

Workforce Development for Teachers and Scientists

Funding Profile by Subprogram

(dollars in thousands)

	FY 2007 Current Appropriation	FY 2008 Original Appropriation	FY 2008 Adjustments	FY 2008 Current Appropriation	FY 2009 Request
Workforce Development for Teachers and Scientists					
Student Programs	4,274	4,433	-40 ^a	4,393	4,615
Educator Programs	3,308	3,180	-29 ^a	3,151	7,498
Program Administration and Evaluation	370	505	-5 ^a	500	1,470
Total, Workforce Development for Teachers and Scientists	7,952	8,118	-74^a	8,044	13,583

Public Law Authorizations:

Public Law 95–91, “Department of Energy Organization Act”, 1977

The Albert Einstein Distinguished Educator Fellowship Act of 1994

The Omnibus Energy Legislation: Sec. 995. Educational Programs in Science and Mathematics amends Public Law 101–510, “DOE Science Education Enhancement Act”, 1995

Public Law 109–58, “Energy Policy Act of 2005”

Public Law 110–69, “America COMPETES Act of 2007”

Mission

The Workforce Development for Teachers and Scientists (WDTS) program helps ensure that DOE and the Nation have a sustained pipeline of highly trained STEM workers. That workforce includes DOE federal employees, the DOE national laboratories, and more broadly, the university and private sector institutions that perform the science and technology required for DOE to achieve its goals in energy, environment, national security, and basis discovery. WDTS accomplishes this mission primarily by providing hands-on science and technology learning experiences to the Nation’s students and educators of STEM. The Office of Science sponsors research at all of the Department’s 17 national laboratories and the WDTS program, primarily through that laboratory system, offers students and educators an unparalleled opportunity to improve their understanding of science and to develop their ability to reason scientifically through direct experience.

Description

In 2007, a series of stakeholder meetings was held to assist in the development of a new direction that is consistent with the Administration’s American Competitiveness Initiative (ACI), and the goals of the Congressionally-mandated Academic Competitiveness Council (ACC) Report, the 2005 Energy Policy Act, and the 2007 America Competes Act. As a result of this effort, the WDTS program has been restructured to include:

^a Reflects a reduction for the 0.91% rescission in P.L. 110-161, the Energy and Water Development and Related Agencies Appropriations Act, 2008.

- Rigorous evaluation of all WDTS programs, consistent with the recommendations of the ACC Report.
- Focused efforts for on-going programs for undergraduate students and educators that will fill critical skill gaps identified through a workforce assessment effort.
- Expansion of the Academies Creating Teacher Scientists (ACTS) program to 600 educators per year by FY 2010 and promotion of ACTS as a model Federal national program for K–12 educators.
- Implementation of several new initiatives in the outyears consistent with recommendations from WDTS stakeholders and the ACI.

WDTS programs are designed to provide students with an uninterrupted pathway to STEM careers at the Department, its national laboratories, and other institutions that support scientific disciplines consistent with the Office of Science’s mission. WDTS supports the following subprograms that are designed to provide appropriate opportunities at various stages in STEM career paths:

Student Programs provide experiential learning opportunities to enhance student understanding of science and to increase their interest in pursuing science, technology, engineering, and math careers. Included within this newly restructured subprogram in FY 2009 are Science Undergraduate Laboratory Internship (SULI), Community College Institute (CCI), Pre-Service Teachers (PST) (formerly funded under the Undergraduate Research Internship subprogram), and the National Science Bowl (formerly funded under the Pre-College Activities subprogram).

Educator Programs make the world-class intellectual and physical assets of the Department available to the U.S. education community. Included within this newly restructured subprogram in FY 2009 are DOE Academies Creating Teacher Scientists (ACTS), Faculty and Student Teams (FaST), and the Albert Einstein Distinguished Educator Fellowship (formerly funded under the Graduate/Faculty Fellowships subprogram).

Program Administration and Evaluation activities, which include partnering with Federal agencies, industry, academic institutions, and professional associations to leverage resources and expertise in workforce development; developing and deploying rigorous evaluation methods for all programs; developing longitudinal workforce studies that track students and educators who participate in DOE programs; and improving outreach efforts to communicate to the broader public the role the Department plays in STEM education and the opportunities that are available to students and educators. Included within this newly restructured subprogram is ongoing support for the Laboratory Equipment Donation Program (formerly funded under the Graduate/Faculty Fellowship subprogram), Evaluation Studies, Workforce Studies, Technology Development and On-Line Application Systems, and Outreach (formerly supported within overall WDTS funding).

Significant Program Shifts

WDTS has established a rigorous program evaluation effort and a longitudinal workforce assessment study. This builds on recommendations from the Academic Competitiveness Council (ACC) Report and will enable WDTS to make effective investments in student and educator programs.

