to the doctorate.

The third area I would cite is our GK12 fellowship program, which brings graduate students into the elementary and secondary schools, primarily to overcome some of the misunderstandings on what inquiry-based means and what rigor means. In the minds of some teachers, rigor is memorizing the periodic table, whereas to a scientist, what rigor means is being able to go into the periodic table, and understanding the relationship of structure to properties for a particular element. And in the case of inquiry-based learning, to many teachers, that means I ask the questions, and the students have to answer the questions, whereas what our graduate students are trying to impart is no, it is the other way around. We need to teach the students to ask the questions, but also, to develop evidence to help back up their understanding of the answer.

So, in these ways, we are not only dealing with the most gifted students, but also, the people that are the students that have issues having to do with learning, learning disabilities, or perhaps, need more motivation, need role models, need encouragement, as they go through their education.

Secretary SPELLINGS. Thank you, Mr. Chairman. Great question. As you know, that is exactly what *No Child Left Behind* is all about is every single group of students, poor, minority, special education students, and the like, and I think, you know, we have put the highway in place to hold ourselves accountable for the achievement of each of those students.

My experience is, as I travel around, is we are starting to see states and localities stretch their accountability systems and round out their accountability system with additional curricular areas, and as well, let us ask ourselves not just how many kids are merely passing the tests, or on grade level, but how many kids are acing the test? How many superstars do we have, and continuing to raise the bar for all students.

I am a firm believer in what gets measured gets done, as you know, and I think when we put that kind of focus, we will see those sorts of results. As you know, *No Child Left Behind* also has a teacher focus. The dirty little secret in education, not so secret any more is with some of our most experienced, most effective teachers are in our least challenging educational environments, and vice versa. And with the highly qualified teacher provisions, and the enforcement abilities there, you heard me talk about the 40 percent of the high schools who offer no advanced placement, I think that is the first place we go to focus on, you know, our most effective professionals allocated and charged with educating some of our most challenged students, particularly, as you said, if we in-

tend for those people to be employed in the workforce of the 21st Century.

I appreciate Administrator Dale's comments about the Academic Competitiveness Council. I have given them the assignment to look at who is their client, as we look at these various programs, and find ourselves with the right mix of our most gifted, as well as every student, and the opportunity that they may or may not have in this changing world.

Mr. EHLERS. Excuse me. I am going to have to learn more about the Tiger Team. It sounds intriguing. And I assume you are all using Macintosh computers, too, with the new Tiger Operating System. I had to get that one in. I hope that your idea of what you can measure gets done, if that comes to the Congress, it could really revolutionize things around here.

Secretary SPELLINGS. Uh-oh.

Mr. EHLERS. Quick question for Dr. Decker. There is a lot of interest in some quarters, not all, but in some quarters, in creating a statute giving a lot of additional—creating a lot of additional programs at the Department of Energy. My bias is more towards giving clear education authority to the Department, and then letting you build on existing efforts.

Are there any gaps in your programs now that you would most like to fill, and what would you spend additional educational funds on? Furthermore, do you need any new legislation to create any new, specific effort? Maybe you weren't even aware of the interest around here in writing this, statutory instructions for you.

Dr. DECKER. I don't believe we——

Mr. EHLERS. Pull your microphone closer again, there.

Dr. DECKER. Oh, I am sorry. It wasn't on.

Mr. EHLERS. Oh. Okay.

Dr. DECKER. Sorry.

Mr. EHLERS. That could explain it.

Dr. DECKER. Dr. Ehlers, I am not intimately familiar with those bills. I am not aware of any additional authorities that the Department needs in education. In our current programs, where we bring K–12 in-service teachers, and pre-service teachers in, we are expanding by about a factor of three or so, and with our '07 budget request.

Could we do more? The answer is probably, and we will certainly look at that for the future.

Mr. EHLERS. Okay. Thank you. Secretary Spellings, I would just like to continue, getting back to this Academic Competitiveness Council. I assume that is what you call the Tiger Team. What is the purpose of it, how are you going to measure success? How are you going to determine which programs are continued or expanded, and which programs are eliminated? And I am particularly concerned, because I know the National Science Foundation, which has always been the bulwark of math/science education, has lost funding in the last few years, and I hope that this is not a forerunner of some continuing deleterious effects for the Foundation.

Secretary SPELLINGS. No, sir. It is not. And that would not be our agenda at all. This Competitiveness Council was created as part of the Deficit Reduction Act at the early part of this year, and we have already met. I have given them the assignment, firstly, of

inventorying each and every program, who it serves, and what is their evidence—what sort of evaluation have they undergone, and so, they are hard at work doing that. We intend to have the work of this group completed within a year, by February of next year.

I think we all know that we wouldn't be having this hearing if we were using the $3 billion that we spend in this government at my Department and all the rest of them as effectively as possibly, and that we need to make sure that we are as smart as we can be with the programs we have, and as well as figuring out what the gaps are, and what we need to fill in, and for whom. And so, the first order of business is to inventory each of those, share information about overlaps between them, and then bring some of these policy issues to the forefront for you, as well as for us in the Administration.

Mr. EHLERS. Okay, thank you. Anyone else wish to comment on that here? Who is all involved in that? NSF and NASA, all of you are?

Secretary SPELLINGS. Plus the National Institutes of Health, plus the Justice Department, in various things they do over there. And just a full complement of federal agencies that are specified in the statute.

Mr. EHLERS. Okay. Well, thank you very much. I will probably have to go, and Mr. Boehlert should be back momentarily, so——

Dr. BEMENT. Mr. Chairman.

Mr. EHLERS. Yes.

Dr. BEMENT. If you have a moment, I would like to bring to your attention something that came to my attention yesterday, which I think would be of interest to you.

This is a newspaper article from the Pittsburgh Post-Gazette reporting on the Franklin Regional School District, and their performance in an international competition. The Franklin Regional fourth graders scored second highest in the world on the Third International Mathematics and Science Study, and—actually, they tied with Korea, and in the higher grades, the tenth grade students actually scored second highest in the world, just a little bit below Sweden, and if you look at their proficiency scores on the state tests, for both math and reading, in eighth grade, 90 percent of the school people scored proficient or advanced in math, 86 percent did so in reading, and in grade three, the figures were 92 percent in math, and 85 percent in reading. Really quite an outstanding achievement.

Mr. EHLERS. There are a number of those remarkable success stories in our nation, and the point is to spread the wealth, so to speak, and make sure that that——

Dr. BEMENT. The reading scale——

Mr. EHLERS.—those are not uncommon situations——

Dr. BEMENT. Right.

Mr. EHLERS.—but very common. I think that is the goal we all have. With that, I will be happy to yield the chair back to its rightful owner, Congressman Boehlert.

Chairman BOEHLERT. Excuse the rude interruption. The Speaker doesn't check with the Chairman of the Science Committee to determine the schedule, and we are reverting back over on the floor right now to the old fashioned partisanship. I have never seen par-

tisanship at a higher level in this institution in all my years here, and I came 42 years ago as a young staff member, and I have never seen the level of tolerance sink to greater depths. It is unfortunate. So, we have got a privilege resolution over there now that we are dealing with.

Be that as it may, let me ask, and we are not going to keep you here, because you have all got other demanding schedules. What we will do is submit some additional questions in writing, and we would very much appreciate timely responses, but the one thing, Madam Secretary, this is your first appearance before us, and you probably will notice the smile on the face of the gentleman to your left, because he knows, when he comes up here, we are like a paid cheerleading squad for NSF, but we—I happen to think very strongly, and this is shared by my colleagues, that NSF does so many things the right way, and so, once again, I want to salute you.

