

Workforce Development for Teachers and Scientists

Program Mission

The mission of the Workforce Development for Teachers and Scientists program is to continue the Department's long-standing role of training young scientists, engineers and technicians in the scientifically and technically advanced environment of our National Laboratories. Through providing a wide variety of college undergraduates the opportunity to work side by side with many of the world's best scientists and use the most advanced scientific instruments available, this program intends to expand the nation's supply of well-trained scientists and engineers, especially in the physical sciences where the greatest demand lies. By providing K-14 teachers, mentor-intensive laboratory fellowships, this program will greatly enhance their content knowledge and skills of mathematics and science and can contribute to the national goal of a qualified teacher in every classroom.

The Workforce Development for Teachers and Scientists program supports three science, technology and workforce development subprograms: 1) Undergraduate Internships, for undergraduate students wishing to enter science, technology, engineering and mathematics (STEM), as well as with science and math teaching careers; 2) Graduate/Faculty Fellowships for STEM teachers and faculty; and 3) Pre-College Activities for middle and high school students such as the National Science Bowl. Each of the subprograms targets a different group of students and teachers to attract as broad a range of participants to the programs and to expand the pipeline of students who can enter the STEM workforce. In this fashion, the subprograms use our National Laboratories to meet the demand for a well-trained scientific and technical workforce, including those teachers that help spawn that workforce.

In response to the growing national need for highly trained teachers in their content area, the Office of Science plans to initiate a pilot program at Argonne National Laboratory (ANL) for K-14 STEM teachers, the *Laboratory Science Teacher Professional Development* activity within the Graduate/Faculty Fellowship subprogram. Through mentor-intensive experiences teachers will be provided a range of research, technical education, and training options designed to improve their classroom performance, their students' achievement, and their content knowledge in the subjects they teach. Follow-on support is critical. All teachers completing the initial laboratory experience will be provided: monetary support to help them extend what they have learned to their classes; support to enable student involvement, when appropriate, in National Laboratory research; long-term support through communication with other participant teachers and laboratory scientists; return trips to the laboratory; and support to present their experiences at professional conferences and in publications.

Significant Program Shifts

- The FY 2004 request of \$6,470,000 for "Workforce Development for Teachers and Scientists" budgets Science Education in a new program. The former subprogram name changes from "Science Education" (budgeted in Science Program Direction prior to FY 2004) to "Workforce Development for Teachers and Scientists" program to more accurately reflect the program mission and scope.
- In response to the national need for science teachers who have strong content knowledge in the classes they teach, the Department is proposing a new \$1,000,000 internship opportunity at ANL for K-14 teachers to help address that need. The Department of Energy National Laboratories can provide mentor-intensive professional development that compliments the efforts of states and federal agencies. The multidisciplinary, 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. More importantly, the extensive mentoring power of our laboratory scientists is an excellent vehicle to establish fruitful, lasting relationships that would allow teachers to remain connected to the scientific community once they return to the classroom. Armed with this knowledge and experience, each teacher could enter the classroom as a genuine effective representative of the exciting world of science and technology. Teacher classroom performance and student academic and career paths will help measure the long-term impact of this program.

- It is well recognized that the middle school years are the most productive time to exert an effort to attract students to science and math subjects. In FY 2002 and FY 2003 there was a small pilot for the Middle School Science Bowl and it was conducted under the auspices of the National Science Bowl. The Middle School Science Bowl activity will be expanded in FY 2004 and provide opportunities for students to develop their science and math skills in a non-classroom setting. Carefully crafted activities that are based on successful hands-on activity models will be conducted to attract their imagination, excite their interest and provide a chance for the students to experience applied science under the direction of professional scientists and engineers. Students who win in regional events will then enjoy a trip to a National Laboratory and participate in a final three day event that is designed to capture their interest and reward them for their hard work.

Funding Profile

(dollars in thousands)

	FY 2002 Comparable Appropriation	FY 2003 Request	FY 2004 Request	\$ Change	% Change
Workforce Development for Teachers and Scientists					
Undergraduate Internships	3,165	4,075	3,768	-307	-7.5%
Graduate/Faculty Fellowships	568	725	1,900	+1,175	+162.1%
Pre-College Activities	727	660	802	+142	+21.5%
Subtotal, Workforce Development for Teachers and Scientists.....	4,460	5,460	6,470	+1,010	18.5%
Adjustment.....	0	0	0	0	--
Total, Workforce Development for Teachers and Scientists.....	4,460 ^a	5,460 ^a	6,470	+1,010	18.5%

Public Law Authorization:

Public Law 95-91, "Department of Energy Organization Act"

Public Law 103-62, "Government Performance and Results Act of 1993"

^a Includes \$4,460,000 in FY 2002 and \$5,460,000 in FY 2003 for Science Education transferred from Science Program Direction.