Student Programs

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Student Programs			
Science Undergraduate Laboratory Internship	2,437	2,549	2,600
Community College Institute of Science and Technology	279	319	350
Pre-Service Teachers	221	194	250
National Science Bowl [®]	1,337	1,331	1,415
Total, Student Programs	4,274	4,393	4,615

Description

The goal of the Student Programs subprogram is to continue the Department’s long-standing role of providing mentor-intensive research experiences at the national laboratories for students to enhance their content knowledge in science and mathematics and their investigative expertise; and to inspire commitments to careers in science, engineering, and K–12 STEM teaching. By providing a wide variety of students with the opportunity to work directly with many of the world’s best scientists and use the most advanced scientific facilities available, this program will expand the Nation’s supply of highly skilled scientists and engineers, especially in the physical sciences where the greatest demand lies because of a steady decline in U.S. citizens entering these fields. Through the National Science Bowl and other student science and engineering competitions, DOE’s laboratories and facilities provide experiences to inspire secondary students to continue and focus on STEM education and careers.

FY 2007 Accomplishments

- In 2006, more than 97% of all students in undergraduate research internships submitted abstracts (about 517) and research papers, which were published in the seventh edition of the “Journal of Undergraduate Research.” The 21 students who published full-length papers presented their work at a poster session at the American Association for the Advancement of Science (AAAS) national meeting in San Francisco, California in February 2007.
- In the summer of 2007, 60 community college students, including 12 National Science Foundation funded participants, attended a 10-week mentor-intensive scientific research experience at several DOE national laboratories. Thirty-seven percent of the participating students came from under-represented groups in STEM disciplines and many were “non-traditional” students. Grades of abstracts for these students were statistically equal to those from the SULI program.
- FY 2007 marked the 17th anniversary of the DOE’s National Science Bowl[®]. More than 12,000 high school students were hosted in the 64 regional science bowl events. Saturday science seminars at the National Science Bowl[®] weekend continued, introducing students to many contemporary issues and findings in contemporary scientific research. In FY 2007, two of the speakers were former National Science Bowl[®] participants. One of them is currently doing a post-doctoral fellowship at Brown University in theoretical physics. In FY 2007, 30 of the 64 high school teams took part in designing, building, and racing cars under the Hydrogen Fuel Cell Model Car Challenge that was added to

National Science Bowl[®] in FY 2003. Fourteen of these teams raced in the stock category and the other 16 in the hill climb. Awards were presented to the top teams in this event.

The Middle School Science Bowl (MSSB), initiated in FY 2002 with 8 teams, expanded to 30 regional events with 30 teams traveling to the nationals in FY 2007. The national event was hosted by the National Renewable Energy Laboratory at the University of Denver. During FY 2007, 20 teacher workshops at regional MSSB sites were held to explain and demonstrate the design and construction of fuel cell model cars. The Middle School Science Bowl, initiated in FY 2002 with 8 teams, expanded to 30 regional events with 30 teams traveling to the nationals in FY 2007. The national event was hosted by the National Renewable Energy Laboratory at the University of Denver in Denver, Colorado.

Detailed Justification

(dollars in thousands)

FY 2007	FY 2008	FY 2009
---------	---------	---------

Science Undergraduate Laboratory Internship

2,437	2,549	2,600
--------------	--------------	--------------

Science Undergraduate Laboratory Internship (SULI) supports a diverse group of students at DOE's national laboratories in individually mentored research experiences. Through these unique and highly focused experiences, students become a part of the national laboratory community and a source of talent to help the DOE meet its science mission goals. Students in the program: 1) apply on a competitive basis and are matched with mentors working in the student's fields of interest; 2) spend an intensive 10–16 weeks working under the individual mentorship of resident scientists; 3) produce a peer-reviewed abstract and research paper; and 4) attend seminars that broaden their view of science careers and help them understand how to become members of the scientific community. Goals and outcomes are measured based on students' research papers and abstracts, surveys, and an annual evaluation by a group of peers, both within and outside of the DOE. An undergraduate student journal is produced annually that publishes selected full length peer-reviewed research papers and all abstracts of SULI students. Full research papers published in the journal are presented by the student authors at the poster competition at the annual meeting of the American Association for the Advancement of Science (AAAS). The abstracts of the research conducted by these students' and their mentors' are posted on the AAAS web site. The National Science Foundation (NSF) collaborates with DOE to offer students in its undergraduate student programs access to individually mentored research internships that they would otherwise not have. This activity will ensure a steady flow of students with growing interest in science careers into the Nation's pipeline of workers at the national laboratories, academia, and industry. A system is being refined to track students during their academic and career paths.

In FY 2007, with DOE, NSF, and other leveraged support, 16 students participated in the fall semester program, 26 students participated in the spring semester program, and 370 students participated in the summer with 22 from NSF programs. The DOE contribution will support an estimated 360 students in FY 2008 and 365 in FY 2009.

