Workforce Development for Teachers and Scientists

Overview

The Workforce Development for Teachers and Scientists (WDTS) program mission is to help ensure that DOE has a sustained pipeline of science, technology, engineering, and mathematics (STEM) workforce. Accomplishing this mission depends on continued support for undergraduate internships and graduate thesis research; administration of the Albert Einstein Distinguished Educator Fellowship for K–12 STEM teachers for federal agencies; and annual, nationwide, middle- and high-school science competitions culminating in the National Science Bowl® in Washington, D.C. These investment activities support the development of the next generation of scientists and engineers to address the DOE mission, administer programs, and conduct research.

WDTS activities rely significantly on DOE's 17 national laboratories and scientific facilities, which employ more than 30,000 individuals with STEM backgrounds. The DOE laboratory system provides access to leading scientists; world-class scientific user facilities and instrumentation; and large-scale, multidisciplinary research programs unavailable in universities or industry. WDTS leverages these assets to develop and train post-secondary students and educators in support of the DOE mission. WDTS experience-based STEM learning opportunity programs enable highly qualified applicants to conduct research at DOE laboratories and facilities in support of the workforce mission.

Highlights of the FY 2019 Request

The FY 2019 Request prioritizes funding for programs that place highly qualified applicants in authentic STEM learning and training experience opportunities at DOE laboratories. It also prioritizes support for the DOE National Science Bowl® (NSB), a signature STEM competition testing middle and high school students' knowledge in science and mathematics. By encouraging students to pursue STEM careers, these programs address the DOE's STEM mission critical workforce pipeline needs required to advance national security and promote American competitiveness.

Description

Activities at the DOE Laboratories

WDTS supports activities such as the Science Undergraduate Laboratory Internships program, the Community College Internships program, the Office of Science (SC) Graduate Student Research Program, and the Visiting Faculty Program. One of the primary goals of these programs is to prepare students to enter STEM careers that are especially relevant to the DOE mission. By providing research experiences at DOE laboratories under the direction of scientific and technical laboratory staff who serve as research advisors and mentors, these activities provide opportunities for participants to engage in research requiring specialized instrumentation; large-scale, multidisciplinary efforts; and/or scientific user facilities. WDTS activities are aligned with the STEM workforce training recommendations of the Federal advisory committees of SC's six research program offices, the strategic objectives of the National Science and Technology Council Committee on STEM Education (CoSTEM) Federal STEM Education 5-Year Strategic Plan,[a] and the Administration's goals for developing a future-focused workforce.[b]

The Science Undergraduate Laboratory Internships (SULI) program places students from two- and four year undergraduate institutions as paid interns in science and engineering research activities at DOE laboratories, working with laboratory staff scientists and engineers on projects related to ongoing research programs. Appointments are for 10 weeks during the summer term and 16 weeks during the fall and spring terms.

The Community College Internships (CCI) program places community college students as paid interns in technological activities at DOE laboratories, working under the supervision of a laboratory technician or researcher. Appointments are for 10 weeks during the summer, fall, and spring terms.

[a] https://www.whitehouse.gov/sites/whitehouse.gov/files/ostp/Federal_STEM_Strategic_Plan.pdf
[b] https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2017/m-17-30.pdf

The Office of Science Graduate Student Research (SCGSR) program goal is to prepare graduate students for STEM careers critically important to the SC mission by providing graduate thesis research opportunities at DOE laboratories. The SCGSR program provides supplemental awards for graduate students to pursue part of their graduate thesis research at a DOE laboratory or facility in areas that address scientific challenges central to the SC mission. U.S. graduate students pursuing Ph.D. degrees in physics, chemistry, materials sciences, non-medical biology, mathematics, computer or computational sciences, or specific areas of environmental sciences aligned with the SC mission are eligible for research awards to conduct part of their graduate thesis research at a DOE laboratory or facility in collaboration with a DOE laboratory scientist. Research award terms range from three months to one year.

The Visiting Faculty Program (VFP) goal is to increase the research competitiveness of faculty members and students at institutions of higher education historically underrepresented in the research community. Through direct collaboration with research staff at DOE host laboratories, VFP appointments provide an opportunity for faculty and their students to develop skills applicable to programs at their home institutions; this helps increase the STEM workforce in DOE science mission areas at institutions historically under-represented within the DOE enterprise. Appointments are in the summer term for 10 weeks.