Funding by Site^a

(dollars in thousands)

	FY 2002	FY 2003	FY 2004	\$ Change	% Change
Albuquerque Operations Office					
National Renewable Energy Laboratory	0	150	200	+50	+33.3%
Chicago Operations Office					
Argonne National Laboratory	430	615	570	-45	-7.3%
Brookhaven National Laboratory	430	615	522	-93	-15.1%
Fermi National Laboratory	20	100	50	-50	-50.0%
Princeton Plasma Physics Laboratory.....	125	100	150	+50	+50.0%
Chicago Operations Office	443	500	600	+100	+20.0%
Total, Chicago Operations Office	1,448	1,930	1,892	-38	-2.0%
Idaho Operations Office					
Idaho National Engineering and Environmental Laboratory	10	0	100	+100	+100.0%
Total, Idaho Operations Office	10	0	100	+100	+100.0%
Oakland Operations Office					
Lawrence Berkeley National Laboratory	505	750	600	-150	-20.0%
Stanford Linear Accelerator Center	150	150	150	0	---
Total, Oakland Operations Office.....	655	900	750	-150	-16.7%
Oak Ridge Operations Office					
Oak Ridge Institute for Science and Education	1,377	1,250	1,292	+42	+3.4%
Thomas Jefferson National Accelerator Facility.....	50	100	100	0	---
Oak Ridge Operations Office	75	75	90	+15	+20.0%
Total, Oak Ridge Operations Office	1,502	1,425	1,482	+57	+4.0%
Richland Operations Office					
Pacific Northwest National Laboratory	635	740	690	-50	-6.8%
Richland Operations Office	150	220	0	-220	-100.0%
Total, Richland Operations Office	785	960	690	-270	-28.1%
Washington Headquarters	60	95	1,356	+1,261	+1,327.4%
Total, Workforce Development for Teachers and Scientists	4,460^b	5,460^b	6,470	+1,010	+18.5%

^a On December 20, 2002, the National Nuclear Security Administration (NNSA) disestablished the Albuquerque, Oakland, and Nevada Operations Offices, renamed existing area offices as site offices, established a new Nevada Site Office, and established a single NNSA Service Center to be located in Albuquerque. Other aspects of the NNSA organizational changes will be phased in and consolidation of the Service Center in Albuquerque will be completed by September 30, 2004. For budget display purposes, DOE is displaying non-NNSA budgets by site in the traditional pre-NNSA organizational format.

^b Includes \$4,460,000 in FY 2002 and \$5,460,000 in FY 2003 for Science Education transferred from Science Program Direction.

Site Description

Argonne National Laboratory

Argonne National Laboratory (ANL) in Argonne, Illinois, is a multi-program laboratory located on a 1,700-acre site in suburban Chicago. Argonne research falls into 4 broad categories: basic science, scientific facilities, energy resources, and environmental management. ANL has a satellite site located in Idaho Falls, Idaho. This site, referred to as Argonne-West, occupies approximately 900 acres and is the home of most of Argonne's major nuclear reactor research facilities. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Brookhaven National Laboratory

Brookhaven National Laboratory (BNL) is a multi-program laboratory located on a 5,200-acre site in Upton, New York. BNL creates and operates major facilities available to university, industrial, and government personnel for basic and applied research in the physical, biomedical, and environmental sciences, and in selected energy technologies. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Fermi National Accelerator Laboratory

Fermi National Accelerator Laboratory (Fermilab) is located on a 6,800-acre site in Batavia, Illinois. It is the largest U.S. laboratory for research in high-energy physics and is second only to CERN, the European Laboratory for Particle Physics, in the world. About 2,500 scientific users, scientists from universities and laboratories throughout the U.S. and around the world, use Fermilab for their research. Fermilab's mission is the goal of high-energy physics: to learn what the universe is made of and how it works. Fermilab builds and operates the facilities that high-energy physicists need to do forefront research, and develops new accelerator technology for the experiments of the future. Fermilab is operated by Universities Research Association, a consortium of 89 research universities. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Idaho National Engineering and Environmental Laboratory

The Idaho National Engineering and Environmental Laboratory (INEEL) is located on 890 square miles in the southeastern Idaho desert. Other INEEL research and support facilities are located in nearby Idaho Falls. Within the laboratory complex are nine major applied engineering, interim storage and

research and development facilities, operated by Bechtel, B&W Idaho for the U.S. Department of Energy. Today, INEEL is solving critical problems related to the environment, production and use of energy, U.S. economic competitiveness, and national security. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Lawrence Berkeley National Laboratory