Community College Institute of Science and Technology

279	319	350
------------	------------	------------

Community College Institute (CCI) of Science and Technology is designed to address workforce shortages, particularly at the technician and semi-professional levels, and will help develop the workforce needed to continue building the DOE's capacity in critical areas for the next century. Because community colleges account for over 40% of the entire Nation's undergraduate enrollment and a

(dollars in thousands)

FY 2007	FY 2008	FY 2009
---------	---------	---------

majority of under-represented minorities in STEM, this is an untapped and clear avenue to increase the number of U.S. scientists and engineers. The CCI targets students from under-represented populations in science and technology fields to increase the diversity of the workforce and provides a 10-week mentored research internship at a DOE national laboratory for highly motivated community college students. Students in the program: 1) apply online and are matched with mentors working in the student's field of interest; 2) spend an intensive 10 weeks working under the individual mentorship of resident scientists; 3) produce an abstract and formal research paper; and 4) attend professional enrichment activities, workshops, and seminars that broaden their view of career options, help them understand how to become members of the scientific community, and enhance their professional skills. Goals and outcomes are measured based on a students' research papers and abstracts, surveys, and external evaluation. An ongoing undergraduate student journal was created to publish selected full research papers and all abstracts of students in this activity. Through a Memorandum of Understanding with the NSF starting in FY 2001, undergraduate students in NSF programs (e.g., the Louis Stokes Alliance for Minority Participation and Advanced Technology Education program) are also participating in CCI.

In FY 2007, 48 DOE supported students directly participated in this internship. Twelve additional students were part of one of the NSF programs that provided funding for them to participate in CCI. An estimated 52 students will participate in FY 2008 and 55 students will participate in FY 2009.

Pre-Service Teachers	221	194	250
-----------------------------	------------	------------	------------

The Pre-Service Teachers (PST) activity is for students who are preparing for a teaching career in a STEM discipline. This effort addresses the national need to improve the content knowledge of STEM teachers prior to entering the teaching workforce. The NSF entered into a collaboration with DOE on this activity in FY 2001. This allows NSF's undergraduate pre-service programs to include a PST internship in the opportunities they provide to students. Students in this program: 1) apply on a competitive basis and are matched with mentors working in the student's field of interest; 2) spend an intensive 10 weeks working under the mentorship of a master teacher and laboratory scientist to help maximize the building of content knowledge and skills through the research experience; 3) produce an abstract and an educational module related to their research and an optional research paper, poster, or oral presentation; and 4) attend professional enrichment activities, workshops, and seminars that help students apply what they learn to their academic program and the classroom, help them understand how to become members of the scientific community, and improve their communication and other professional skills. Goals and outcomes are measured based on students' abstracts, education modules, surveys, and external evaluation. In FY 2007, PST was hosted at six DOE national laboratories with 29 participating students. Seven of these students were from NSF programs that provide funding for their participation in this program at a DOE laboratory. In FY 2008, funding will support about 26 students at four national laboratories. In 2009, the increase will support about 35 students at six national laboratories.

(dollars in thousands)

FY 2007	FY 2008	FY 2009
1,337	1,331	1,415

National Science Bowl®

The National Science Bowl® (NSB) is a nationally recognized, prestigious academic event for high school and middle school students. It has attained its level of recognition and participation through a grass-roots design, which encourages the voluntary participation of professional scientists, engineers, and educators from across the Nation. Students answer questions on topics in astronomy, biology, chemistry, mathematics, and physics in a highly competitive, Jeopardy-style format. Since 1991, more than 150,000 students have participated in regional and national competitions.

Since 1991, the NSB's high school competition has encouraged high school students from across the Nation to excel in mathematics and science and to pursue careers in those fields. The National Science Bowl® provides students and teachers with a forum to receive recognition for their talent and hard work by solving traditional academic problems in selected fields of science and math, in addition to their activity in various hands-on science challenges. The high school teams that win their regional events attend the four-day national finals held in Washington, DC. During this time, the students participate in a day of scientific seminars and science discovery activities with the students "doing" science, with the event culminating in an academic competition.

The regional and national events are primarily volunteer programs where thousands of people dedicate weeks of their time to organize and execute educational events and become involved with bright, enthusiastic high and middle school students. WDTS funding provides all of the travel and lodging expenses for each winning team, seminar speakers, trophies, awards, and items and equipment for the various hands-on and interactive science activities and events.

It is well established in educational evaluation literature that the middle school years are perhaps the most important time to attract and retain student interest in science and math. The middle school National Science Bowl® was designed to take advantage of this fact by bringing DOE science to middle school students and teachers in a way that will engage their interest and potentially lead to careers in science and technology.

The NSB's middle school science bowl has two events: an academic competition in mathematics and science; and a competition to design, build, and race hydrogen fuel cell model cars. The academic competition 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 regional events enjoy a trip to a national laboratory and participate in the three-day national finals at the University of Denver.

The number of regional events remains relatively constant from one year to the next with 66 to 68 high school and 29 to 39 middle school teams participating in recent years. In FY 2009, support for the National Science Bowl® is increased to reflect cost increases in travel, lodging, and associated activities and speakers.

Total, Student Programs

4,274	4,393	4,615
-------	-------	-------

Explanation of Funding Changes

FY 2009 vs. FY 2008 (\$000)

Science Undergraduate Laboratory Internship

The number of students participating in this program will increase by 5 in FY 2009, from 360 in FY 2008 to a total of 365 in FY 2009.