Albert Einstein Distinguished Educator Fellowship

The Albert Einstein Distinguished Educator Fellowship Act of 1994 charges the Department of Energy (DOE) with administering a fellowship program for elementary and secondary school mathematics and science teachers that focuses on bringing teachers' real-world expertise to government to help inform federal STEM education programs. Selected teachers spend eleven months in a Federal agency or a Congressional office. WDTS manages the Albert Einstein Distinguished Educator Fellowship (AEF) Program for the Federal government. Fellows are supported by DOE and other Federal agencies. Typically, SC supports six Fellows each year; five are placed in Congressional offices and one is placed in SC. Participating agencies have included the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), and the National Oceanic and Atmospheric Administration (NOAA), as well as other DOE offices. The Fellows provide educational expertise, years of teaching experience, and personal insights to these offices to advance science, mathematics, and technology education programs.

National Science Bowl®

The DOE National Science Bowl® is a nationwide academic competition testing students' knowledge in all areas of mathematics and science, including energy. High school and middle school students are quizzed in a fast-paced, question-and-answer format. Approximately 275,000 students have participated in the National Science Bowl® throughout its 27-year history, and it is one of the nation's largest science competitions. The U.S. Department of Energy Office of Science manages the National Science Bowl®, and sponsors the NSB finals competition. Regional competitions rely upon volunteers and are supported by numerous local organizations, both public and private.

The National Science Bowl® regional winning teams receive expenses-paid trips to Washington, D.C. to compete at the National Finals in late April. Competing teams are composed of four students, one alternate, and a teacher who serves as an advisor and coach. SC manages the National Science Bowl®, provides central management of 116 regional events, and sponsors the NSB Finals competition.

In FY 2017, more than 5,100 middle school students from 651 schools, and approximately 9,000 high school students from 1,191 schools, participated in the regional competitions, with 48 middle school and 63 high school teams (552 students) participating in the National Finals in Washington, D.C. All 50 U.S. States, the District of Columbia, and Puerto Rico were represented at regionals. More than 5,000 volunteers also participate in the local and national competitions.

The National Science Bowl® championship finals are held at the Lisner Auditorium, located on the campus of The George Washington University, and features a live web-streaming broadcast of the event.

The DOE National Science Bowl® is aligned with the CoSTEM Federal STEM Education 5-Year Strategic Plan priority investment area for STEM engagement.

Technology Development and On-Line Application

This activity modernizes on-line systems used to manage applications and review, data collection, and evaluation for WDTS programs. A project to develop, build, and launch new online application and program support systems is progressing to improve program management, execution, and evaluation by WDTS program staff and by DOE laboratory staff. An important component of the systems is the ability to support regular evidence-based evaluation of program performance and impact. A phased approach is being used to develop and build these systems. The final phase involves the development of an analytics and visualization portal, using a data-dictionary and data warehouse of participant information, with an embedded commercially available business intelligence software tool as its analysis and visualization engine. Using this toolset, a scheduled portfolio of reports will be made available to DOE host laboratories to inform them of participant trends and program outcomes. WDTS will use this toolset as part of a data-driven programmatic impact evaluation process, providing means to measure progress and optimize program management.

Evaluation Studies

The Evaluation Studies activity supports work to assess whether WDTS programs meet established goals. This is accomplished through the use of triannual reviews of its program performers, and of WDTS itself. These reviews are either subject matter program peer reviews, or Federal Advisory Committee commissioned Committee of Visitors reviews, respectively. Additional supported activities that measure and assess program performance involve the collection and analysis of data and other materials, including pre- and post-participation questionnaires, participant deliverables, notable outcomes (publications, presentations, patents, *etc*.), and longitudinal participant tracking. In FY 2014, evaluation plans for each WDTS activity were completed. In FY 2015, a data management and analysis plan was completed and a set of technical requirements developed, which were used to define a project plan in FY 2016 and begin its execution to develop and implement a data-driven analysis, visualization, and reporting toolset. In FY 2017, development of this toolset was completed. In FY 2018, a pilot longitudinal study of program outcomes has commenced.