Lawrence Berkeley National Laboratory (LBNL) is a multi-program laboratory located in Berkeley, California, on a 200-acre site adjacent to the Berkeley campus of the University of California. LBNL is dedicated to performing leading-edge research in the biological, physical, materials, chemical, energy, and computer sciences. LBNL also operates unique user facilities available to qualified investigators. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

National Renewable Energy Laboratory

The National Renewable Energy Laboratory (NREL) is located on a 300-acre campus at the foot of South Table Mountain in Golden, Colorado. It is the world leader in renewable energy technology development. Since its inception in 1977, NREL's sole mission has been to develop renewable energy and energy efficiency technologies and transfer these technologies to the private sector. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Oak Ridge Institute for Science and Education

Oak Ridge Institute for Science and Education (ORISE) is located on a 150-acre site in Oak Ridge, Tennessee. ORISE conducts research into modeling radiation dosages for novel clinical, diagnostic, and therapeutic procedures. In addition, ORISE coordinates several research fellowship programs and the peer review of all Basic Energy Sciences funded research. ORISE manages and administers ORNL undergraduate research opportunities for students and faculty.

Oak Ridge National Laboratory

Oak Ridge National Laboratory (ORNL) is a multi-program laboratory located on a 24,000-acre site in Oak Ridge, Tennessee. Scientists and engineers at ORNL conduct basic and applied research and development to create scientific knowledge and technological solutions that strengthen the nation's leadership in key areas of science; increase the availability of clear, abundant energy; restore and protect the environment; and contribute to national security. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National

Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Pacific Northwest National Laboratory

Pacific Northwest National Laboratory (PNNL) is a multi-program laboratory located on 640 acres at the Department's Hanford site in Richland, Washington. PNNL conducts research in the area of environmental science and technology and carries out related national security, energy, and human health programs. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Princeton Plasma Physics Laboratory

Princeton Plasma Physics Laboratory (PPPL) is a program-dedicated laboratory (Fusion Energy Sciences) located on 72 acres in Princeton, New Jersey. The primary mission of PPPL is to develop the scientific understanding and the innovations, which will lead to an attractive fusion energy source. Associated missions include conducting world-class research along the broad frontier of plasma science and providing the highest quality of scientific education. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Richland Operations Office

Richland is responsible for and manages all environmental cleanup and science and technology development at the 560 square mile Hanford Site, coordinating closely with contractor companies hired to manage and complete the work of the world's largest cleanup project. The primary contractors are Fluor Daniel Hanford and its subcontractors, the Bechtel Hanford, Inc, the Hanford Environmental Health Foundation, and the Battelle Memorial Institute, which serves as the contractor for Laboratory operations of the Pacific Northwest National Laboratory. Richland also manages the cooperative agreement with Associated Western Universities to administer research appointments at National Laboratories and universities, for undergraduate students and faculty, as part of the Office of Science funded Education Programs.

Stanford Linear Accelerator Center

Stanford Linear Accelerator Center (SLAC) is a program-dedicated laboratory (High Energy Physics) located on 426 acres in Menlo Park, California. SLAC is a national basic research laboratory, probing the structure of matter at the atomic scale with x-rays and at much smaller scales with electron and positron beams. SLAC scientists perform experimental and theoretical research in elementary particle physics using electron beams, plus a broad program of research in atomic and solid state physics, chemistry, biology, and medicine using synchrotron radiation. There are also active programs in the development of accelerators and detectors for high-energy physics research and of new sources and

instrumentation for synchrotron radiation research. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Thomas Jefferson National Accelerator Facility

Thomas Jefferson National Accelerator Facility (TJNAF) is a program-dedicated laboratory (Nuclear Physics) located on 273 acres in Newport News, Virginia. TJNAF is a basic research laboratory built to probe the nucleus of the atom to learn more about the quark structure of matter. The Laboratory gives scientists a unique and unprecedented probe to study quarks, the particles that make up protons and neutrons in an atom's nucleus. Workforce development for scientists, technicians, engineers, and mathematics along with teachers of these disciplines are conducted at the National Laboratories through research internships and fellowships that fully immerse the participants in state-of-the-art technologies with the added benefit of a mentor-intensive relationship that helps guide them through their stay at the laboratory and fosters their continuing in STEM and science-teaching careers.

