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 for the 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® finals in Washington, D.C. These 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 DOE workforce development mission.

Highlights of the FY 2020 Request

The FY 2020 Request for $19,500,000 prioritizes funding for programs that place highly qualified applicants in authentic STEM learning and training experiences 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 draft 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 educating and training an American workforce for the 21st century economy.[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.

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/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf

[b] https://www.whitehouse.gov/wp-content/uploads/2018/07/M-18-22.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.

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 11 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. SC sponsors placement opportunities in WDTS and in Congressional offices., Other Federal agencies sponsor placement opportunities in their own offices. Participating agencies have included the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the Library of Congress, and the National Oceanic and Atmospheric Administration (NOAA). The Fellows provide educational expertise, years of teaching experience, and personal insights to these offices to advance Federal science, mathematics, and technology education programs.

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 290,000 students have participated in the NSB throughout its 28-year history, and it is one of the nation's largest science competitions. The U.S. Department of Energy Office of Science manages the NSB, 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.

In FY 2018, more than 5,000 middle school students (from 680 schools) and 9,000 high school students (from 1,211 schools) participated in the regional competitions, with 48 middle school teams (215 students) and 65 high school teams (310 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.

Technology Development and On-Line Application

This activity modernizes on-line systems used to manage application solicitations, review applications, facilitate data collection, perform outreach, and integrate evaluation for WDTS programs. A project to develop, build, and launch new online application and program support systems continues, with evolving new elements to advance 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 improved and new features. One of these features is 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 are being made available to DOE host laboratories to inform them of participant trends and program outcomes. WDTS is using 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 triennial 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 2019, as directed by the Federal STEM Education 5-Year Strategic Plan[a], WDTS will perform a systematic review of data-derived evidence from its current and past program participants, to be further augmented by the design of a longitudinal study of its cohorts of prior SULI participants, looking back more than 20 years.

An expected outcome of these activities is improved means to assess and inform programs, investments, and activities.

The Evaluation Studies activity is aligned with the Government Performance and Results Act (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. Additional online tools are being implemented to directly publicize opportunities for students via their institutional career offices, which is a rapidly expanding outreach modality amongst student populations seeking internship opportunities.

WDTS also annually solicits proposals from DOE host laboratories and facilities 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 host participants in the SULI, CCI, VFP, and/or SCGSR programs. Based upon reported outcomes of annually completed activities, a portfolio of model practices is evolving to help ensure that WDTS activities are fully open and accessible to all members of the population. The FY 2020 Request continues support for curation of this information.

The Laboratory Equipment Donation Program (LEDP) is operated under Outreach and provides excess laboratory equipment to STEM faculty at accredited 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

(dollars in thousands)

	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Request	FY 2020 Request vs FY 2019 Enacted
Activities at the DOE Laboratories				
Science Undergraduate Laboratory Internships	8,300	10,300	9,100	-1,200
Community College Internships	1,000	1,000	1,100	+100
Office of Science Graduate Student Research Program	2,500	3,500	2,600	-900
Visiting Faculty Program	1,700	1,700	1,700	—
Total, Activities at the DOE Laboratories	**13,500**	**16,500**	**14,500**	**-2,000**
Albert Einstein Distinguished Educator Fellowship	**1,200**	**1,200**	**800**	**-400**
National Science Bowl®	**2,900**	**2,900**	**2,900**	**—**
Technology Development and On-Line Application	**750**	**750**	**500**	**-250**
Evaluation Studies	**600**	**600**	**300**	**-300**
Outreach	**550**	**550**	**500**	**-50**
Total, Workforce Development for Teachers and Scientists	**19,500**	**22,500**	**19,500**	**-3,000**

Program Accomplishments

Science Undergraduate Laboratory Internships (SULI) — In FY 2018, and as in prior years, participants made notable contributions to research projects as evidenced by co-authorship in peer reviewed journals and/or presentations at scientific meetings. FY 2018 funding supported 790 placements, of which more than 50 were from Minority Serving Institutions (MSIs).

Community College Internships (CCI) — In FY 2018, approximately 20% of the participants were from MSIs.

Office of Science Graduate Student Research Program (SCGSR) — In FY 2018, the General Atomics/DIII-D National Fusion Facility in San Diego, California was added as a new host site (in addition to the 17 DOE national laboratories), and had its first SCGSR placement. To date, about 372 awardees from 120 graduate institutions across the U.S. have participated in SCGSR.

Visiting Faculty Program (VFP) —FY 2018 funding supported 51 faculty and 19 student placements. Approximately 40% of the faculty participants were from MSIs.

Albert Einstein Distinguished Educator Fellowship (AEF) — In FY 2018, two of the six WDTS sponsored AEF participants held WDTS office appointments. In addition to engaging in WDTS programmatic activities, as nationally recognized STEM educators, one of these Fellows collaborated with Brookhaven National Laboratory and the Pacific Northwest National Laboratory, while the other Fellow collaborated with Idaho National Laboratory, applying their expertise to portions of the laboratories' STEM education outreach activities. In efforts to expand federal agency participation, the incoming 2018-2019 cohort includes a placement at the Library of Congress, and WDTS is engaged in discussions with other agencies who have expressed interest in hosting a Fellow for the FY 2019 application cycle (2019-2020 cohort).