But I also don't neglect paying attention to other departments, and when you come here before this committee, it is not for confrontation. It is for cooperation. We are trying to sort of sort things out, and figure out the best way to proceed. And so, we are not trying to play gotcha with our questions, but we are really trying to elicit something more than just what is on the script, and whether it is this Administration or any Administrations. Of course, people from the executive branch are going to come up and put the best light on what their contribution is to the program under discussion, and—but we try to get beyond that, and one of the things that I have been disturbed about for the longest time is the fact that we are not able to attract to the classroom some of the best and brightest for teaching positions, and particularly, in the math and science area. It is not that our classrooms are filled with teachers who are not committed, who are not dedicated. They are, but in so many instances, we have our youngsters being taught maybe calculus or chemistry by someone who majored in French or history, dedicated, professional teachers, but not a major in their disciplines.

So, many years ago, partnering with a colleague of mine across the Capitol, Senator Jay Rockefeller, we developed a scholarship for service program. Initially, it was called the Boehlert-Rockefeller Program, and that didn't excite many people, so we renamed it after the founder of Intel. It is now called the Noyce Scholarship Program. And I think that personifies some of the problem areas that we are talking about, and were brought to light in the "Rising Above the Gathering Storm" report, which got a lot of people's attention, and I am glad it did. We have this program that provides stipends, scholarships, if you will, for juniors and seniors in college, majoring in science, math, or engineering, in exchange for an agreement to teach two years in our public school system for every year of the stipend. But the problem has been, it initially was not funded at all. We had authorizations, and we had feel-good press releases saying we have authorized this program, but authorizations aren't worth anything in and of themselves, unless they are followed by appropriations, and to the credit of the current Administration, we started funding the program, but only at a modest level, $9 million. That is all NSF has to work with.

So, I would imagine if I asked all of you for an indication, could you use more money, you would all raise your hand and say yes, but I know the process, and these are difficult, challenging budgetary times. But I would like to close with Dr. Bement addressing the question of scholarship for service, and is it working, and do you have any anecdotal information you can share with us?

Dr. BEMENT. Thank you, Mr. Chairman. Yes, it is working. It is a very important program, and our evaluations have been very positive. It is my goal to continue to increase this program. You will note that even though it is at a very small level, we were able to get it up about 11 to 12 percent in the '07 budget, but it—and I agree with you. It deserves more funding.

Chairman BOEHLERT. And Madam Secretary, we are moving on a trend, and we are doing it in some other agencies, and Mr. Rohrabacher of our committee has been particularly enamored with this concept, scholarship for service, and we have added that to NASA's authorization. Does that make a lot of sense to pursue that approach?

Secretary SPELLINGS. Sure, and we have done some other things that are akin to that. Loan forgiveness, that has been raised to $17,500 from $5,000 for teachers who are going to teach in those fields, and the Academic Competitiveness Grants, the additional Pell resources that you all have just made available to folks who are studying in those fields. I mean, I think there are different approaches to do this, but you know, the more teachers we can get in our schools that have math and science capability, the better off we are going to be, no doubt.

Chairman BOEHLERT. And what do I tell the youngsters of America of all persuasions, that an education, early, solid foundation in the math and sciences open up unlimited opportunities and career fields, and but—and I think they get that message, but then, when they graduate from college, Johnny and Suzie, for example, outstanding academic record, great resume, in terms of their proficiency in the sciences or math, and—but they are facing the prospect of maybe a $25,000 outstanding loan obligation they have got to begin paying back, and Johnny and Suzie might want to get married and start raising their own family, and we can understand that. So, do they take the offer to teach in the school system, or do they follow the dollars and get maybe twice what they would get if they go in the academic route, if they go with the Fortune 500 company. More often than not, they follow the dollar for all the reasons I previously mentioned, so I just would hope that you would continue to be as supportive as you have been, and we will work with you to try to convince the people downtown, as they develop the budget numbers, to provide more money in this arena, because it really works, and it achieves a desired objective.

With that, let me recognize Ms. Woolsey.

Ms. WOOLSEY. Thank you, Mr. Chairman.

Madam Secretary, I know you have to leave, but there are two of us that are left, and we would like very much to just make comment, at least. My comment is, I so hope you are using this passion and brilliance that you have brought here today—I mean, you are an amazing woman, thank you—to help the Administration get the big picture about freezing early childhood education, about under-

funding *No Child Left Behind,* and about student cuts that are equaling—student aid cuts over $12 million, so—billion dollars. So, I just hope you will take that out of here, and know you have got a lot of people behind you, and appreciate who you are.

You ask the question, why can't a NASA scientist teach in the classroom? Well, I have to tell you—I am not a NASA scientist. I was a management consultant, human resources consultant before I became a Member of Congress, and I was invited to teach at the community college, and teach basic human resources management, and you know, I have got the personality and the energy, and I certainly had the smarts, but you know what? I taught this class, and then, we would have a test, and I would have true and false questions that true and false were both right. I didn't know how to write a test. I mean, that is why what we need, you know, if you bring experts in the field, they have got to—I mean, maybe the scientist wouldn't have to give a test, but there is something lacking, and we need to help those other people. So, that would be something I thought was important.

And then, the other—a quick question. People say to me, "Woolsey, you have been there fourteen years. What is the best trip you have ever been on?" And without a question, the Antarctica. South Pole, Science Committee. There is nothing like it. But the most important impression that I got out of it was summertime, science and math teachers coming to the Antarctica, working in the labs at McMurdo Station, and learning and getting reinvigorated for coming back to the classroom, and carrying out their discipline. We——

So, my question is, are we doing enough of this? Are we funding it? Is—not for Members of Congress. It was very, very good for us, every one of us. But for the educators, the teachers. Ms.—Dr.——

Dr. BEMENT. We have a program called Research Experience for Teachers, and this is one of the programs that you are making reference to, but we involve teachers in all kinds of programs throughout the Foundation. Some of them may deal with oceanography. Some of them may deal with long-term ecological research sites, and if we involve the teachers, we also involve the students. So, this is a very important intervention in developing motivation, and also, in increasing interest in the STEM fields especially.

Ms. WOOLSEY. Thank you. General Kelly.

Brigadier General KELLY. We have two programs, one I mentioned in my testimony, Teacher at Sea, and while, we can't duplicate the Antarctic, we can, at least, put a teacher on a NOAA vessel that is out on a research mission, and they go our for extended periods of time, and our experience is that it does just what you said. It really revitalizes, reenergizes the teacher, and quite frankly, she becomes a bigger advocate for science than he or she was before they went.

We also have, at a smaller level, over the summer, we attempt to get teachers into some of our weather forecast offices, to work with forecasters and at our National Training Center. And our experience is, if you can get the teacher with practicing scientists, there is almost a natural chemistry that goes between both of them, and that helps. And your answer to your question, what federal bureaucrat would you know that you would ask could you do

more, who would say no, no, I couldn't do more. Of course, anyone would——

Ms. WOOLSEY. No, no. Of course, we could.

Brigadier General KELLY. Yeah. You certainly could do more.

Ms. WOOLSEY. All right. Thank you, I am going to yield.

Chairman BOEHLERT. And this is the final question, because we made a commitment to our panel, who are very busy people. Mr. Miller.

Mr. MILLER. Thank you, Mr. Chairman. I assume that Ms. Woolsey, when she said her best trip was to Antarctica, the best company on her trip was her trip to Iraq.

Ms. WOOLSEY. That was a good one.

Mr. MILLER. Ms. Spellings, my questions are for you. I very much agreed with your discussion with Ms. Woolsey that decisions about how to teach math and science should be based upon tough minded determinations about what works and what doesn't, and that that should be based upon clear-eyed, methodologically sound, dispassionate research. I have a couple of questions.

First of all, the charter school study from 2004. That was—the final volume of that was not published by the Department. It became public because the *New York Times* filed a Freedom of Information Act request. It turned out that the study concluded that charter school students were not doing as well, were not performing as well, as students in traditional public schools.