+51

Community College Institute of Science and Technology

The number of students participating in this program will increase by 3 in FY 2009, from 52 in FY 2008 to a total of 55 in FY 2009.

+31

Pre-Service Teachers

The number of student participating in this program will increase by 9 in FY 2009, from 26 in FY 2008 to a total of 35 in FY 2009.

+56

National Science Bowl®

Support is increased to reflect cost increases in travel, lodging, and associated activities and speakers.

+84

Total Funding Change, Student Programs

+222

Educator Programs

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Educator Programs			
DOE Academies Creating Teacher Scientists	2,320	2,184	6,398
Faculty and Student Teams	243	250	300
Albert Einstein Distinguished Educator Fellowship	745	717	800
Total, Educator Programs	3,308	3,151	7,498

Description

DOE Academies Creating Teacher Scientists (DOE ACTS) program establishes the basic framework for DOE’s long-term relationships with K–12 educators. Through DOE ACTS, educators improve their content knowledge in areas of high importance to DOE missions and become contributing researchers in the scientific community. As highly trained leaders in STEM education, they are a key element of the effort to reform our Nation’s science education and help to meet the President’s goal of a qualified educator in every classroom.

The Faculty and Student Teams (FaST) program will benefit the individual faculty, their students, and their respective institutions by giving them the training needed to successfully compete for Federal science research grants.

The Albert Einstein Distinguished Educator Fellowship benefits Federal agencies and Congressional offices because these outstanding educators provide their “real world” classroom expertise and advice to national policy makers. After their Fellowship, the educators return to their school districts better prepared to be leaders at the local, regional, and national levels, and bring knowledge of Federal programs that provide resources to their school districts.

In a survey of STEM graduate students conducted by the NSF, 84% of those surveyed stated that they made their choice to choose a STEM field career by the time they left high school. This strongly suggests that educators hold the key to increasing the number and quality of the science, technology, and engineering workforce.

WDTS’s Educator Programs are designed to build a strong cadre of highly qualified STEM educators. The President’s “No Child Left Behind” initiative has placed great emphasis on providing a “qualified teacher in every classroom,” but educators highly trained in modern science and math are in short supply in the Nation’s classrooms. In 1999, for example, only 41% of U.S. eighth graders received instruction from a math educator who specialized in math. “About 56% of high school students taking physical science are taught by out-of-field teachers, as are 27% of those taking mathematics. Among schools with high poverty rates, students have a less than 50% chance of getting a science or math teacher who holds both a license and degree in the subject area being taught” (The National Commission on Mathematics and Science Teaching for the 21st Century 1999 citing and Linda Darling-Hammond).

The business community is also sounding the alarm about the future of the workforce and our Nation’s ability to maintain technological superiority and is calling for education reform targeted at educators. The Business Roundtable, in a report published in July 2005 entitled, “Tapping America’s Potential: The

Education for Innovation Initiative,” calls for the Federal government and agencies to, “Support cost-effective professional development [for teachers] and prepare them to teach the content effectively.”

DOE’s unique role in educator training derives from the existence of its national laboratories. The primary goal of DOE ACTS is to create a cadre of STEM educators who have the proper content knowledge and scientific research experience to perform as leaders and agents of positive change in their local and regional education communities. The program has been designed around best practices in professional development as outlined from educational research and program improvements based upon evaluation data. In developing the program, several models have been considered, including the National Board Professional Teaching Standards, “Five Core Principles,” and Loucks-Horsley and colleagues’ “Fifteen Strategies of Professional Development.”

FY 2007 Accomplishments

- In 2007, six national laboratories—Argonne, Brookhaven, Fermi National Accelerator Laboratory, Lawrence Berkeley, Oak Ridge, and Pacific Northwest—placed 42 Faculty and Student Teams, with 27 of those being partially supported by NSF. For summer 2007, there were a total of 61 NSF funded students and 27 faculty that participated on FaST teams. These participants were eligible for supplemental funding from NSF to pay for their stipends and travel. Since the program began, more than 30 FaST faculty have submitted 80 grant proposals to federal institutions/agencies.
- By leveraging resources and collaborating with other service agencies, the Albert Einstein Distinguished Educator Fellowship activity for FY 2007–2008 placed 17 outstanding K–12 science, math, and technology educators: 4 in Congressional offices, 3 at DOE, 1 at the National Aeronautics and Space Administration (NASA), 8 at NSF, and 1 at the National Oceanic and Atmospheric Administration (NOAA).

Detailed Justification

(dollars in thousands)

FY 2007	FY 2008	FY 2009
---------	---------	---------

DOE Academies Creating Teacher Scientists

2,320 2,184 6,398

DOE ACTS requires a three-year commitment by educators to participate in this program, which is based on research in teacher professional development that indicates that change takes place over an extended period of time and that multi-year professional development is required to make the necessary differences. Each educator spends an intensive four to eight weeks annually at DOE national laboratories working under the mentorship of master educators and laboratory scientists to build content knowledge, research skills, and a lasting connection with the scientific community through the research experience. Master educators, who are expert K–12 educators and adept in both scientific research and scientific writing, act as liaisons between the mentor scientists and the educator participants. This helps the educators transfer the research experiences to their classrooms. Follow-on support is considered critical. Master educators and other teacher participants receive an \$800 per week stipend plus travel and housing expenses.