The National Science Bowl® (NSB) — The National Finals of the 28th DOE National Science Bowl® took place in the Washington, DC, area from April 27 – May 1, 2017. The Secretary of Energy addressed the high school finalists, while the Under Secretary for Science delivered congratulatory remarks to the 65 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 DOE laboratory workplace experience and careers to these students' STEM areas of study. 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 national laboratory complex. The 2018 NSB Science Day for high-school finalists had as its theme Cybersecurity, a DOE mission critical field with programmatic research activity in SC and in the National Nuclear Security Administration.

The Cyber-Challenge middle school activity continued in FY 2018. 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 provides an opportunity to develop and test these cybersecurity outreach and training activities at large concurrent participant scales. Based upon this success, as well as additional pilot activities sponsored under Outreach, the technical requirements for additional DOE national laboratories to host cyber-challenge events across the nation were defined.

Technology Development and On-Line Application — In FY 2018 the online system codebase was refreshed, including a review and update for compliance with current Section 508 of the Rehabilitation Act of 1973 accessibility requirements. Completed new development includes a budget management dashboard for enhanced transparency and tighter compliance, implementation of an ORCID iD (Open Researcher and Contributor ID - a nonproprietary alphanumeric code to uniquely identify scientific and other academic authors and contributors) as an unique online system applicant identifier to mitigate risks involving identity protection instead using the last four digits of social security numbers, and incorporation of

"Handshake", a rapidly growing position posting system where students have access to search and apply for opportunities, which is especially gaining popularity when seeking internships.

Evaluation — WDTS completed additional phases of a project to develop and implement a data-dictionary/data-warehouse based analytics and visualization toolset supporting data-driven program evaluation. Completed activities in FY 2018 include the migration and normalization of participant data collected by legacy online systems. ORCID implementation enables seamless access to notable outcomes made by current and former participants and also providing means to unobtrusively follow STEM career outcomes without jeopardizing privacy.

Outreach — DOE host laboratories and facilities executed projects aimed at recruiting a more diverse applicant pool to WDTS laboratory-based programs, targeting recruitment of individuals traditionally underrepresented in STEM and addressing needs to increase the applicant pool diversity for one or more of the WDTS programs currently implemented at DOE host laboratories and facilities. As one outcome, a portfolio of model practices is evolving.

The LEDP online system has been migrated from the Office of Scientific and Technical Information (OSTI) to the Oak Ridge Institute for Science and Education (ORISE) and was integrated it into current online systems. By using established online resources, and their capabilities, this migration improves the client experience when accessing and applying for equipment, and also improves management and execution of equipment transfer processes.

Workforce Development for Teachers and Scientists

Activities and Explanation of Changes

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
Workforce Development for Teachers and Scientists **$22,500,000**	**$19,500,000**	**-$3,000,000**
Activities at the DOE Laboratories $16,500,000	$14,500,000	-$2,000,000
Science Undergraduate Laboratory Internships *$10,300,000*	*$9,100,000*	*-$1,200,000*
The FY 2019 Enacted budget for SULI supports approximately 1,000 students.	The Request for SULI will support approximately 870 students.	Funding will support 130 fewer students.
Community College Internships *$1,000,000*	*$1,100,000*	*+$100,000*
The FY 2019 Enacted budget for CCI supports approximately 100 students.	The Request for CCI will support approximately 110 students.	Increased funding will support an additional 10 students.
Graduate Student Research Program *$3,500,000*	*$2,600,000*	*-$900,000*
The FY 2019 Enacted budget for the SCGSR program supports approximately 210 graduate students. Targeted priority research areas are informed by SC's workforce training needs studies.	The Request for the SCGSR program will support approximately 115 graduate students. Targeted priority research areas will be informed by SC's workforce training needs studies.	Decreased funding will support 95 fewer students.
Visiting Faculty Program *$1,700,000*	*$1,700,000*	*$—*
The FY 2019 Enacted budget for the VFP supports approximately 65 faculty and 40 students.	The Request for the VFP will support approximately 65 faculty and 40 students.	No change.
Albert Einstein Distinguished Educator Fellowship $1,200,000	$800,000	-$400,000
The FY 2019 Enacted budget supports 6 Fellows.	The Request will support 4 Fellows.	Funding will support 2 fewer Fellows.

FY 2019 Enacted	FY 2020 Request	Explanation of Changes FY 2020 Request vs FY 2019 Enacted
National Science Bowl $2,900,000	$2,900,000	$–
The FY 2019 Enacted budget for the NSB allows WDTS to sponsor the finals competition, and provides 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.	The Request will provide support to 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.
Technology Development and On-line Application Systems $750,000	$500,000	-$250,000
The FY 2019 Enacted budget continues support for the development and operation of the on-line systems.	The Request will continue development and operation of the on-line systems.	Funding will maintain operation of the on-line systems; development will be slowed.
Evaluation $600,000	$300,000	-$300,000
The FY 2019 Enacted budget continues support for evaluation activities, including data archiving, curation, and analyses.	The Request will continue support for evaluation activities, including data archiving, curation, and analyses. WDTS will perform a systematic review of data-derived evidence from its current and past program participants, to be further augmented by the design of a longitudinal study of its cohorts of prior SULI participants, looking back more than 20 years.	Funding will reduce evaluation activities.
Outreach $550,000	$500,000	-$50,000
The FY 2019 Enacted budget continues support for 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.	The Request 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. Support continues for the LEDP program.	Funding change will have no impact due to the launch of LEDP operations on WDTS online systems, improving its program management efficiency, and resulting in reduced costs.