Your Department said that the reason it was not published was not that—the conclusions were politically inconvenient. It was because it was scientifically unsound. It was bad science. It was methodologically unsound. The conclusions were not supported by the data, whatsoever. It was bad science. I assume that that critique was reduced to writing, that there was a report, there were memoranda, there was correspondence.

Ms. Spellings, Secretary Spellings, would you release that, those written documents that contain your Department's critique, so the scholars in the area can both look at the report, and your Department's criticisms of it, and judge both? Would you agree to do that, Ms. Spellings?

Secretary SPELLINGS. Congressman, I will go back and investigate that. My memory is, a somewhat distant memory, is that there was division among the peers and so forth. Let me investigate what was at issue, but certainly, materials of the Department of Education that are not specifically precluded are available through the Freedom of Information Act and the like.

Mr. MILLER. Okay. Well, then a second study was on bilingual education, and again, that has not been released yet. We understand that the Department decided not to release it, again, based on the same kind of criticism about the soundness of the science behind it, which concluded that bilingual education programs worked better for students for whom English was a second language than did English only instruction. The Bush Department—the Bush Administration's view has been that English only is the preferred method of teaching, and this study commissioned by the Department reached a different conclusion. Again, it was not released. I understand that the Department has now agreed with the

scholars who performed it that they can release it on their own without the distribution or the stamp of approval.

Would you also release the—any documents within the Department's criticism of the methodology of that study?

Secretary SPELLINGS. I will certainly investigate both of those things, and get back with you about all of that information. Let me clarify, though, that the Department of Education does not have an opinion for or against English only. *No Child Left Behind* is about doing what gets kids onto grade level by 2014, and those are decisions that are made at the state and local level.

Mr. MILLER. Okay. But Madam Secretary, you would agree that the usual scholarly method is to publish a report, and have the scholars who prepared that report defend, in public, criticisms of their methodology and of their conclusions, and that by releasing both the Department's critiques and the reports themselves, we can have that debate, the scholars can have that debate.

Secretary SPELLINGS. So long as it meets particular standards of evidence and the like. When the Department of Education, or NSF, or any of these agencies puts their seal of approval——

Mr. MILLER. Right.

Secretary SPELLINGS.—on a piece of work, it carries tremendous weight.

Mr. MILLER. Yeah. Madam Secretary, I am not asking the Department to put the seal of approval on. What I want to know is why the Department did not.

Secretary SPELLINGS. Let me——

Mr. MILLER. And if I assume that that has been reduced to writing, those criticisms reduced to writing, if those could be released, so the scholars in the area could look, take a hard, dispassionate look at the study, the methodology, the conclusions, and the Department's criticisms, the reason the Department said that it would not put a stamp of approval or release those results, we could have a debate, a helpful debate, within the scholars in this field.

Secretary SPELLINGS. I will certainly follow up on the issues you have raised, Congressman. Thank you.

Mr. MILLER. And then finally, I understand the Department has ten regional research laboratories. Our staff on this committee has gotten anonymous notes thrown over the transom that those regional offices do regularly release reports that do, with wide fanfare and circulation, that support the Administration's policies, but there are various reports that have not been released, again because the criticism is that they are methodologically unsound, that they were bad science, but there seems to be a pattern of those reports being the ones that do not support the Administration's policy preferences.

Will your Department release any reports prepared by the educational research regional research labs, and the criticisms of them within the Department, so that scientists or scholars in this area can judge the methodology, the research, the conclusions, and the criticisms of them?

Secretary SPELLINGS. I am not familiar with these allegations about the research labs that you have mentioned, and so, let me likewise investigate those, as well.

Mr. MILLER. Okay. Do you know if——

Chairman BOEHLERT. Mr. Miller—the gentleman's time has expired, and we have been generous going over the time, and we will give you every opportunity to submit additional questions in writing.

Mr. MILLER. Okay.

Chairman BOEHLERT. But we do have a commitment, and we are—overextended our time.

Thank you all so much for serving as resources to this committee. We are in this together. Let us go forward. Hearing adjourned.

[Whereupon, at 12:30 p.m., the Committee was adjourned.]

Appendix:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Margaret Spellings, Secretary, Department of Education

Questions submitted by Chairman Sherwood L. Boehlert

Q1. What are the one or two most important steps the Federal Government should be taking to improve K–12 science and math education and what is the role of your agency in taking those steps? What is the single most effective program your agency runs to help take those steps? How do you know that that program has been effective?

A1. The most important role the Federal Government can take to improve K–12 math and science education is to effectively implement the *No Child Left Behind Act of 2001* (NCLB). NCLB provides the framework for setting standards and measuring progress against them. Reading and math are the foundational skills of science. Without mastery of both, knowledge of the science, technology, engineering and math (STEM) fields is impossible. We must continue to hold schools accountable for teaching all children to the highest standards in the early grades under NCLB. And we must expand NCLB's accountability principles to our high schools, while helping older students who have fallen behind in reading and math. It is important that our high schools graduate more students with strong skills in the STEM fields—not only to prepare them for the challenges they'll face in college and the global workforce, but to encourage them to enter STEM fields themselves.

With regard to your questions on the single most effective K–12 math and science program administered by my agency, the only program administered by the Department of Education that focuses exclusively on K–12 math-science is the Mathematics and Science Partnerships program. Because that program has not yet been through a rigorous evaluation, I am unable to make any definitive statement about its impact or effectiveness.

Q2. What do you think constitutes a quality program evaluation? Are there examples from your department or others of program evaluations that could serve as models? Which federal agencies have been most effective at conducting program evaluations? How is the Academic Competitiveness Council going to determine the effectiveness of the various federal education programs?

A2. Science teaches us to rely on research and data before reaching conclusions. In teaching science and math, educators must know, practice, and share what works. We must therefore insist on research-based instructional practices and data-driven education policies. Part of the work of the Academic Competitiveness Council (ACC) is to review the evaluations for all federal math and science programs. The ACC has asked each agency to submit information on the evaluations for each of its programs. Once this information is received the Council will consider the extent to which those studies incorporate the elements of a rigorous evaluation, such as randomized controlled trials or well-matched comparison groups. The Council will then determine, based on that review, which Federal STEM programs have real evidence of effectiveness as demonstrated through rigorous evaluations.

Questions submitted by Representative Bart Gordon

Q1. During the hearing, Mr. Miller inquired into the Department of Education's reasoning behind refusing to publish the two DOE sponsored studies.

The first incident involved the completion of the third part of a long running study evaluating charter school performance in educating children. SRI International conducted the study and produced a final report in 2004. The study concluded that children in charter schools didn't perform as well in state testing as children in traditional public schools. However, the results of the study weren't publicized because the Department of Education refused to release them.

The second case brought up by Rep. Miller involved a final report prepared by a Department of Education commissioned panel on bilingual education. Funded with $1 million, the expert panel surveyed the existing research and concluded that bilingual education works better in educating children for whom English is a second language than does an English only approach. Once again, the Department of Education refused to publish the results of the study. After months of negotiation, the Department released its copyrights to a private publisher.

Mr. Miller asked that the Secretary release Departmental records that explain the rationales for failing to put these reports out as Department of Education

reports. However, there are consequences to these actions that stretch beyond the rationale for a decision to publish or not. One consequence of the Department withdrawing its support for these reports is that, even if an outside publishing scheme can be arranged by the report authors as in the case of the bilingual education study, such publications will lack the broad, publicly-subsidized distribution and promotion that would come with the Department's support. Reports that have the advantage of Departmental subsidy are much more readily available to the public and the expert community than reports that are denied such support.

To say it another way, "officially" sanctioned reports come to enjoy the subsidy of the taxpayer in advertising and distribution, thus advantaging them in public discourse on education policy. Reports that are not so lucky must make their own way as best they can, assuming the authors are granted the right publish, making it much harder for those reports to muscle their way into public discussion.