Undergraduate Internships

Mission Supporting Goals and Measures

The Undergraduate Internships subprogram contains three activities:

The “Science Undergraduate Laboratory Internship” activity (formerly known as Energy Research Undergraduate Laboratory Fellowship [ERULF]) is designed to provide workforce development through research experiences at DOE laboratories for highly motivated undergraduate students from any two or four year accredited college or university. These internship opportunities complement the students’ academic training and introduce them to the unique intellectual and physical resources present at the DOE laboratories. Appointments are available during the spring, summer, and fall terms. These research opportunities have also been extended, in collaboration with the National Science Foundation (NSF), to undergraduate students in NSF programs, careers in science, mathematics or technology.

The “Community College Institute (CCI) of Science and Technology” provides a 10-week workforce development program through research experiences at several DOE National Laboratories for highly motivated community college students. The CCI is targeted at underserved community college students who have not had an opportunity to work in an advanced science-research environment. It incorporates both an individually mentored research component and a set of enrichment activities that include: lectures, classroom activities, career guidance/planning, and field trips. Appointments are available during the summer. This activity has also been extended, in collaboration with the National Science Foundation (NSF), to community college students and faculty in NSF funded programs that might not otherwise have an advanced research opportunity.

“Pre-Service Teachers” (PST) is for undergraduate students who have decided on a teaching career in science, technology, engineering or mathematics. Students work with scientists or engineers on projects related to the laboratories' research programs. They also have the mentorship of a Master Teacher who is currently working in K-12 education as a teacher and is familiar with the research environment of a specific National Laboratory. Appointments are available during the summer. This activity began in collaboration with the National Science Foundation (NSF) and has been extended to all pre-service teachers.

PROGRAM ACCOMPLISHMENTS

- An innovative, interactive Internet system has been developed and implemented for all Office of Science national workforce development programs, to receive and process hundreds of student and teacher/faculty applications for summer, fall, and spring semester research appointments at participating DOE laboratories. The automated system is virtually paperless and provides an excellent example of how the Internet can be used to streamline the operation of the Department’s research participation programs. The on-line application system is linked with an SC laboratory central processing center called Education Link.

This system enhances communication with the participants regarding their internships, contains pre- and post-surveys that quantify student knowledge, performance and improvement, allows SC to measure program effectiveness, track students in their academic and career path, and be a hosting site for publishing student papers, abstracts and all activity guidelines.

- Through special recruitment efforts, the Science Undergraduate Laboratory Internship (formerly ERULF, now SULI) has attracted a diverse group of students using the electronic application. Nearly 20 percent of those submitting applications were from under-represented groups. Approximately 40 percent of the applicants were females, and more than 25 percent were from low-income families. In the summer of 1999, more than 400 appointments were made through the new application process and in the summers of 2000, 2001 and 2002 more than 500 appointments were made each year through the new application process.
- An undergraduate student journal was created and publishes full-length peer-reviewed research papers and abstracts of students in the activity. A second edition was published in 2002, with 15 full-length papers and 350 abstracts. The 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 Boston. One of the students won a poster award at the AAAS meeting.
- Two Program Guidebooks were written for the student participants: 1) SULI and the Community College Initiative (CCI) guidebook provides formats and instructions for the written requirements, including scientific abstract, research paper, oral presentation, and poster; and 2) Pre-Service (PST) guidebook also includes instructions for an education module.
- The DOE Community College Institute of Science and Technology is no longer a pilot and is open to students from all community colleges. In the summer of 2002, more than 125 community college students attended a 10-week mentor-intensive scientific research experience at several DOE National Laboratories. Almost 60 percent of the participating students came from underrepresented groups in STEM disciplines; many were “non-traditional” students.

Subprogram Goals

Expand the number and diversity of participants in the Science Undergraduate Laboratory Internships, the Community College Institute (CCI) for Science and Technology, and Pre-Service Teacher (PST) programs, by establishing partnerships with other federal agencies and professional educational organizations. Also, evaluate the programs to assess the overall quality and relevance of the intern experience and track the students to determine the impact of these programs on advanced education and career goals.

Performance Indicator

Number of applicants; quality of mentorship; tracking of academic and career choices.

Annual Performance Results and Targets

FY 2002 Targets/Results	FY 2003 Targets	FY 2004 Targets
More than 1,600 applicants for the Undergraduate Internships were received (60% increase in applications). 470 students were selected for summer 2002. [Met Goal]	Increase the number and/or diversity of the applicants by 20% over FY 2002 level.	Increase the number and/or diversity of the applicants by 10%, leading to a more select group of students entering the program.
90% of students submitted acceptable abstracts. [Met Goal]	90% of approximately 500 students will submit acceptable abstracts.	90% of approximately 500 students will submit research abstracts judged as high quality by independent review.

