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) workers. This is accomplished through support of 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 investments support the development of the next generation of scientists and engineers to support the DOE mission, administer programs, and conduct research.

WDTS activities rely significantly on DOE's 17 laboratories and facilities, which employ more than 30,000 workers 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 2018 Budget Request

The FY 2018 Budget 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 national competitiveness.

Description

Activities at the DOE Laboratories

WDTS supports activities such as the Science Undergraduate Laboratory Internships program, the Community College Internships program, and the Office of Science (SC) Graduate Student Research Program. One of the primary goals of these programs is to encourage 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 and the strategic objectives of the National Science and Technology Council Committee on STEM Education (CoSTEM) Federal STEM Education 5-Year Strategic Plan.[a]

The **Science Undergraduate Laboratory Internships (SULI)** program places students from 2 and 4 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.

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

[a] https://www.whitehouse.gov/sites/whitehouse.gov/files/ostp/Federal_STEM_Strategic_Plan.pdf

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.

Albert Einstein Distinguished Educator Fellowship

The Albert Einstein Distinguished Educator Fellowship Act of 1994 charged the Department of Energy (DOE) with administering a fellowship program for elementary and secondary school mathematics and science teachers that focused on bringing teachers' real-world expertise to government to help inform federal STEM education programs. Selected teachers spent eleven months in a Federal agency or a Congressional office. WDTS has managed the Albert Einstein Distinguished Educator Fellowship (AEF) Program for the Federal government. In FY 2018, no funds are requested for the AEF Program as WDTS focuses its efforts on those programs that directly advance DOE and SC workforce training needs. The final cohort of AEF participants, those selected for the 2017 – 2018 Fellowship Year beginning September 1, 2017, is based upon the FY 2017 application and placement process, with this cohort being fully supported by funds obligated in FY 2017. DOE will work with other participating agencies to identify ways in which the original goals of the program can be addressed through other means.

National Science Bowl®

The DOE National Science Bowl® (NSB) 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 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, 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), featuring 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 their demographic 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 through the use of 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, with a set of technical requirements developed. In FY 2016, the technical requirements were used to define a project plan, and begin its execution to develop and implement a data-driven analysis, visualization, and reporting toolset.

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.

Evaluation Studies 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 opportunities for student internships, SC Graduate Student Research program, the Visiting Faculty Program (VFP), and the Albert Einstein Distinguished Educator Program. 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. In FY 2016, a pilot proposal solicitation from DOE host laboratories and facilities was issued 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.

The Laboratory Equipment Donation Program is 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.

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

Workforce Development for Teachers and Scientists
Funding ($K)

	FY 2016 Enacted	FY 2017 Annualized CR[a]	FY 2018 Request	FY 2018 vs FY 2016
Activities at the DOE Laboratories				
Science Undergraduate Laboratory Internships	8,300	—	7,900	-400
Community College Internships	1,000	—	1,000	0
Office of Science Graduate Student Research Program	2,500	—	2,000	-500
Visiting Faculty Program	1,700	—	0	-1,700
Total, Activities at the DOE Laboratories	**13,500**	**—**	**10,900**	**-2,600**
Albert Einstein Distinguished Educator Fellowship	**1,200**	**—**	**0**	**-1,200**
National Science Bowl®	**2,900**	**—**	**2,400**	**-500**
Technology Development and On-Line Application	**750**	**—**	**300**	**-450**
Evaluation Studies	**600**	**—**	**200**	**-400**
Outreach	**500**	**—**	**200**	**-300**
Laboratory Equipment Donation Program	**50**	**—**	**0**	**-50**
Total, Workforce Development for Teachers and Scientists	**19,500**	**19,463**	**14,000**	**-5,500**

[a] FY 2017 Annualized CR amounts reflect the P.L. 114-254 continuing resolution level annualized to a full year. 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 2016, of the 800 participants, more than 45% 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 WDTS SC research mission relevancy, and illustrates willingness of SC principal investigators to serve as mentors.

Community College Internships (CCI) – In FY 2016, semester terms were fully adopted to increase availability of the opportunity, now with an option for a "flex-schedule" where the equivalent of 400 hours spent on-site at a host lab can be spread over a 16 week duration term. This option is available at the discretion of host labs, and is designed to allow participants to stay enrolled in coursework while participating in the program. Under a flex-schedule, weekly stipends are based on a 40 hours per week payment, prorated accordingly, with any housing allowance being based upon a 10-week duration appointment. In FY 2016, 18 participants were from Minority Serving Institutions.

Office of Science Graduate Student Research Program (SCGSR) – In FY 2016, the SCGSR Program supported 110 supplemental awards to graduate students to conduct their thesis research at 13 DOE national laboratories. Over two thirds of the awards support project terms ranging from 6-12 months. The SCGSR Program attracts graduate student applicants at various stages in their graduate education and from a broad range of graduate schools across the U.S. Awards were made to graduate students from 60 different universities who will conduct graduate research in areas that span the research missions of the six Office of Science program offices. A total of 9 new research areas were added, with 4 from the Office of Biological and Environmental Research and 5 from the Office of Basic Energy Sciences.

Visiting Faculty Program (VFP) – In FY 2016, 30 faculty participants were from Minority Serving Institutions (MSIs), with 15 from Hispanic Serving Institutions (HSIs), 13 from Historically Black Colleges and Universities (HBCUs), and 2 from Predominately Black Institutions (PBIs). Additionally, 15 VFP student participants were from MSIs.