Please provide to the Committee a description of how the Department provides for the release of approved reports. In other words:

- *What kind of public relations effort is made (news releases, advertisements in educational publications, mailings to researchers or practitioners, web efforts, contracts with outside sources to assist in raising the visibility of the report)?*
- *How many copies of a major research report are typically printed?*
- *Are copies of the report made available through DVD, Web pages or through other means of distribution? Who bears the costs of these alternative distribution means?*
- In distributing printed copies of reports approved by the Department, what proportion of recipients are typically charged for copies of the report?

A1. Prior to receipt of these questions, we responded to Representative Miller, who had already written directly to the Department about these reports. I have enclosed a copy of our response.

In response to your other questions, publication practices within the Education Science Institute and across the Department vary depending on the type of report, the subject matter, and the audience for the report. For example, the Institute recently released the *National Assessment of Title I: Interim Report to Congress.* The report was announced through the Institute's listserv, 700 paper copies were printed, and it is available for downloading through the Institute's web page. There was no press release and no public relations effort. This is the normal pattern for IES reports, except that most are not printed—the Institute depends on web distribution of pdf files as the primary means of public access. A very small number of IES reports receive extensive publicity. For example, reports from the National Assessment of Education Progress (NAEP), the most recent being the assessment results for science, are released at press conferences, are generally covered by news outlets such as C–SPAN, are printed in runs of thousands, have dedicated web sites, and are supported by briefings and outreach to States, associations, Congress, and the press. Other reports in this category are the annual report on the Condition of Education and the recent report from the National Assessment of Adult Literacy. All printed reports of the U.S. Department of Education are available free to the public from Ed Pubs.

Q2. Over the past year, accusations have come to the attention of Committee staff regarding a "scrubbing" of the Department of Education's Education Resources Information Center (ERIC) database. ERIC is a database of education related literature.

- *Would you please inform the Committee whether any citations of any material, in any form, have been removed (or otherwise shielded from being reported in a search) from the ERIC database during the past year?*
- *Have the criteria for including materials in the ERIC database changed at all since 2001?*
- *If any items have been removed from the database, or made otherwise unavailable, please index each item removed, and list the reason the item was removed from the database. We would prefer to learn that no items have been removed or made unavailable to searching and we hope you can reassure us on this score.*

A2. With regard to the question about the possible "scrubbing" of the Institute's Education Resources Information Center (ERIC) database, I assure you that no

"scrubbing" has occurred. There have been a relatively small number of deletions from the system for particular technical reasons. For example, a small number of full-text entries have been removed at the request of copyright holders, and duplicate entries have also been removed. Additionally, a technical error occurred in the fall of 2005 when a content aggregator working under a subcontract with ERIC downloaded to the ERIC site a massive number of records containing basic bibliographic information—8,768 of these records (e.g., obituaries and news items) were subsequently removed because they were not appropriate for ERIC. With these small exceptions, all historical records in ERIC are intact.

Further, we have recently launched an initiative to digitize historical holdings, which are now largely on microfilm. This will substantially enhance public access to the ERIC database.

The criteria for including materials in the ERIC database have changed since 2001. Prior to 2004, the work of ERIC was carried out by 16 separate clearinghouses, each with its own procedures and standards for including materials in the ERIC database. With the award of the new ERIC contract in 2004, we adopted new standards and criteria for selecting journals and non-journal materials for the ERIC database that are applied by content experts working for ERIC. The selection criteria are described at *http://www.eric.ed.gov.* The new ERIC is more comprehensive, cost-effective, and user-friendly than the previous version of ERIC.

Q3. Regarding Reading First, please provide the Committee with information regarding conflict-of-interest assessments or disclosure of interest requirements that the Department conducts when you:

- *appoint advisory panels;*
- *award grants;*
- *award contracts.*

If the materials are too voluminous, you may answer this question by reference to those materials, but please provide the referenced materials to the Democratic staff.

A3. In awarding Reading First grants, the Department convened expert review subpanels that evaluated State applications against statutory criteria and made recommendations to Reading First program officials as to whether an application should be funded or needed to be revised to address certain deficiencies. Applications that met all established criteria were recommended for funding.

The statute does not require the Department to screen the review panelists for conflicts of interest. The panelists are not hired by the Department as government employees and are therefore not subject to the federal conflict-of-interest laws and regulations. Furthermore, as a formula program, Reading First is not subject to the procedures we generally use in panels that evaluate discretionary grants. However, although not required by statute to do so, the Department did screen panelists for potential conflicts of interest. Applying the basic criteria used in screening panels in the discretionary grant area, we required expert reviewers to complete a questionnaire about direct and indirect conflicts of interest, including their connection to potential grantees and to commercial products that might be identified in applications.

The Office of the General Counsel and the program office administering the program reviewed and evaluated the questionnaires to determine if any conflict of interest existed, and the program office used those determinations in forming the review panels. In some instances, we eliminated a reviewer from consideration because we determined that he or she had too many conflicting interests to serve effectively as an expert reviewer. In some other cases, an identified potential conflict of interest was resolved by ensuring the proposed reviewer did not review the proposal giving rise to the potential conflict. For example, proposed reviewers who were employed by a State government were not assigned to review the proposal submitted by their State. Likewise, a proposed reviewer who either authored or co-authored a commercial product mentioned in a particular proposal was not assigned to review that proposal. All proposals were screened prior to review assignments to ensure that no reviewer was assigned to review a proposal from which he or she was recused. In most instances, no direct or indirect conflict was identified.

In response to the third question, awarding contracts related to the Reading First program, the Department has used only Department staff as reviewers. All Department staff serving as contract reviewers have been advised by the Department's Contracts and Acquisition Management (CAM) office about conflict-of-interest requirements, and have signed the standard disclosure forms used by CAM for this purpose. It is also my understanding that CAM staff followed their normal proce-

dures to help ensure that the contractors selected had no organizational conflicts of interests.

In response to a recent Inspection Report issued by the Department's Office of Inspector General concerning the Reading First program, I have committed to have staff from our Grants Policy and Oversight Staff and the Office of the General Counsel to review and expand the protocol for reviewing potential conflicts of interest when the Department uses outside review panels, to include both formula and discretionary grant panels. We are taking other steps to address the recommendations in the Inspection Report.

Q4. At the hearing, you made the claim that, "Long-term trends show that more reading progress was made among nine-year-olds between 1999–2004 than in the previous 28 years combined." *Could you please disclose the factual basis for this claim? In your response, please include the underlying data supporting this assertion.*

A4. In 1971, the average reading score for nine-year-olds on the National Assessment of Educational Progress long-term trend assessment was 208. By 1999, the average reading score had risen to 212, a gain of four points. In 2004, the average reading score was 219, a gain of seven points from 1999. The seven points is larger than the four-point gain made between 1971 and 1999.

Q5. The Department of Education funds ten regional research labs around the country. Committee staff have received information that those labs are required to submit any item that they wish to post on their web site to the Department for approval prior to posting, if the item was produced with any Departmental money.

- *Does the Department have such a requirement for any or all of its regional labs?*
- *If so, when was this policy instituted?*
- *If so, does the Department simply approve or disapprove of the materials or does the Department actively edit the substance of the materials?*

A5. The Institute has recently re-competed its 10 regional educational labs. The new contract requires each lab have a web site hosted by the Institute and that materials posted to the lab's web site conform to the Institute's data-quality requirements. There are four reasons for this requirement. The first is that the Institute is responsible by law for ensuring that reports that are generated by its contractors meet the scientific standards set out in the *Education Sciences Reform Act.* The second is that, in many cases, the regional lab contracts represent a small fraction of the business of the corporate entities that hold lab contracts. Under previous practice, the regional labs posted content on their web site that was supported by the Institute and mixed it together with content that was supported by other funders. A user finding content on the web site of, for example, the Northwest Regional Education Laboratory had no easy way to determine the provenance of that content and could easily assume that it was done pursuant to the lab contract and met the standards of the Institute. The third reason is that having the lab web sites hosted at the Institute allows all of their content to be indexed and searchable by users through the same portal and search process that subsumes other reports and materials produced by and for the Institute. The fourth reason is economy—the marginal costs for the Institute to host 10 regional lab web sites is small compared with the costs of each of those labs hosting its own web site.