FY 2002 Targets/Results	FY 2003 Targets	FY 2004 Targets
Develop tracking mechanisms to follow employment and career choices of participants at National laboratories and associated institutions. [Goal not met]	Complete the development of the tracking mechanisms and establish a baseline to begin following employment and career choices of participating students.	Track career choices of at least 30% of participating students, which will baseline long-term benefits of the program.
On-site review of workforce development programs at each laboratory by independent evaluators.	Evaluate quality of workforce development programs through independent evaluators.	SC Institutional Plan on-site reviews will include Workforce Development programs. Evaluate quality of workforce development programs through independent evaluators.

Funding Schedule

(dollars in thousands)

	FY 2002	FY 2003	FY 2004	\$ Change	% Change
Science Undergraduate Laboratory Internship	2,206	3,050	2,653	-397	-13.0%
Community College Institute of Science and Technology.....	695	625	605	-20	-3.2%
Pre-Service Teachers	264	400	510	+110	+27.5%
Total, Undergraduate Internships	3,165	4,075	3,768	-307	-7.5%

Detailed Program Justification

(dollars in thousands)

FY 2002	FY 2003	FY 2004
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Science Undergraduate Laboratory Internship..... 2,206 3,050 2,653

The Science Undergraduate Laboratory Internship (formerly ERULF) supports a diverse group of students at our National Laboratories in individually mentored research experiences. Through these unique and highly focused experiences these students will comprise a repository of talent to help the DOE meet its science mission goals. The paradigms of the activity are: 1) students apply on a competitive basis and are matched with mentors working in the students' fields of interest; 2) students spend an intensive 10-16 weeks working under the individual mentorship of resident scientists; 3) students must each produce an abstract and formal research report; 4) students attend seminars that broaden their view of career options and help them understand how to become members of the scientific community; and 5) activity goals and outcomes are measured based on students' research papers, students' abstracts, surveys and outside evaluation. An undergraduate student journal was created that publishes selected full research papers and all abstracts of students in the activity. Students who publish in this journal present their research at the annual AAAS meeting. The National Science Foundation (NSF) began a collaboration with this activity as of FY 2001. The activity will ensure a steady flow of students with technical expertise into the Nation's pipeline of workers in both academia and industry. A system is being created to track students in their academic career paths.

(dollars in thousands)

FY 2002	FY 2003	FY 2004
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Community College Institute of Science and Technology

695 625 605

The Community College Institute (CCI) of Science and Technology was originally a collaborative effort between DOE and its National Laboratories with the American Association of Community Colleges and specified member institutions. Through a recent Memorandum of Understanding with the NSF, undergraduate students in NSF programs (e.g., Lewis Stokes Alliance for Minority Participation and Advanced Technology Education program) are also participating in this activity and in FY 2002 the CCI was made available to students from all community colleges. This activity is designed to address shortages, particularly at the technician and paraprofessional levels and will help develop the workforce needed to continue building the Nation’s capacity in critical areas for the next century. Since community colleges account for more than half of the entire nation’s undergraduate enrollment, this is a great avenue to find and develop talented scientists and engineers. The Institute provides a ten-week mentored research internship at a DOE National Laboratory for highly motivated community college students. The paradigms of the activity are: 1) students apply on a competitive basis and are matched with mentors working in the students’ field of interest; 2) students spend an intensive 10 weeks working under the individual mentorship of resident scientists; 3) students must each produce an abstract and formal research report; 4) students 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 communication and other professional skills; and 5) activity goals and outcomes are measured based on students’ research papers, students’ abstracts, surveys and outside evaluation. An undergraduate student journal was created that publishes selected full research papers and all abstracts of students in this activity. The National Science Foundation entered into a collaboration with this activity in FY 2001. This allows NSF’s undergraduate programs to include a community college internship in their opportunities they provide to students.

Pre-Service Teachers

264 400 510

The Pre-Service Teachers activity is for students who are preparing for a teaching career in a STEM discipline. This effort is aimed at addressing the national need to improve content knowledge of STEM teachers prior to entering the teaching workforce. The paradigms of the activity are: 1) students apply on a competitive basis and are matched with mentors working the student’s field of interest; 2) students spend an intensive 10 weeks working under the mentorship of master teachers and laboratory scientists to help maximize the building of content, knowledge, and skills through the research experience; 3) students must produce an abstract and an educational module related to their research and may also produce a research paper or poster or oral presentation; 4) students attend professional enrichment activities, workshops and seminars that help students apply what they learn to their academic program and the classroom, and also to help them understand how to become members of the scientific community, and enhance their communication and other professional skills; and 5) activity goals and outcomes are measured based on students’ abstracts, education modules, surveys and outside evaluation.