The National Commission on Mathematics and Science Teaching indicates that professional staff development is one of the most effective ways of improving the achievement of K–12 students. The National Academy of Sciences (NAS) and Teachers Advancement Program (TAP) reports point to educators as the central players in improving U.S. student STEM achievement. The national laboratories clearly are not positioned to affect the hundreds of thousands of STEM educators through direct

(dollars in thousands)

FY 2007	FY 2008	FY 2009
---------	---------	---------

retraining. However, the laboratories can play a pivotal role in reforming the Nation's STEM education by creating sufficient numbers of highly trained education leaders as agents of change in STEM education. This is accomplished by providing carefully designed mentor-intensive training for science and math educators that will allow them to more effectively teach; to attract their students' interests to science, mathematics, and technology careers; and to improve student achievement. Educators apply on a competitive basis and are matched with mentors working in their subject fields of instruction.

All educators completing the initial summer experience will be provided monetary support each year for the three years they are in the program to purchase materials and scientific equipment, which is critical to transfer their research experiences to their classrooms. In addition, long-term support is provided in following years through communication with other educators and laboratory scientists return trips to the national laboratory, and support to publish or present their work at professional conferences. Evaluation includes a self identification of science content gaps by the educator participant, successful development of a professional development plan by each educator, attainment of a leadership role, and impact on local STEM education and student achievement. External evaluation of program effectiveness will include visits to participant educators' schools to assess the long-term impact of the program on student achievement. External evaluators submitted a report on the first program year, which found that the success of this program relies on proper placement of each participant to match their professional developmental needs and the follow-on interaction between the educators and the national laboratories

The DOE ACTS, which began in FY 2004, funded 145 teachers in FY 2007 and will fund 114 teachers in FY 2008. As a result of the FY 2008 Energy and Water Development and Related Agencies Appropriations Act, no new teachers are added in FY 2008. The FY 2009 request would fund a total of 341 teachers and will increase the stipends for all teachers.

Faculty and Student Teams

243

250

300

The Faculty and Student Teams (FaST) summer internship/fellowship provides an opportunity for faculty from colleges and universities with limited prior research capabilities and those institutions serving women or minorities to participate with up to three of their undergraduate students in a mentor-intensive science research project at one of six DOE national laboratories. Faculty members may come back to the laboratory in subsequent summer terms. The undergraduate students on the FaST teams are funded either by the Science Undergraduate Laboratory Internship (SULI) or Community College Institute of Science and Technology (CCI) activities. Over a 10-week summer visit to the laboratory, the faculty member is introduced to new and advanced scientific techniques that contribute to their professional development and help them prepare their students for careers in science, engineering, computer sciences, and technology. FaST activities at SC laboratories are being conducted in collaboration with the NSF. Faculty members from minority serving institutions have overwhelmingly identified the FaST program as providing a high quality developmental scientific experience. Faculty from minority serving institutions and other populations under-represented in the fields of science, engineering, and technology are encouraged to take advantage of the FaST opportunity to prepare students for careers in science, engineering, computer sciences, and technology and for their own professional development. In part, because of increasing support from the NSF through an existing partnership created in 2001, the number of teams has increased from 6 in FY 2002 to 42 teams in FY 2007. With similar support from NSF, there will be 9 teams in FY 2008 and 11 teams in FY 2009.

(dollars in thousands)

FY 2007	FY 2008	FY 2009
---------	---------	---------

Albert Einstein Distinguished Educator Fellowship

745

717

800

The Albert Einstein Distinguished Educator Fellowship Awards for outstanding K–12 science, mathematics, and technology educators brings real classroom and education expertise to Congress and to DOE’s and other Federal agencies’ education and outreach activities. These outstanding educators provide practical insights and “real world” perspectives to policy makers and program managers. The Einstein Fellowship is a valuable professional growth opportunity for the educators because they return to their education field with knowledge of Federal resources and an understanding of national education policies. In FY 2007, with the organizational support of DOE, other Federal agencies (including the National Science Foundation, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, and the National Institutes of Health) were able to place 17 teachers as Einstein Fellows. Of these, five were directly supported by WDTS and two were supported by Office of Science research programs (four fellows in Congress and three at DOE). The FY 2009 request will directly support four fellows in Congress and two at DOE, an increase of one fellow (five in FY 2008). The increased funding will also augment stipends and health insurance for the participants, and allow for the continued organizational support for the placement of additional fellows at other Federal agencies.

Total, Educator Programs

3,308

3,151

7,498

Explanation of Funding Changes

FY 2009 vs. FY 2008 (\$000)

DOE Academies Creating Teacher Scientists

The number of educators participating in DOE ACTS will increase by 227 in FY 2009, from 114 in FY 2008 to a total of 341 in FY 2009, and stipends for all teachers will be increased to be competitive with other scientific internship programs.