Q6. The Department of Education funds a company to operate a "What Works Clearinghouse (WWC)." The WWC web page indicates that their mission is to "provide educators, policy-makers, researchers, and the public with a central and trusted source of scientific evidence of what works in education."

Just this month a very prominent researcher on math education, Dr. Alan Schoenfeld of Berkeley, published an account of his efforts to advise the WWC in their efforts to devise standards for evaluating what works to improve math instruction. Dr. Schoenfeld was invited by WWC to produce an essay for a special edition of the journal "Research in Middle Level Education Online" with a plan for WWC to publish a hardcover version subsequently.

Dr. Schoenfeld wrote his essay, which challenged the methods used by WWC to evaluate math education research. Dr. Jere Confrey, an expert in education methods who has chaired a prestigious 2005 National Research Council panel on math curriculum assessments, also produced an essay. Her essay criticized the very underpinnings of the WWC effort. WWC staff produced their own papers

which they intended to publish as well to make the case for what they had accomplished and why they were taking the approaches that they had. The end result would have been a very lively survey of WWC's approach to evaluating education research designed to generate discussion in the education research and policy community.

According to Dr. Schoenfeld, the Department barred WWC from publishing its essays, thus killing the special edition of the journal and the book. While Schoenfeld and Confrey were free to publish their work if they wanted to, the Department's step effectively suppressed dialogue in the education research community and amounts to censorship.

- *If WWC has to submit its work to the Department for clearance by political appointees, in what meaningful sense is WWC independent from the Department? Why should they be considered a "trusted source of scientific information" when their work is subject to censorship by the Department?*
- *The Department has made repeated claims in recent years that it wishes to use science to guide its policies. However, the actions reported by Dr. Schoenfeld reflect an effort to suppress publication and dissemination of ideas, opinions and findings. Such a step flies in the face of good practice in the research community. Please explain how suppressing informed discussion and publication is consistent with scientific values?*
- *The information provided by the Department indicates that the Math, Now! panel is to be modeled on the National Reading Panel. One of the criticisms of the reading panel is that they didn't have the time or resources to do an adequate review of the full scope of literature on reading. The Department has apparently used WWC to search the Math education literature and evaluate it. It would be useful to know if what WWC has identified as "meaningful" research will act as the filter for what you would have a math panel consider as valid research. Will the work of the WWC be used in any way to support the proposed "Math, Now!" panel?*

A6. Professor Alan Schoenfeld has asserted that the Institute "suppressed" a report he wrote that was critical of the processes used by the What Works Clearinghouse (WWC), a project of the Institute carried out by contract with the American Institutes for Research (AIR). Dr. Schoenfeld was hired by AIR to serve as a content advisor for a review of mathematics materials and curricula. AIR proposed to the Institute that it would edit an issue of an on-line journal published by the National Middle Schools Association that would contain essays by Dr. Schoenfeld and others. This activity was not covered under the terms of the contract and AIR was informed that time spent on it could not be charged to the government. Consequently, AIR withdrew from the project. Dr. Schoenfeld was informed of this and notified that he was free to pursue publication of his essay on his own. He did so. Nothing was suppressed or censored.

With respect to the question about the relationship between the WWC and the National Mathematics Panel, I expect that the Math Panel will find the WWC reviews of mathematics curricula useful. But the Math Panel will set its own standards of evidence and will determine what it considers meaningful research.

Q7. In response to a question at the hearing, you mentioned that other agencies that sponsor STEM education activities will be involved in the education component of the American Competitiveness Initiative, even though the funding is designated only for programs at the Department of Education.

- *In what ways will other agencies participate in the initiative?*
- *Do you anticipate any funds being transferred from the Department of Education to other agencies?*

A7. The American Competitiveness Initiative proposes to double the collective budgets of NSF, DOE Office of Science and NIST Core. By increasing research funding, ACI funding will contribute significantly to the training of STEM undergraduates, graduate students and post-docs who are integrally involved in this research. In the case of the NSF, the President's budget request includes increased funding for the Education and Human Resources Directorate as well as the research directorates.

I would also like to note that ACI includes a STEM evaluation program that aligns with the work of the Academic Competitiveness Council (ACC). Through the ACC, all agencies with STEM education programs are coming together to determine which programs are most effective in improving STEM education at all levels and to consider how to optimize the federal investment in STEM education.

The President's 2007 budget request does not transfer any programs from Education to other agencies.

Q8. Will the Academic Competitiveness Council develop a coordinated, cross-agency STEM education budget with identified priorities and agencies roles and responsibilities, and if not, why not?

A8. The ACC will be focusing on areas as set forth in the statute—to identify federal education programs with a mathematics and science focus; identify the target populations being served by such programs; determine the effectiveness of such programs; identify areas of overlap or duplication in such programs; and recommend ways to efficiently integrate and coordinate such programs. The improved integration and coordination of STEM education programs that results from the ACC will help focus these efforts while still allowing the agencies to prioritize among these and other programs to achieve their mission needs.

Questions submitted by Representative Eddie Bernice Johnson

Q1. The President's American Competitiveness Initiative includes $380 million in new funding for STEM education programs at the Department of Education. However, at the same time, the budget request cuts over $1 billion in funding for several programs that improve science and math achievement. Programs are eliminated that help to close the digital divide; that boost college preparation and graduation rates among high-risk students—including rigorous college math and science prep classes; and that ensure high-risk students stay in school and earn high school diplomas—the students we will need to attract to science and math to ensure we meet future demands for scientists and engineers.

Two of the programs eliminated, TRIO Upward Bound and GEAR UP, received passing grades in OMB's Program Assessment Rating Tool (PART) assessment process. Students participating in TRIO Upward Bound are four times more likely to earn an undergraduate degree than those students from similar backgrounds who do not participate in the program.

Such programs are important because, although Blacks and Hispanics constitute about 24 percent of the U.S. population, they fill only 10 percent of science and engineering positions in the U.S. workforce (Science and Engineering Indicators, 2006). The education programs eliminated in this budget proposal are the kinds of programs that will help address this imbalance.

- *How is this budget proposal consistent with the President's statement in the description of the American Competitiveness Initiative that "the bedrock of America's competitiveness is a well-educated and skilled workforce"? Why isn't it simply false advertising to tout funding increases largely for some limited math curriculum development, while slashing $1 billion from education programs that will add to the well-educated and skilled workforce the President rightly says is essential for American competitiveness?*

A1. The Administration is proposing $380 million for programs in the American Competitiveness Initiative to strengthen the capacity of schools to improve instruction in mathematics and science. We believe that these activities should be a national priority. Keeping our competitive edge in the world economy requires focused policies that lay the groundwork for continued leadership in innovation, exploration, and ingenuity. America's economic strength and global leadership depend in large measure on our nation's ability to generate and harness the latest in scientific and technological developments, and improving K–12 students' abilities in mathematics and science is the first step in that process.

Because of limited resources, the President is seeking to eliminate programs that are ineffective or duplicative, or do not reflect an appropriate federal role in education. In some cases, program activities are allowable under other existing programs. For example, districts seeking funds to integrate technology into teaching and learning may use other federal program funds, such as funds from their Improving Teacher Quality State Grants and Title I Grants to Local Educational Agencies. The President's proposed High School Reform initiative would provide a more comprehensive and more effective approach to improving high school education and focusing on increasing student achievement for all students. States and local school districts could choose the most promising strategies to meet these critical goals, including continuing activities that grantees carry out under programs like GEAR UP and TRIO's Talent Search and Upward Bound.