Albert Einstein Distinguished Educator Fellowship (AEF) – Two of six WDTS sponsored AEF participants held WDTS office appointments, and in addition to engaging in WDTS programmatic activities, these two participants, as nationally recognized STEM educators, also worked directly with Brookhaven National Laboratory, Idaho National Laboratory, and the National Renewable Energy Laboratory on portions of their STEM education outreach activities. Fellows spent time onsite, with the opportunities being determined by mutual agreement matching interest and opportunity type with expertise.

The National Science Bowl® – 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' science, technology, engineering, and math (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, the its national laboratory complex. In its FY 2016 Science Day, students heard from plenary speaker Dr. Eric Brown, Director of Watson Technologies at the IBM Thomas J. Watson Research Center, as well as from leading researchers at DOE laboratories, who showcased recent developments from the fast-paced fields of high-performance computing and data networks, simulation, modeling, visualization, and data mining.

To enhance the students' learning opportunities, virtual experience kiosks were updated and used at the National 4H Center in Chevy Chase, Maryland, home of the NSB's finals competition, allowing students to self-explore and learn about scientific applications and research at DOE's national laboratories. Also demonstrated at the 4H Center was "Tiny Titan," an interactive educational display computer that visually shows the power of multicore processing and parallel architectures, both of which help form the technological basis for all high-performance computers in use today.

The live attendance at the championship finals was its greatest ever, estimated at 1,100.

Technology Development and On-Line Application – FY 2016 updates to the WDTS Application and Review System (WARS) included an instant SMS-text based user account self-reset feature, as well as improved embedded tooltips and FAQs for client self-help while navigating WARS. WDTS also directed the development and implementation of automated messaging functionalities from within WARS so that SULI, CCI, and VFP program solicitation opening announcements are routinely sent

to all eligible College/University Career Placement Offices/Centers. WDTS also initiated a project to develop and implement a data-dictionary/data-warehouse based analytics and visualization toolset supporting data-driven program evaluation. To date, WDTS has directed the development of the relational database and data dictionary, led the evaluation of business intelligence tools, and based upon this evaluation, directed the selection and implementation of a server-side solution using a commercial software package QlikSense (QlikTech Inc., Radnor, PA). WDTS has completed its definition of the technical requirements for development of a related evaluation toolset portal.

Outreach - DOE host laboratories and facilities issued a pilot proposal solicitation to develop and execute outreach activities aimed at recruiting a more diverse applicant pool to WDTS laboratory-based programs. A merit review based selection identified ten outreach proposals for funding in FY 2016, with proposed activities taking place during FY 2017. These proposals all target 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 will be used to establish a baseline for future outreach activity solicitations.

Activities and Explanation of Changes

FY 2016 Enacted	FY 2018 Request	Explanation of Changes FY 2018 vs FY 2016
Activities at the DOE Laboratories $13,500,000	**$10,900,000**	**$-2,600,000**
Science Undergraduate Laboratory Internships ($8,300,000) SULI supported approximately 800 students, including support for an additional 45 fall and spring semester students.	*Science Undergraduate Laboratory Internships ($7,900,000)* SULI will support approximately 750 students.	*Science Undergraduate Laboratory Internships ($-400,000)* Funding decrease requires a reduction in scope. The number of participants are decreased by 50.
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 ($2,000,000)* The SCGSR program will support approximately 85 graduate students for periods of 3 months to 1 year to conduct a part of their thesis research at DOE laboratories. Targeted priority research areas will be informed by SC's workforce training needs studies.	*Graduate Student Research Program ($-500,000)* Funding decrease requires a reduction in scope. The number of participants are decreased by 25.
Visiting Faculty Program ($1,700,000) VFP supported approximately 65 faculty and 40 students.	*Visiting Faculty Program ($0)* Program ends in FY 2018.	*Visiting Faculty Program ($-1,700,000)* No additional participants will be supported in FY 2018.
Albert Einstein Distinguished Educator Fellowship $1,200,000	**$0**	**$-1,200,000**
The FY 2016 Request supported 6 Fellows.	The participants of the 2017-2018 AEF Fellowship Year are supported by FY 2017 appropriations. No additional participants will be supported in FY 2018.	The AEF Program ends in FY 2018.
National Science Bowl $2,900,000	**$2,400,000**	**$-500,000**
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.	Funding decreases by $500,000, slowing development and renewal of NSB question sets, decreasing numbers of volunteers able to travel to the NSB finals, and curtailing the scope and number of participant enrichment activities at the NSB finals.

FY 2016 Enacted	FY 2018 Request	Explanation of Changes FY 2018 vs FY 2016
Technology Development and On-line Application Systems $750,000	**$300,000**	**$-450,000**
Funding continued development and operation of the on-line systems.	Funding will continue development and operation of the on-line systems.	Funding decreases by $450,000, slowing development of some elements while maintaining baseline operations at programmatically required levels of service.
Evaluation $600,000	**$200,000**	**$-400,000**
FY 2016 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.	Funding decreases by $400,000, slowing development and deployment of some elements while maintaining baseline operations at programmatically required levels of service.
Outreach $500,000	**$200,000**	**$-300,000**
Funding supported a public web portal providing access to the inventory of federally sponsored STEM training and workforce activities and opportunities. Funding supported outreach activities to the scientific community targeting Office of Science mission-driven disciplinary workforce needs in the next 5 to 10 years.	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. Funding will also support Laboratory Education Equipment Donation Program (LEDP) activities.	Funding decreases by $300,000, curtailing the scope and number of supported WDTS outreach activities at DOE host labs, while maintaining other ongoing on-line/virtual based programmatic outreach activities.
Laboratory Equipment Donation Program $50,000	**$0**	**$-50,000**
Funding supported the ongoing program.	Program is funded in FY 2018 under the Outreach program.	No impact.