+4,214

Faculty and Student Teams

The number of teams supported by DOE will increase by 2 in FY 2009, from 9 in FY 2008 to 11 in FY 2009.

+50

Albert Einstein Distinguished Educator Fellowship

There will be 1 additional participant supported by WDTS in FY 2009, an increase from 5 in FY 2008 to 6 in FY 2009. In addition, stipends and other living expense increases will be supported.

+83

Total Funding Change, Educator Programs

+4,347

Program Administration and Evaluation

Funding Schedule by Activity

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Program Administration and Evaluation			
Evaluation Studies	50	150	600
Workforce Studies	50	—	500
Laboratory Equipment Donation Program	90	75	90
Technology Development & Online Application	130	175	180
Outreach	50	100	100
Total, Program Administration and Evaluation	370	500	1,470

Description

The Program Administration and Evaluation (PA&E) subprogram is designed to provide the resources required for effective WDTS program management and delivery. Those resources take two forms: analytical/evaluation studies that will be used by WDTS program managers to make efficient use of resources that are informed by results and lessons learned; and, non-financial resources that enable WDTS performers and participants to more effectively participate in WDTS programs.

Evaluation Studies and Workforce Studies provide the analytical resources required by WDTS to make informed judgments about the effectiveness and benefits of WDTS program investments. Evaluation studies have been developed in a manner consistent with the recommendations of the Academic Competitiveness Council (ACC) and a number of rigorous studies that focus on individual performance, program effectiveness, and the overall accomplishment of WDTS goals. An initial review of WDTS evaluation efforts by an Office of Science and Technology Policy (OSTP) working group found that they are rigorous and consistent with ACC requirements. Workforce Studies focus on the critical skill gaps, by scientific discipline, which may exist within the DOE/SC Federal and national laboratory workforces. Both the Evaluation Studies and Workforce Studies are designed to be long-term, sustained efforts that will provide a baseline of data and results that can be used to effectively manage WDTS programs.

The other activities contained within the PA&E subprogram enable WDTS performers to more effectively participate in WDTS programs. The Laboratory Equipment Donation program is being expanded to include middle schools and high schools (currently only universities may participate) so that educators who participate in the DOE ACTS program may take advantage of DOE's equipment donation efforts. The Technology Development and Online Application activity provides the online resources required by students and educators to apply for resources, conduct general outreach, and manage evaluation studies (for example, the educator electronic portfolio). The Outreach activity is designed to reach under-represented populations and to form "trusted partnerships" with associations, industry and other groups to leverage WDTS investments. Future planned activities include the DOE Mentor Awards activity which will solidify DOE's longstanding capacity to recruit, train and effectively utilize the large cadre of mentor scientists who provide the foundation for WDTS' student and educator programs. This program will develop consistent standards and training for DOE mentors and provide incentives for mentors to participate in all of the WDTS programs.

WDTS, through focus groups with key stakeholders and interactions with other Federal agencies, Congress, and OMB, determined in FY 2007 that two major gaps existed in its program portfolio: rigorous evaluation and workforce assessments of existing programs that could guide investment decisions; and, effective outreach efforts and support activities to enable program participants to be more successful in WDTS programs.

The Academic Competitiveness Council (ACC), in a 2007 report, found that most Federal agencies, including the Department of Energy, were not conducting rigorous evaluations of their science education and workforce development programs. This absence of rigorous evaluation called into question the effectiveness and benefits of those programs because of a lack of externally-validated data and analysis. WDTS has conducted a full review of the academic literature and best practices for rigorous evaluation of experiential learning programs and has developed a comprehensive evaluation and workforce assessment program that fills the gap identified by the ACC.

WDTS stakeholders participated in a strategic planning process that resulted in a redesign of WDTS programs and the publication of the WDTS Future Workforce Strategy in July 2007. This intensive effort, which included participation by more than 100 stakeholder groups, has led to greater leveraging and partnering of WDTS programs. In addition, WDTS stakeholders have clearly articulated the need for improved outreach, particularly to under-represented populations and institutions. WDTS programs currently have strong participation by minorities and women, but not to the degree that the changing demographics of the Nation suggest will be needed in coming decades. Improvements to outreach and to on-line resources were identified as a key to the success of WDTS programs. The preliminary design of the WDTS workforce assessment was completed in FY 2007 and full implementation will begin in FY 2008.

Another key resource that should be strengthened is the population of DOE mentor scientists who form the foundation for all of the WDTS programs. Currently, mentors are recruited and trained by DOE laboratories with very little assistance from WDTS. This limits the number and utility of those mentor scientists because they are not managed as a national resource.

2007 Accomplishments

- A Committee of Visitors (COV) reviewed WDTS program management and evaluation efforts in September 2007 in a first-ever external peer review of WDTS programs. They found that WDTS priorities were aligned with DOE and administration priorities but recommended stronger outreach to underrepresented populations and greater linkages to SC R&D programs. Program managers used the results of the COV process to adjust programs and improve program efficiency/effectiveness by reallocating resources to high priority programs and focusing evaluation efforts on national objectives.