Q2. What are the reasons for eliminating successful education programs that target high-risk students and that have been shown to be effective, particularly since they also help improve science education?

A2. The Administration believes that a more comprehensive approach to addressing the needs of high school students is long overdue. Redirecting funds from programs like TRIO's Upward Bound and GEAR UP to the proposed High School Reform initiative would eliminate a disjointed approach that has not served all students well.

The Administration's PART assessment of Upward Bound found that the program is "Ineffective" because it has limited overall impact on high school and early college outcomes. Although roughly two-thirds of Upward Bound students enroll in college, research data suggest that the majority of Upward Bound participants would have enrolled in college regardless of their participation in the program. Upward Bound was found to have significant effects for higher-risk students with low educational expectations, but services have not been sufficiently well targeted to these students.

GEAR UP is another program that has not been able to demonstrate results in achieving key outcomes, such as increasing high school graduation and college enrollment rates. The PART assessment of GEAR UP found positive early results, but no data are available to determine whether GEAR UP services lead to positive long-term impacts. More importantly, GEAR UP services, like those of Upward Bound, are not designed to meet the needs of all students in all schools.

The Administration's High School Reform proposal would provide States with the flexibility to better prepare all students for college, especially low-income students and students who attend schools that fail to make adequate yearly progress under NCLB. Additionally, it would require a State plan for improving high school education and increasing student achievement, and it would hold States accountable for improving the academic performance of at-risk students, narrowing achievement gaps, and reducing dropout rates. More so than programs like Upward Bound and GEAR UP, the High School Reform proposal would give States the resources and flexibility to focus on critical needs that affect all their students, including such things as adequate math and science preparation.

UNITED STATES DEPARTMENT OF EDUCATION

OFFICE OF LEGISLATION AND CONGRESSIONAL AFFAIRS

May 24, 2006

The Honorable Brad Miller
U.S. House of Representatives
Washington, D.C. 20515

Dear Representative Miller:

I am writing to respond to your request to Secretary Spellings at a recent hearing of the Committee on Science, and your follow-up letter to her dated April 17, 2006, requesting two reports and documents pertaining to the two studies from the U.S. Department of Education. Specifically, you asked that the Department provide copies of the following: (1) the "third part of a study commissioned by the Department to evaluate charter school performance;" (2) "the report of a study on the education of children for whom English is a second language;" and (3) the "memoranda or other documents relied upon in determining that those two studies fell short of the standards of scholarship demanded by the Department[.]"

Referencing your first request, I have enclosed a copy of the 2004 charter school performance report from SRI International, *Evaluation of the Charter Schools Program.** Concerning your second request, Lawrence Erlbaum Associates ("Erlbaum") is scheduled to publish that report in the near future. You may wish to contact the publisher directly. Erlbaum is located at 10 Industrial Avenue, Mahwah, New Jersey, and its telephone number is (201) 258-2200. Finally, in reference to your request for "memoranda or other documents," internal, deliberative documents are protected from disclosure by the deliberative process privilege as part of the government decision-making process.

Thank you for your inquiry.

Yours truly,

Terrell Halaska
Assistant Secretary for
Office of Legislative and Congressional Affairs

*The SRI report is available at: http://www.sri.com:8000/policy/cep/choice/PCSP_FinalReport_2004_OPA_approved.pdf

ANSWERS TO POST-HEARING QUESTIONS

Responses by Arden L. Bement, Jr., Director, National Science Foundation

Questions submitted by Chairman Sherwood L. Boehlert

Q1. What are the one or two most important steps the Federal Government should be taking to improve K–12 science and math education and what is the role of your agency in taking those steps? What is the single most effective program your agency runs to help take those steps? How do you know that that program has been effective?

A1. To maintain America's preeminence in science and engineering, we must augment our nation's research enterprise by fostering innovation in K–12 science and mathematics education. Sustained federal support is critical to a comprehensive approach, including:

- Research on science, technology, engineering and mathematics (STEM) learning for both teachers and students;
- Development of challenging STEM instructional materials;
- Assessment of student and teacher knowledge;
- Evaluation of project and program impacts; and
- Implementation of proven STEM interventions in the Nation's schools.

NSF has specific programs that address each component of this within its comprehensive approach.

The Foundation's K–12 STEM education programs are administered primarily through the Education and Human Resources (EHR) Directorate, although programs in the Research and Related Activities Account also support K–12 education and outreach activities. Within EHR all programs focus on educational research, development, and evaluation in the STEM disciplines.

For example, within EHR's Division of Research on Learning in Formal and Informal Settings programs support a range of activities, including research on: (1) the integration of formal and informal learning; (2) developing and testing new materials and curricula; (3) new pedagogical techniques; (4) content and pedagogy education for K–12 teachers; (5) educational activities outside of the classroom; and (6) the application of new technologies to education. These programs are vitally important cogs in our nation's K–12 STEM education machinery.

As with all basic research, many of NSF's investments in research and education require years to develop and, thus, outcomes can be judged only retrospectively. Nevertheless, assessing performance of our programs is critical to all of NSF's strategic planning efforts. NSF employs a multiple, mixed-methods approach to evaluation. In general, our investments are judged to be effective. The impacts of our investments are determined in multiple ways using qualitative and quantitative techniques, including external assessment by Committees of Visitors (COVs) and the Advisory Committee for Government Performance and Results Act (GPRA) Performance Assessment, and by using the Program Assessment Rating Tool (PART) developed by OMB. PART assesses program performance in four areas: purpose, strategic planning, program management, and program results. It also complements and reinforces GPRA, emphasizing links between budget and performance. All the programs within NSF's People goal have been rated effective by the PART. In addition, NSF's science education programs have additional evaluation requirements:

- All EHR solicitations require every education project to have a sound project-level evaluation.
- Several programs have contractual support for program-specific on-line data collection systems to monitor program activities and outputs on an annual basis and to document trends over time. Other programs have made grant awards for an annual self-assessment monitoring collection or an annual program data collection system. (See Attachment A.)
- Third-party evaluations are also used to determine the impact of various programs. These studies are conducted so that in any given year approximately a third of the education programs will be engaged in evaluation planning and evaluation capacity building efforts, another third will be involved in on-going evaluation studies, and the final third will have recently completed their independent evaluation studies and will be in the process of assessing the results of the evaluation. While the bulk of NSF's programs are found to be

fully successful in these evaluations, NSF uses the results from these evaluations to improve programs that are not rated fully successful.

NSF is not alone in its awareness of the need to evaluate the effectiveness of its programs. The Academic Competitiveness Council (ACC) is an effort led by the Department of Education to identify and assess federal math and science education programs and make recommendations for coordinating federal spending on STEM education. ACC representatives from all of the federal agencies with STEM education programs have been meeting since early March.

Q2. The National Science Foundation administers many education programs through the Education and Human Resources Directorate but it also supports education activities within the research directorates. How do you coordinate these activities across the foundation? How do you share best practices within the foundation, from program to program or directorate to directorate?

A2. Coordinating education activities across NSF is a priority. We strive to integrate research and education through our programs and funding activities. This is done in many different ways. Most of the coordination is through program director interactions. In addition, EHR has periodic joint senior staff meetings with each of the research directorates to discuss existing collaborations and identify additional opportunities for cross-directorate collaborations. These meetings provide ample opportunity to coordinate education activities across the Foundation.

Best practices are shared within the Foundation in similar ways. For example, NSF's Science and Technology Centers (STCs) have an Education and Outreach component and STCs are now explicitly evaluated on research, education, diversity, and knowledge transfer—to the point where they have strategic plans for education and diversity. This is a direct attempt to ensure that the education activities of STCs incorporate best practices in both education and diversity. A similar process exists for Engineering Research Centers in the Directorate for Engineering's Division of Engineering Education and Centers.