In FY 2014, SC completed a study to identify disciplines in which significantly greater emphasis in workforce training at the graduate student or postdoc levels is necessary to address gaps in current and future SC mission needs. In this study, each Office of Science Federal Advisory Committee, each Associate Director, and each Laboratory Director were asked to provide expert assessment on the following: (i) STEM disciplines not well represented in academic curricula; (ii) STEM disciplines in high demand, nationally and/or internationally, resulting in difficulties in recruitment and retention at U.S. universities and at DOE laboratories; (iii) STEM disciplines for which the DOE laboratories may play a role in providing needed workforce development; and (iv) recommendations for programs at the graduate student or postdoc levels that can address discipline-specific workforce development needs. The outcomes of this study now guide prioritization of eligible SCGSR programmatic research areas and inform WDTS strategic planning. More broadly, the outcomes of this study have identified for SC both program-specific workforce development needs and crosscutting workforce development needs in areas such as computing and computational sciences. Based upon the guiding principles, the availability of relevant research areas for SCGSR is reviewed and updated to address emerging mission workforce area needs.

The Evaluation Studies activity is aligned with the GPRA Modernization Act of 2010, which emphasizes the need for federal programs (including STEM education programs) to demonstrate their effectiveness through rigorous evidence-based evaluation. WDTS works cooperatively with SC programs, other DOE programs, and other federal agencies through CoSTEM to share best practices for STEM program evaluation to ensure the implementation of evaluation processes appropriate to the nature and scale of the program effort.

Outreach

WDTS engages in outreach activities, some in cooperation with other DOE program offices and select federal agencies, to widely publicize its opportunities. The WDTS website[a] is the most widely used tool for prospective program participants to obtain information about WDTS and is the gateway to accessing the online applications for the WDTS programs. To help diversify the applicant pool, outreach is conducted via presentations to targeted key stakeholder groups, and via the web using virtual webinar meetings that highlight the programs, their opportunities, and the WDTS internship experience. A portfolio of recorded webinars is available on the WDTS website.

[a] https://science.energy.gov/wdts

In FY 2016, DOE host laboratories and facilities issued a pilot proposal solicitation to develop and execute outreach activities aimed at recruiting a more diverse spectrum of applicants to WDTS laboratory-based programs. Eligible laboratories and facilities are those that hosted FY 2016 participants in the SULI, CCI, VFP, and/or SCGSR programs. Based upon this pilot and its reported deliverables, a more programmatically focused solicitation was issued in FY 2017 for outreach activities commencing in FY 2018.

The Laboratory Equipment Donation Program has been consolidated under Outreach, and it continues to provide excess laboratory equipment to faculty at non-profit research institutions and post-secondary educational institutions. Through the Energy Asset Disposal System, DOE sites identify excess equipment and colleges and universities can then search for equipment of interest and apply via the website. The equipment is free, but the receiving institution pays for shipping costs. This consolidation does not alter the scope of this activity.

Workforce Development for Teachers and Scientists
Funding ($K)

	FY 2017 Enacted	FY 2018 Annualized CR[a]	FY 2019 Request	FY 2019 Request vs FY 2017 Enacted
Activities at the DOE Laboratories				
Science Undergraduate Laboratory Internships	8,300	—	8,300	0
Community College Internships	1,000	—	1,000	0
Office of Science Graduate Student Research Program	2,500	—	2,500	0
Visiting Faculty Program	1,700	—	1,700	0
Total, Activities at the DOE Laboratories	**13,500**	**—**	**13,500**	**0**
Albert Einstein Distinguished Educator Fellowship	**1,200**	**—**	**1,200**	**0**
National Science Bowl®	**2,900**	**—**	**2,900**	**0**
Technology Development and On-Line Application	**750**	**—**	**550**	**-200**
Evaluation Studies	**600**	**—**	**350**	**-250**
Outreach	**500**	**—**	**500**	**0**
Laboratory Equipment Donation Program	**50**	**—**	**0**	**-50**
Total, Workforce Development for Teachers and Scientists	**19,500**	**19,368**	**19,000**	**-500**

[a]A full-year 2018 appropriation for this account was not enacted at the time the budget was prepared; therefore, the budget assumes this account is operating under the Continuing Appropriations Act, 2018 (Division D of P.L. 115-56, as amended). The amounts included for 2018 reflect the annualized level provided by the continuing resolution. (These amounts are shown only at the Congressional control level and above; below that level, a dash (—) is shown).