Detailed Justification

(dollars in thousands)

FY 2007	FY 2008	FY 2009
50	150	600

Evaluation Studies

WDTS will implement a rigorous, comprehensive, and sustained evaluation of all Office of Science experiential education programs consistent with the requirements specified by the Academic Competitiveness Council. Funding in FY 2007 was provided for the development of an evaluation plan

(dollars in thousands)

FY 2007	FY 2008	FY 2009
---------	---------	---------

and pilot evaluations. Full implementation begins in FY 2008 at \$150,000 and increases to \$600,000 in FY 2009 to provide in-depth and systemic evaluation of all WDTS programs.

Workforce Studies **50** **—** **500**

Workforce Studies focus on the critical skill gaps, by scientific discipline, which may exist within the DOE/SC Federal and national laboratory workforces. These studies are designed to be long-term, sustained efforts that will provide a baseline of data and results that can be used to effectively manage WDTS programs. Funding in FY 2007 was provided for the development of a workforce study plan. No funding is provided in FY 2008 as a result of the FY 2008 Energy and Water Development and Related Agencies Appropriations Act. Therefore, full implementation begins in FY 2009 to provide in-depth and systemic review of workforce requirements.

Laboratory Equipment Donation Program **90** **75** **90**

The Laboratory Equipment Donation Program (formerly the Energy Related Laboratory Equipment [ERLE] program) provides excess equipment to faculty at institutions of higher education for energy-related research. Through the Energy Asset Disposal System, DOE sites identify laboratory equipment that is then listed on the ERLE website, which is maintained by the Office of Scientific and Technical Information and updated several times a week. Colleges and universities can search for equipment of interest to them and apply via the website. DOE property managers approve or disapprove the applications. The equipment is free; the receiving institution pays for shipping costs. In FY 2007, more than 900 individual pieces of equipment with an original value of more than \$17,000,000 were donated. WDTS intends to expand this program in FY 2009 to middle schools and high schools.

Technology Development & On-Line Application **130** **175** **180**

Technology Development and Online-Application Systems provides for the enhancement and maintenance of the WDTS application and electronic portfolio system. The increase in FY 2008 will support the design of a single portal for all of the DOE STEM education programs, which will continue to be implemented in FY 2009.

Outreach **50** **100** **100**

Outreach has four components: providing information to WDTS program alumni (science bowls, undergraduate research internships, educator programs, etc.) to encourage their continued participation in DOE programs; creating a common database of internship opportunities, fellowships, and other research-based educational opportunities at DOE; assisting in the coordination of outreach activities with other Federal agencies; and enhancing communication about WDTS programs to the public. Funding in FY 2007 and prior years provided development of an outreach plan. Beginning in FY 2008, this plan will be implemented.

Total, Program Administration and Evaluation **370** **500** **1,470**

Explanation of Funding Changes

FY 2009 vs. FY 2008 (\$000)

Evaluation Studies

Full implementation of the WDTS evaluation program is supported in FY 2009 to provide in-depth and systemic review of all WDTS programs.

+450

Workforce Studies

WDTS requires the data and analysis from these studies to effectively manage its programs and to identify critical skill shortages in the SC and DOE national laboratory workforces. FY 2009 funding will provide for full implementation of this study across the DOE complex and analysis of data.

+500

Laboratory Equipment Donation Program

The increase will support expansion of this program to middle and high schools in FY 2009.

+15

Technology Development & On-Line Application

Improvements to the WDTS on-line process was identified as a key need by WDTS stakeholders. Funding supports continued design and implementation of a single portal for all of the DOE STEM education programs.

+5

Total Funding Change, Program Administration and Evaluation

+970

SC Education Crosscut

The Office of Science (SC) research programs—Basic Energy Sciences, Advanced Scientific Computing Research, Biological and Environmental Research, High Energy Physics, Nuclear Physics, and Fusion Energy Sciences—support development of the R&D workforce through support of undergraduate researchers, graduate students working toward doctoral degrees, and postdoctoral associates developing their research and management skills. The R&D workforce developed under these programs, as well as within the Workforce Development for Teachers and Scientists program, provide new scientific talent in areas of fundamental research and also provide talent for a wide variety of technical and industrial areas that require the problem solving abilities, computing skills, and technical skills developed through education and experience in fundamental research. In addition, the SC scientific user facilities provide outstanding hands-on research experience to many young scientists. Thousands of students and post-doctoral investigators are among the researchers who conduct experiments at SC-supported facilities each year. The work that these young investigators perform at SC facilities is supported by a wide variety of sponsors including SC and other Departmental research programs, other federal agencies, and private institutions.