One of EHR's roles in most cross-disciplinary initiatives like nanotechnology and the former Foundation-wide Information Technology Research (ITR) Priority Area is to promote best practices in the integration of research and education based on knowledge gained through education activities in EHR. This normally takes the form of incorporating some form of assessment into the cross-disciplinary activities.

EHR Program Officers are often involved in discipline specific education and outreach programs such as Broadening Participation in Computing in the directorate for Computer and Information Science and Engineering and Cyberinfrastructure Training, Education, Advancement and Mentoring in the Office of Cyberinfrastructure.

In addition, during recent meetings of the National Science Board's Committee on Education and Human Resources, various NSF Assistant Directors have provided briefings on their activities that support the integration of research and education.

Attachment A

Evaluation Activities for NSF's Science Education Programs

- The following programs have contractual support for a program-specific on-line data collections system to monitor program activities and outputs, such as the number of students obtaining STEM degrees, on an annual basis and to document trends over time:
  - Math and Science Partnership
  - Centers for Research Excellence in Science and Technology
  - Louis Stokes Alliances for Minority Participation
  - Graduate Teaching Fellows in K–12 Education
  - Integrative Graduate Education and Research Traineeships
  - Robert Noyce Scholarship Program
  - Graduate Research Fellowships
- The following programs have made grant awards for an annual self-assessment monitoring collection or an annual program data collection system:
  - Historically Black Colleges and Universities Undergraduate Program
  - Tribal Colleges and Universities Program

- Model Institutions for Excellence
- Advanced Technological Education
- Alliances for Graduate Education and the Professoriate

- It is anticipated that approval for the implementation of monitoring systems for the STEM Talent Expansion Program and the Informal Science Education program will be granted in FY 2006.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Shana L. Dale, Deputy Administrator, National Aeronautics and Space Administration

Questions submitted by Chairman Sherwood L. Boehlert

Q1. What are the one or two most important steps the Federal Government should be taking to improve K–12 science and math education and what is the role of your agency in taking those steps? What is the single most effective program your agency runs to help take those steps? How do you know that that program has been effective?

A1. One step already taken is for federal agencies to continue to replicate the National Reading Panel model, which determined the instructional model and content for reading. This process is already in work with the recently announced National Science Panel. Second, the Government should review science and math content developed through federal agency research and development programs and then assess how this content can be used to support teacher pre-service and in-service education. Each of these areas is being taken up by the recently formed Academic Competitiveness Council chaired by the Secretary of Education.

With regard to NASA's role, in the first example, NASA is working with other federal agencies bilaterally (NSF & Education) & multilaterally (Department of Education-coordinated Tiger Team and the National Science and Technology Council Committee on Science subcommittee on Education, Workforce & Diversity) to provide input to the development of the recently announced National Science Panel. In the second example is NASA's Langley Research Center pre-service program which uses the Agency's unique content, people and facilities to train pre-service educators. NASA's unique program content is provided for in-service teacher training through NASA's Network of Educator Astronaut Teachers, NASA Explorer Schools and the Aerospace Education Services Program, each of which develops NASA-based content consistent with and complementary to the national and individual state education standards.

NASA's Explorer Schools (NES) program is one of many innovative projects focused on STEM education that the Agency makes available to support students, teachers, and families in all 50 States, DC and Puerto Rico. The NES program was recently chosen as one of the Top 50 Government Innovations for 2006 by the Ash Institute for Democratic Governance and Innovation. Through this selection, the NES program was recognized for being one of the most innovative, creative and results-oriented efforts in the Government according to the award criteria. The National Selection Committee on Innovation in American Government will name the most innovative agencies, from among the top 50, in July during a ceremony in Washington.

NES provides school teacher & administrator teams working with under-served or under-represented populations at the 4–9 grade levels with enhanced teaching and learning in STEM education through professional development, stipends, grants and curricular support based on NASA resources.

NES performance is annually measured and analyzed through internal and external data collected from surveys, focus groups and observations of all target audiences; students, teachers, and families. This includes a formal assessment by Wheeling Jesuit College experts in education evaluation. Measures of success include:

Benefits to Teachers

- Teachers were asked to identify specific benefits and challenges they encountered when implementing the program. 90 percent of surveyed team leads responded that they were satisfied with the program. 94 percent expressed they benefited "a lot to some" from the program. School teams report the program had a rejuvenating effect on them.
- Teachers who have been teaching for ten or twenty years repeatedly acknowledge the impact NES has in expanding their instructional capabilities in addition to building their confidence for teaching science and mathematics. Following extensive training in specific areas, teachers feel more confident in presenting NASA-focused material to their students while at the same time being able to better convey its relevance. A fifth grade science teacher in the Program observes, "I am not just teaching the facts but am able to explain why these things are important and how they are used in the world."

Benefits to Students

- 88 percent of surveyed team members have indicated the NES program benefited students. Results from student questionnaires indicate the program increased student interest in STEM disciplines as a result of exposure to exciting NASA science resources and curriculum, astronaut visits, communication with NASA scientists through DLN, and special student and family events. Across the data sources, students report being inspired by attending a NASA Explorer School.
- Students report learning more about STEM topics and show interest in pursuing more STEM experiences and knowledge. Students showed significant growth in how successful they think they will be in a career requiring scientific ability. Although data is not available for all schools, early indicators show an increased performance on homework, school tests, and even state achievement exams. At Bay Saint Louis, Mississippi, the NES Team focused on engaging students with more challenging learning opportunities. Pre- and post-tests indicated that the new teaching methods were extremely effective in delivering content and sparking student interest. "Our school scores increased from a level 3 (on a scale from one to five) to a level 5. We had earned the distinction of being an exemplary school. When we further evaluated the scores, we recognized the impact of NES participation in significant ways."

Increased Use of Technology

- The NES program increased technology use by students and teachers by providing schools with funds to purchase technology, such as video-conferencing equipment and with opportunities for connectivity to other schools and science experts. "We have obtained video-conferencing equipment and our students have been able to participate in distance learning with NASA Centers." Teachers rated the impact of the program on their use of the knowledge and skills in the application of science, technology, engineering, mathematics, and geography at a level of 4.5 on a scale of one to five and the impact of the program on their use of the knowledge and skills in instructional technology for students at 4.5.

Q2. NASA administers education programs through the Office of Education but it also supports education activities in other organizational units, including mission directorates, centers, and other offices. How do you coordinate these activities across NASA? How do you share best practices within NASA, from directorate to directorate or center to center?

A2. The Assistant Administrator for Education is the responsible official for ensuring all aspects of NASA are maximizing their potential to highlight the Agency's people, resources, and facilities in support of the Nation's education efforts to develop the skilled workforce necessary to achieve the Agency's goals and objectives. The primary mechanism for this close coordination is the Education Coordinating Committee (ECC).

Chaired by the Assistant Administrator for Education, the ECC includes representatives from Office of Education, each Mission Directorate and NASA Center, the Office of Human Capital Management, the Office of Diversity and Equal Opportunity, and other Mission Support offices as needed to ensure that workforce requirements are identified and met, and that education efforts are aligned and focused on building the future workforce. Members of the ECC speak authoritatively on behalf of their organizations.

The ECC is a collaborative structure that maximizes NASA's ability to maintain an integrated education portfolio and strategically manage the implementation of numerous programs, projects and activities in a distributed system. To accomplish the Education Outcomes outlined in the NASA Strategic Plan, the ECC plans and strategizes collaboratively, allowing the Assistant Administrator of Education to assess and evaluate the health of the entire education portfolio. The ECC provides an overarching Agency structure where issues are fully discussed. The ECC also provides checks and balances for effective internal control and ensures the successful achievement of education goals and portfolio. With input from the ECC, the Assistant Administrator for Education maintains control of architectures, strategy and top-level requirements, while Mission Directorates and the Office of Education maintain control of schedules and budgets for their own programs. NASA Centers execute and implement programs, projects, and activities and have a voice on the ECC to ensure coordination, integration, and teamwork.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Brigadier General John J. Kelly, Deputy Under Secretary for Oceans and Atmosphere, National Oceanic and Atmospheric Administration

Questions submitted by Chairman Sherwood L. Boehlert

Q1a. What are the one or two most important steps the Federal Government should be taking to improve K–12 science and math education and what is the role of your agency in taking those steps?