Program Accomplishments

Science Undergraduate Laboratory Internships (SULI) — In FY 2017, approximately 50% of the 780 participants worked on SC supported research projects, which is by far the largest DOE program office-funded research project representation. While all participants work on DOE mission relevant activities, this outcome supports SC research mission relevancy, and illustrates willingness of SC principal investigators to serve as mentors. More than 50 of the FY 2017 participants were from Minority Serving Institutions (MSIs).

Community College Internships (CCI) — In FY 2017, approximately 35% of the participants were from Minority Serving Institutions (MSIs).

Office of Science Graduate Student Research Program (SCGSR) — In FY 2017, with the addition of a placement at the National Energy Technology Laboratory, SCGSR had participants at all 17 DOE national laboratories. To date, there has been about 260 awardees from 102 graduate institutions across the U.S.

WDTS coordinated with SC's Office of Fusion Energy Sciences to support the DIII-D tokomak user facility to host SCGSR awardees. As an outcome, beginning in FY 2017 DIII-D is a new host site for SCGSR applicants. General Atomics, where DIII-D is sited, has a 20+ year record of hosting undergraduate and graduate students performing research and using DIII-D to train students in plasma and fusion sciences.

Visiting Faculty Program (VFP) — In FY 2017, approximately 50% of the faculty participants were from MSIs.

Albert Einstein Distinguished Educator Fellowship (AEF) — In FY 2017, two of six WDTS sponsored AEF participants held WDTS office appointments. In addition to engaging in WDTS programmatic activities, one of these participants, as a nationally recognized STEM educator, also collaborated with Brookhaven National Laboratory and the Savannah River National Laboratory to apply their expertise to portions of their STEM education outreach activities.

The National Science Bowl® (NSB) — The National Finals of the 27th DOE National Science Bowl® took place in the Washington, DC, area from April 27 – May 1, 2017. The White House Deputy Chief Technology Officer and Senior Advisor, delivered congratulatory remarks to the 63 high schools and 48 middle schools at the finals, and conferred awards to the winning teams.

The NSB's Science Day is a cornerstone event, opening the finals competition with a tradition of attracting prominent speakers, including outstanding researchers from DOE laboratories, who are able to connect workplace experience and relevancy to these students' STEM area studies. Having Science Day speakers from across the DOE laboratory complex is particularly relevant from a workforce mission perspective, as this is often the first time that these students become aware of DOE mission research, and the its national laboratory complex. The 2017 NSB Science Day for high-school finalists had as its theme Quantum Information Sciences (QIS), a rapidly-developing interdisciplinary field, with substantial intersections with the program offices within SC and significant implications for the Nation as a whole.

A new Cyber-Challenge middle school activity successfully replaced the middle school electric car competition. This Cyber-Challenge activity leverages NNSA's *Cybersecurity Workforce Pipeline Consortium* investments, and is based upon activities developed at Lawrence Livermore National Laboratory. The NSB provided an opportunity to develop and test these cybersecurity outreach and training activities at large concurrent participant scales.

Technology Development and On-Line Application — WDTS completed an initial phase of a project to develop and implement a data-dictionary/data-warehouse based analytics and visualization toolset supporting data-driven program evaluation. Completed activities include the development of a participant relational database and data dictionary, selection and implementation of a business intelligence server-side solution using a commercial software package, QlikSense (QlikTech Inc., Radnor, PA) for efficient data analyses, and the development and implementation of a related evaluation toolset and reporting portal.

Evaluation — An external peer review of DOE host labs was completed resulting in updated guidance for the SULI, CCI, and VFP Core Requirements and Model Practices, which will be used by host labs in their updated program Implementation Plans. These plans establish an execution roadmap for host labs to follow as means to achieve the Core Requirements, thereby helping ensure that participants receive a substantially equivalent internship experience regardless of host lab placement, as well as providing a measurement framework for future program reviews and process improvement cycles. A Committee of Visitors (COV) review of WDTS activities implemented at DOE laboratories (*i.e*. SULI, CCI, VFP, and SCGSR) was held in FY 2017, with its final report presented and approved by the Basic Energy Sciences Advisory Committee. The COV report and WDTS responses to the report's recommendations are posted on appropriate SC webpages. The COV found that all programs reviewed as either very good or excellent, and noted that the developed suite of online system tools used to manage applications and their reviews, data collection and archiving, and data evaluation and reporting for WDTS programs greatly enhances program management and oversight efficacy and increases program execution efficiencies at host labs.