Total, Undergraduate Internships

3,165 4,075 3,768

Explanation of Funding Changes

FY 2004 vs. FY 2003 (\$000)

<ul style="list-style-type: none"> ■ The number of Science Undergraduate Laboratory Internship decreases by 66 students. ■ The number of students in the Community College Institute of Science and Technology decreases by 4. ■ The number of students participating in the Pre-Service Teachers activity will increase by 20. 	-397 -20 +110
Total Funding Change, Undergraduate Internships	-307

Graduate/Faculty Fellowships

Mission Supporting Goals and Measures

The Graduate/Faculty Fellowships subprogram contains four activities:

In response to the national need for science teachers who have strong content knowledge, the Department is proposing a Laboratory Science Teacher Professional Development pilot fellowship at Argonne National Laboratory for K-14 teachers that will provide a mentor-intensive scientific professional development activity to improve their classroom performance and the achievement of their students.

The Faculty and Student Teams program provides research opportunities at a DOE National Laboratory to faculty and undergraduate students from colleges and universities with limited prior research capabilities and those institutions serving populations, women, and minorities underrepresented in the fields of science, engineering, technology and community college faculty, enabling a broader and lasting impact on undergraduate programs. These opportunities are also extended to faculty from NSF funded institutions.

The “Albert Einstein Distinguished Educator Fellowship” activity supports outstanding K-12 science and mathematics teachers, who provide insight, extensive knowledge, and practical experience to the Legislative and Executive branches. This activity is in compliance with the Albert Einstein Distinguished Educator Act of 1994 (signed into law in November 1994). The law gives DOE responsibility for administering the activity of distinguished educator fellowships for elementary and secondary school mathematics and science teachers.

The used “Energy Related Laboratory Equipment” (ERLE) activity was established by the United States Department of Energy (DOE) to grant available excess equipment to institutions of higher education for energy-related research.

PROGRAM ACCOMPLISHMENTS

- An innovative, interactive Internet system has been developed and implemented for all Office of Science national workforce development programs, to receive and process hundreds of student and teacher/faculty applications for summer, fall, and spring semester research appointments at participating DOE laboratories. The automated system is virtually paperless and provides an excellent example of how the Internet can be used to streamline the operation of the Department’s research participation programs. The on-line application system is linked with an SC laboratory central processing center called Education Link.

This system enhances communication with the participants regarding their internships, contains pre- and post-surveys that quantify student knowledge, performance and improvement, allows SC to measure program effectiveness and track students in their academic and career path, and be a hosting site for publishing student papers, abstracts and all activity guidelines.

- The Albert Einstein Distinguished Educator Fellowship Activity placed four outstanding K-12 science, math, and technology teachers in Congressional offices and two at DOE, as directed by legislation. The National Aeronautics and Space Administration, the National Science Foundation,

and the National Institute of Standards and Technology contributed funds to place seven additional Einstein Fellows in those agencies.

- A pilot Faculty and Student Team (FaST) activity was hosted at three Office of Science laboratories – Argonne National Laboratory, Lawrence Berkeley National Laboratory, and Pacific Northwest National Laboratory-- in collaboration with the National Science Foundation. Faculty and students from colleges and universities with limited prior research capabilities and those institutions serving populations, women, and minorities underrepresented in the fields of science, engineering, and technology were part of a research team at a National Laboratory. Over a ten week summer visit to the laboratory the faculty were introduced to new and advanced scientific techniques that will help them prepare their students for careers in science, engineering, computer sciences and technology and for their own professional development.

Subprogram Goals

Develop grade level K-14 STEM teachers as leaders in their profession and as members of the extended scientific and technical community. Develop a tracking system to determine quality of the activity and long term impact on physical science courses being offered; inquiry based instruction in the classroom that is at grade level and matched to local standards and benchmarks; use of technology; and leadership roles in education activities.

Performance Indicator

Number of leadership roles and quality of classroom teaching techniques.

Annual Performance Results and Targets

FY 2002 Results	FY 2003 Targets	FY 2004 Targets
	Develop the Laboratory Science Teacher Professional Development initiative to support professional development of K-14 STEM teachers.	Implement the Laboratory Science Teacher Professional Development initiative pilot at Argonne National Laboratory and provide follow-up support to participants. Track teachers with respect to their leadership roles and changes in their classroom teaching techniques.