A1a. The Federal Government should help state and local officials ensure there is a strong connection between Science, Technology, Engineering and Mathematics (STEM) education and everyday science applications to help motivate students and enable them to see the value of their education. The Federal Government needs to hold states accountable for ensuring that every math and science course is taught by a teacher who is highly qualified in those subjects, as is required by the *No Child Left Behind Act.* NOAA works to understand the Earth system in the areas of weather, climate and ecosystems and for providing that information to the public to inform decision-making to increase social, economic, and environmental prosperity. NOAA is able to provide daily, applied examples of the importance and applications of these sciences for the general public, as part of a larger effort to increase interest and performance in the sciences. NOAA is an active participant on the Academic Competitiveness Council (ACC). The Council provides a forum to coordinate the federal effort in science, technology, engineering and math education to establish common goals, harmonize approaches, and develop consistent standards of evaluation. NOAA is involved in all three of the ACC working groups, K–12, higher education, and informal education.

Q1b. What is the single most effective program your agency runs to help take those steps? How do you know that that program has been effective?

A1b. The only K–12 program in which NOAA is proposing to participate in FY 2007 is The JASON Project. JASON, founded in 1989 by Dr. Robert D. Ballard, is a nonprofit educational organization headquartered in Ashburn, VA. Its mission is to inspire in grade-school students an interest in science, math, and technology through hands-on, real-world scientific discovery. NOAA has requested $1 million in our FY07 budget for The JASON Project, which has previously been supported by NOAA (FY05–06) through earmarked funds. The $1 million request is the appropriate level for this program given the current constrained fiscal environment.

The JASON Project focuses on scientific expeditions with supplemental science and geography curricula. JASON reaches a million fourth–ninth grade students and 20,000 teachers every year and combines authentic science and classroom curriculum with video and tele-presence to enhance environmental and scientific literacy and to promote NOAA sciences.

Q2. The National Oceanic and Atmospheric Administration (NOAA) administers education programs through the Office of Education but it also supports education activities in other operating branches, such as the Office of Oceanic and Atmospheric Research and the National Ocean Service. How do you coordinate these activities across NOAA? How do you share best practices within NOAA, from branch to branch?

A2. The NOAA Office of Education serves as the primary point of contact for NOAA on education issues. The Director of Education coordinates with NOAA programs for which education is an important element, through the Education Council and other education mechanisms as appropriate and administers programs within NOAA whose primary purpose is education. Programs administered through the Office of Education include the Educational Partnership Program, Environmental Literacy Grants, and the Hollings and Nancy Foster Scholarship programs.

ANSWERS TO POST-HEARING QUESTIONS

Responses by James F. Decker, Principal Deputy Director, Office of Science, U.S. Department of Energy

Questions submitted by Chairman Sherwood L. Boehlert

Q1. What are the one or two most important steps the Federal Government should be taking to improve K–12 science and math education and what is the role of your agency in taking those steps? What is the single most effective program your agency runs to help take those steps? How do you know that that program has been effective?

A1. We are of the opinion that the two most important ways the Federal Government can improve science and math education is first to help ensure that there is a highly qualified teacher in every classroom and second, to help ensure that students have the opportunity in their schools to study science and math every day of the school year and every year throughout their K–12 education. The President's "No Child Left Behind" initiative has put great emphasis on providing a qualified teacher in every classroom. Providing opportunities for professional development for science and math teachers is an area where the Department of Energy (DOE) and the national laboratories have played and will continue to play a valuable role.

One education program that we feel has been effective in this regard is the Laboratory Science Teacher Professional Development (LSTPD) activity within our Workforce Development for Teachers and Scientists program. Created in 2004, LSTPD is an in-service teacher professional development program targeting the Nation's K–12 science, technology, engineering, and math (STEM) teachers with an emphasis on middle and high school. The primary LSTPD goal is to create a cadre of STEM teachers who have the proper math and science content knowledge and scientific research experience to perform as leaders and agents of positive change in their local and regional education communities. A primary expected outcome of the program is that participating teachers will better educate and inspire students to study and become more involved in academic and extracurricular STEM activities, eventually raising student achievement on standardized tests and ultimately leading to more highly qualified students pursuing STEM majors in college. To achieve these results, the program provides K–12 classroom teachers long-term, mentor-intensive professional development through scientific research or research-like opportunities at the national laboratories over a three-year period.

The evaluation of the LSTPD is in part based on components completed by the participants: a content knowledge self-assessment; a professional development plan; a professional practice inventory; and an education module that is submitted by each participant. Several teachers have also submitted research abstracts, papers, and posters related to their research at the national laboratories. The program uses the teachers to collect data that will support the program evaluation and also be useful to the teachers in their classrooms and in their own professional development.

An independent educational testing and evaluation company, WorldViews, LLC conducted an external evaluation in May of 2005 and found the program to be a success in its pilot year. A full evaluation of the impact of this program will be done in 2008. Evaluation will include but not be limited to: evidence of improved content knowledge through testing of teachers; review of teacher work portfolio, technical/scientific publications, and presentation; classroom assessments by outside evaluators; evidence of leadership shown by teachers organizing/presenting workshops and instituting new classes or programs in their respective school systems such as Advanced Placement courses, science fairs, and science. bowls; and evidence of impact on students, as shown by more students taking advanced or elective science and math courses and participating in science fairs and science bowls, more students pursuing science, math, and engineering majors, and improved standardized test scores. This evaluation will be repeated at year ten of the program.

Q2. The Department of Energy (DOE) Office of Science administers education programs through the Office of Workforce Development for Teachers and Scientists but it also supports education activities in other ways, including through overhead-funded programs at the National Laboratories. How do you coordinate these activities? How do you share best practices within DOE, especially among the National Laboratories?

A2. Each year the Workforce Development for Teachers and Scientists (WDTS) program convenes a meeting of representatives from all the national laboratory edu-

cation offices to discuss how the laboratory educational programs can be leveraged and how the laboratories can work together. During this four-day meeting, laboratory education directors and staff review the past year's results and evaluations, and share best practices and outreach efforts. They also set the plans for how the laboratories will work together in common national programs, such as those in teacher professional development.

WDTS also provides a central online system for all the laboratories to list their educational opportunities and through which students, mentors, and faculty can.

Question submitted by Representative Bart Gordon

Q1. The energy authorization bill passed last year has important initiatives in science and technology education including the Science and Engineering Education Pilot Program (SEEPP) headed by Oak Ridge Associated Universities contained in Section 983. In light of the President's increased interest in science education in the State of the Union Address, will the Administration use the requirement to spend 0.3 percent of its energy research and development budget on science education to get a jump start on this and other priority science education efforts?

A1. The *Energy Policy Act* authorizes appropriations for Section 983 for FY 2007, 2008, and 2009 under the Energy Enhancement Fund. Office of Science staff have met with representatives of the university consortia regarding their initial proposals and have begun investigating how we would work towards ensuring a productive end. There is no funding in the 2007 budget for this pilot program. The Department of Energy (DOE) has not yet formulated a response to the 0.3 percent budget assessment called for under the Energy Enhancement Fund.

This issue has been somewhat overtaken by events including the recent establishment of the statutorily-mandated Academic Competitiveness Council (ACC). We are reluctant to move forward with an entirely new program at DOE until the ACC completes its inventory of Federal math and science education programs and presents findings and recommendations on a government-wide basis.