Outreach — DOE host laboratories and facilities executed pilot projects aimed at recruiting a more diverse applicant pool to WDTS laboratory-based programs. These projects all targeted recruitment of individuals traditionally underrepresented in STEM and address needs to increase the applicant pool diversity for one or more of the WDTS programs currently implemented at DOE host laboratories and facilities. Based upon outcomes, this pilot is being used to establish a baseline for ongoing outreach activities and future solicitations.

Activities and Explanation of Changes

FY 2017 Enacted	FY 2019 Request	Explanation of Changes FY 2019 Request vs FY 2017 Enacted
Activities at the DOE Laboratories $13,500,000	**$13,500,000**	**$0**
Science Undergraduate Laboratory Internships ($8,300,000) SULI supported approximately 800 students.	*Science Undergraduate Laboratory Internships ($8,300,000)* SULI will support approximately 800 students.	*Science Undergraduate Laboratory Internships ($0)* No change.
Community College Internships ($1,000,000) CCI supported approximately 100 students.	*Community College Internships ($1,000,000)* CCI will support approximately 100 students.	*Community College Internships ($0)* No change.
Graduate Student Research Program ($2,500,000) The SCGSR program supported approximately 110 graduate students for periods of 3 months to 1 year to conduct a part of their thesis research at DOE laboratories. Targeted priority research areas were informed by SC's workforce training needs studies.	*Graduate Student Research Program ($2,500,000)* The SCGSR program will support approximately 110 graduate students for periods of 3 months to 1 year to conduct a part of their thesis research at DOE laboratories. Targeted priority research areas will be informed by SC's workforce training needs studies.	*Graduate Student Research Program ($0)* No change.
Visiting Faculty Program ($1,700,000) VFP supported approximately 65 faculty and 40 students.	*Visiting Faculty Program ($1,700,000)* VFP will support approximately 65 faculty and 40 students.	*Visiting Faculty Program ($0)* No change.
Albert Einstein Distinguished Educator Fellowship $1,200,000	**$1,200,000**	**$0**
FY 2017 funding supported 6 Fellows.	FY 2019 funding will support 6 Fellows.	No change.
National Science Bowl $2,900,000	**$2,900,000**	**$0**
WDTS sponsored the finals competition and provided central management of 116 regional events, involving 14,300 students from all fifty states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.	WDTS will sponsor the finals competition and provide central management of 116 regional events, involving 14,300 students from all fifty states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.	No change.

FY 2017 Enacted	FY 2019 Request	Explanation of Changes FY 2019 Request vs FY 2017 Enacted
Technology Development and On-line Application Systems $750,000	**$550,000**	**$-200,000**
Funding continued development and operation of the on-line systems.	Funding will continue development and operation of the on-line systems.	The requested funding prioritizes programmatically required on-line system operations.
Evaluation $600,000	**$350,000**	**$-250,000**
Funding continued support for evaluation activities, including data archiving, curation, and analyses.	Funding will continue support for evaluation activities, including data archiving, curation, and analyses.	The requested funding prioritizes programmatically required evaluation activities.
Outreach $500,000	**$500,000**	**$0**
Funding supported outreach activities to the scientific community targeting Office of Science mission-driven disciplinary workforce needs in the next 5 to 10 years, including additional outreach activity proposal solicitations from DOE host labs and facilities.	Funding will support outreach activities to the scientific community targeting Office of Science mission-driven disciplinary workforce needs in the next 5 to 10 years, including additional outreach activity proposal solicitations from DOE host labs and facilities.	No change. The requested funding prioritizes critical outreach activities at DOE host labs and facilities.
Laboratory Equipment Donation Program $50,000	**$0**	**$-50,000**
Funding supported Laboratory Education Equipment Donation Program (LEDP) activities.	Program is funded in FY 2019 under the Outreach program.	No impact.