Funding Schedule

(dollars in thousands)

	FY 2002	FY 2003	FY 2004	\$ Change	% Change
Laboratory Science Teacher Professional Development.....	0	0	1,000	+1,000	+100.0%
Faculty and Student Teams	50	150	210	+60	+40.0%
Albert Einstein Distinguished Educator Fellowship.....	443	500	600	+100	+20.0%
Energy Related Laboratory Equipment	75	75	90	+15	+20.0%
Total, Graduate/Faculty Fellowships.....	568	725	1,900	+1,175	+162.1%

Detailed Program Justification

(dollars in thousands)

FY 2002	FY 2003	FY 2004
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Laboratory Science Teacher Professional Development

0 0 1,000

The *National Commission on Mathematics and Science Teaching* and numerous other studies indicate that *professional staff development is one of the most effective ways of improving the achievement of K-14 students*. The National Laboratories can play a significant role in providing carefully designed *mentor-intensive training for science and math teachers* that will allow them to more effectively teach, *attract their students' interests to science, mathematics and technology careers*, and improve student achievement. The paradigms of the pilot "*Laboratory Science Teacher Professional Development*" activity are: 1) Teachers apply on a competitive basis and are matched with mentors working in their subject fields of instruction; 2) in the first year *about 60 teachers spend an intensive 4 to 8 weeks at a National laboratory* working under the mentorship of master teachers and laboratory mentor scientists to help build content knowledge research skills and a lasting connection with the scientific community through the research experience. *Master teachers*, who are expert K-14 teachers and adept in both scientific research experience at a National Laboratory and scientific writing, *will act as liaisons between the mentor scientists and the teacher researchers to help the teachers transfer the research experience to their classroom environments*; 3) follow-on support is considered critical. Master teachers and other teacher participants receive an \$800/week stipend, travel and housing expenses. All teachers completing the initial immersion experience will be provided monetary support, which consists of approximately \$3,000 to *purchase materials and scientific equipment*, to help them transfer their research experience to their classroom. Follow-on support also will include: Returning to the laboratory in the first year for *additional training sessions* of approximately 1 week long; and *long-term support* in following years through communication with other participants and laboratory scientists, more *return trips* to the National Laboratory, and support to *present their experience at teaching conferences and publications*; and 4) *outside evaluation* of program effectiveness including visits to participant teachers' schools and long term impact of the program on student achievement. Success of the pilot is based on two separate outcomes: 1) proper placement of a participant with a suitable mentor; and 2) the effect the program has on the teachers during the academic year. In FY 2004, a pilot program will be initiated at Argonne National Laboratory.

Faculty and Student Teams

50 150 210

Faculty and Student Teams (FaST) at Department of Energy, Office of Science Laboratories are being piloted in partnership with the National Science Foundation. Faculty from colleges and universities with limited prior research capabilities and those institutions serving populations, women, and minorities underrepresented 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.

(dollars in thousands)

FY 2002	FY 2003	FY 2004
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Albert Einstein Distinguished Educator Fellowship... **443** **500** **600**

The Albert Einstein Fellowship Awards for outstanding K-12 science, mathematics, and technology teachers continues to be a strong pillar of the program for bringing real classroom and education expertise to our education and outreach activities. Albert Einstein Fellows bring to Congress, DOE and other Federal agencies extensive knowledge and experience of classroom teachers. They provide practical insights and “real world” perspectives to policy makers and program managers.

Energy Related Laboratory Equipment **75** **75** **90**

The used “Energy Related Laboratory Equipment” (ERLE) grant activity was established by the United States Department of Energy (DOE) to grant available excess equipment to institutions of higher education for energy-related research.

Total, Graduate/Faculty Fellowships **568** **725** **1,900**

Explanation of Funding Changes

FY 2004 vs. FY 2003 (\$000)

- Initiate the Laboratory Science Teacher Professional Development pilot at Argonne National Laboratory for approximately 60 science, technology, engineering and mathematics (STEM) teachers in grades K-14. +1,000
 - This allows an increase of 3 Faculty and Student Teams to participate in a 10 week mentored research experience at a DOE National Laboratory..... +60
 - Increase the number of Fellows, their stipends and administrative expenses for the Albert Einstein Distinguished Educator Fellowship..... +100
 - Increase the used Energy Related Laboratory Equipment activity to upgrade and maintain the web-based on-line system. +15
- Total Funding Change, Graduate/Faculty Fellowships..... +1,175

Pre-College Activities

Mission Supporting Goals and Measures

The Pre-College Activities subprogram contains two activities:

The “National Science Bowl®” activity is a highly visible educational event and academic competition among teams of high school students who attend science and technology seminars and compete in a verbal forum to solve technical problems and answer questions in all branches of science and math. This activity is a highly publicized academic event among high school students who answer questions on scientific topics in astronomy, biology, chemistry, mathematics, physics, earth, and general science. Since its inception, more than 80,000 high school students have participated in regional tournaments leading up to the national finals.