Funding Summary

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
Undergraduate Programs	5,191	5,753	6,413
▪ Advanced Scientific Computing Research —Awards to under-represented groups in Applied Mathematics, Computer Science, Networking R&D, and Computational Science.	1,200	1,600	2,000
▪ Biological and Environmental Research	526	528	528
• Summer Undergraduate Research Experience	426	428	428
• American Chemical Society Summer School in Nuclear and Radiochemistry	100	100	100
▪ Fusion Energy Sciences	268	395	395
• National Undergraduate Fellowship Program	248	370	370
• Plasma Physics Speakers Bureau	20	25	25
▪ High Energy Physics —Minority Outreach Program, Argonne National Laboratory	20	20	20
▪ Nuclear Physics	150	180	180
• American Chemical Society's Nuclear Chemistry Summer School	50	65	80
• Minority participation in physics research, Argonne National Laboratory	100	100	100

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
• Conference for Undergraduate Women in Physics at Yale University	—	15	—
▪ Workforce Development for Teachers and Scientists	3,027	3,030	3,290
• Science Undergraduate Laboratory Internship	2,437	2,415	2,600
• Community College Institute of Science and Technology	279	311	350
• Pre-Service Teachers	221	214	250
• Laboratory Equipment Donation Program	90	90	90
Graduate Programs	16,379	18,138	19,121
▪ Advanced Scientific Computing Research	13,395	14,298	15,298
• Computer Science Graduate Fellowships	4,000	5,000	6,000
• Scientific Discovery through Advanced Computing Institutes.(includes Undergraduates)	8,100	8,100	8,100
• Stanford Synchrotron Radiation Laboratory Student Training	300	200	200
• Graduate Research Environmental Fellowships	995	998	998
▪ Biological and Environmental Research	633	539	503
• American Meteorological Society /Industry/Government Graduate Fellowship	23	24	24
• Life Sciences and Medical Sciences—Minority Colleges and Universities Support	102	102	102
• 2007 NASA Space Radiation Summer School support	50	—	—
• Annual meeting of Nobel Laureates and Young Scientists in Lindau, Germany	50	100	100
• Marine Biological Laboratory Summer Course at Woods Hole, Massachusetts	15	15	15
• Gordon Research Conferences	38	10	—
• International Society for Computational Biology annual workshop in “intelligent systems for molecular biology,” (student travel and registration)	35	35	—
• Summer of Applied Geophysical Experience	30	30	30

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
• Post-Doctoral Atmospheric Research Measurement (ARM) Science program: European Centre for Medium-range Weather Forecasts	117	112	127
• Post-Doctoral ARM Science program—Geophysical Fluid Dynamics Laboratory	85	88	92
• Workshop, Mentoring Physical Oceanography Women to Increase Retention	75	—	—
• Gordon Conference on Atmospheric Radiation	13	13	13
• Fourteenth-Sixteenth Microbial Genomics Conference 2006–2008.	—	10	—
▪ Basic Energy Sciences	570	914	860
• Mineralogical Society and Geochemical Society Short Courses	10	25	25
• Pan American Advanced Studies Institutes Program Solicitation NSF 01–48	200	200	200
• American Physical Society Workshop on Energy Research for Physics Graduate Students and Postdoctoral Associates	—	29	—
• Nobel Laureates and Young Scientists in Lindau, Germany	25	25	—
• Argonne National Laboratory National School on Neutron and X-ray Scattering	150	150	150
• Los Alamos National Laboratory Neutron School	35	35	35
• Oak Ridge National Laboratory Spallation Neutron Source Instrumentation Fellowship	150	450	450
▪ Fusion Energy Sciences	746	1,352	1,350
• Graduate Fellowship Program	436	882	880
• Postdoctoral Research Program	310	470	470
▪ High Energy Physics	905	905	905
• Particle Accelerator School	817	817	817
• Italian Student Exchange Program	88	88	88
▪ Nuclear Physics	130	130	205
• Hampton University's summer school	45	45	45
• Exotic Beam Physics summer school	15	15	15

(dollars in thousands)

	FY 2007	FY 2008	FY 2009
• Quark Matter Series of International Conferences	—	—	75
• Institute for Nuclear Theory	70	70	70
Educator Programs, K–12 students	6,696	6,719	13,172
▪ Biological and Environmental Research	661	650	642
• ARM Southern Great Plains Site Scientist support for K–12 educational outreach at the University of Oklahoma	50	50	50
• ARM Education and Outreach K–12	400	400	400
• Science Literacy for Mid-career Public Radio Participants	206	200	192
• Applied & Environmental Microbiology Gordon Research Conference (July 2007).	5	—	—
▪ Fusion Energy Sciences	640	837	850
• Advancing Precollege Science and Mathematics Education	199	260	260
• Professional development for science, math, and technology for K–12 teachers in the Trenton, New Jersey	165	245	245
• Plasma Physics Summer Institute and Contemporary Physics Education Project	100	125	125
• Fusion/Plasma Education	124	155	155
• Wonders of Physics Traveling Show	52	52	65
▪ High Energy Physics—QuarkNet	750	750	750
▪ Workforce Development for Teachers and Scientists	4,645	4,482	10,930
• Science Bowl for Middle and High School Students	1,337	1,331	1,415
• DOE Academies Creating Teacher Scientists	2,320	2,184	8,415
• Faculty and Student Teams research experience	243	250	300
• Albert Einstein Distinguished Educator Fellowship	745	717	800
Total, SC Education Funding	28,266	30,610	38,706