The Middle School Science Bowl will attract students at the most critical stage of their academic development. The emphasis at this grade level will be on discovery and hands-on activities such as designing, building and racing model solar cars.

PROGRAM ACCOMPLISHMENTS

- Three additional regional competitions were held in conjunction with DOE’s National Science Bowl®. More than 12,000 high school students participated in the 64 regional science bowl tournaments.
- A pilot Middle School Science Bowl was added in FY 2002, bringing eight teams to Washington DC for the National event. The event had two main activities: 1) a science and mathematics academic question and answer forum; and 2) a hands-on activity where each team designed, built and raced a scale-model solar car.
- Saturday morning science seminars were added to the National Science Bowl weekend, introducing students to many contemporary issues and findings in scientific research. A Nobel laureate from the National Institute of Standards and Technology (NIST) also spoke to all the students on Saturday morning.
- National Science Bowl awards were expanded to include a wide variety of academic awards to the top 18 teams and a Civility Award sponsored by IBM.

Subprogram Goals

Broaden the educational impact and outreach of the “Science Bowl” competition by increasing the number of scientific seminars; improve and expand the middle school component of the science bowl, and increase the number of participating schools in both the National Science Bowl and the Middle School Science Bowl.

Performance Indicator

Number of participants, quality of science seminars and other educational enrichment activities.

Annual Performance Results and Targets

FY 2002 Targets/Results	FY 2003 Targets	FY 2004 Targets
Pilot a Middle School Science Bowl; Nobel Laureate speaker at National Science Bowl.	Increase the number of students participating at regional events; and increase number of scientists giving seminars at Science Bowl.	Increase the number of students participating at regional events; and increase number of scientists giving seminars at Science Bowl.
Extend the science education of the Science Bowl beyond the current academic, question and answer event, to a broader experience by including a hands-on engineering event where students build and compete in a model solar car competition.	Enhance the hands-on elements of Science Bowl by having students build and compete in a model fuel cell car competition.	Collaborate with industry partner to increase the number of students and regional events for the model fuel cell car competitions.

Funding Schedule

(dollars in thousands)

	FY 2002	FY 2003	FY 2004	\$ Change	% Change
National Science Bowl.....	727	660	702	+42	+6.4%
Middle School Science Bowl	0	0	100	+100	+100.0%
Total, Pre-College Activities	727	660	802	+142	+21.5%

Detailed Program Justification

(dollars in thousands)

	FY 2002	FY 2003	FY 2004
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National Science Bowl..... 727 660 702

SC will manage and support the National Science Bowl® for high school students from across the country for DOE. Since its inception, more than 80,000 high school students have participated in this event. The National Science Bowl® is a highly publicized academic competition among teams of high school students who answer questions on scientific topics in astronomy, biology, chemistry, mathematics, physics, earth, computer, and general science. In 1991, DOE developed the National Science Bowl® to encourage 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 the students and teachers a forum to receive national recognition for their talent and hard work. An entire day of Saturday seminars in the latest scientific topics and the hydrogen fuel cell challenge has been added to the National Science Bowl® weekend. Students participating in the National Science Bowl® will be tracked to see the long-term impact on their academic and career choices.

Middle School Science Bowl..... 0 0 100

It is well recognized that the middle school years are the most productive time to exert an effort to attract students to science and math subjects. *There are two competitions at the Middle School Science Bowl –*

(dollars in thousands)

FY 2002	FY 2003	FY 2004
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an academic mathematics and science competition and a model solar car competition. The academic competition is a fast-paced question and answer contest where students answer questions about earth science, life science, physical science, mathematics, and general science. The model solar car competition challenges students to design, build, and race model solar cars. Students who win in regional events will then enjoy a trip to a National Laboratory and participate in a final three day event that will be designed to capture their interest and reward them for their hard work.

Total, Pre-College Activities	727	660	802
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Explanation of Funding Changes

FY 2004 vs. FY 2003 (\$000)

■ This is to increase the number of National Science Bowl teams and to also provide a whole day of scientific seminars and workshops for the students.	+42
■ Initiate the Middle School Science Bowl activity, which will include an academic mathematics and science competition and a model solar car competition	+100
Total Funding Change, Pre-College Activities	+142