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, graduate thesis research opportunities, and visiting faculty research appointments; administration of the Albert Einstein Distinguished Educator Fellowship for K–12 STEM teachers for the federal government; 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 2021 Request

The FY 2021 Request for $20,500,000 prioritizes funding for programs that place highly qualified applicants in authentic STEM learning, training, and research experiences at DOE laboratories. The Request increases support for outreach activities to the scientific community targeting Office of Science (SC) mission-driven disciplinary workforce needs. It also prioritizes support for the DOE National Science Bowl®, 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 (SULI) program, the Community College Internships (CCI) program, the Office of Science Graduate Student Research (SCGSR) program, and the Visiting Faculty Program (VFP). 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's Committee on STEM Education (CoSTEM) Federal STEM Education 5-Year Strategic Plan, and the Administration's goals for educating and training an American workforce for the 21st century economy.

SULI 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.

CCI 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.

SCGSR's 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 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, the Department of Defense, the Smithsonian, and the U.S. Geological Survey (USGS). 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® 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 305,000 students have participated in the National Science Bowl® throughout its 29-year history, and it is one of the nation's largest science competitions. The DOE Office of Science manages the National Science Bowl®, and sponsors the National Science Bowl® 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 sponsors the National Science Bowl® finals, and provides central management of its regional events.

In FY 2019, more than 5,400 middle school students (from 649 schools) and 9,200 high school students (from 1,200 schools) participated in 111 regional competitions, with 48 middle school teams (215 students) and 64 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 that improve accessibility to applicants, advance program oversight and evaluation by WDTS program staff, and allow more efficient management and execution of programs 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

implement new and improved features. WDTS uses embedded toolsets to improve data-management and to enable quantitative analyses for measuring progress and optimizing 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. As directed by the 2018 Co-STEM 5-Year Plan on STEM Education[a], WDTS is also tracking and reporting how its programs, and activities at DOE labs and SC scientific user facilities, fulfill the objectives of that plan.

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 is the most widely used tool for prospective program participants to obtain information about WDTS and provides a gateway to accessing the online applications for the WDTS programs. To help diversify the applicant pool, outreach is also conducted via presentations to targeted stakeholder groups, and via the web using virtual webinar meetings that highlight the programs, their opportunities, and the WDTS internship experience. Additional online tools have been implemented to directly publicize opportunities for students via their academic 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, and encouraging the pipeline of WDTS program participants to pursue careers supporting the SC and DOE mission at DOE National Laboratories. Emphasis of laboratory outreach activities is on reaching potential applicants who are underrepresented in STEM fields, including targeted outreach to minority serving institutions. 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 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 General Services Administration 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://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf

Workforce Development for Teachers and Scientists
Funding

(dollars in thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Activities at the DOE Laboratories				
Science Undergraduate Laboratory Internships	10,300	13,600	9,100	-4,500
Community College Internships	1,000	1,700	1,100	-600
Office of Science Graduate Student Research Program	3,500	4,500	2,600	-1,900
Visiting Faculty Program	1,700	2,000	1,700	-300
Total, Activities at the DOE Laboratories	**16,500**	**21,800**	**14,500**	**-7,300**
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**	**700**	**500**	**-200**
Evaluation Studies	**600**	**600**	**300**	**-300**
Outreach	**550**	**800**	**1,500**	**+700**
Total, Workforce Development for Teachers and Scientists	**22,500**	**28,000**	**20,500**	**-7,500**

Program Accomplishments

Science Undergraduate Laboratory Internships (SULI) — FY 2019 funding supported approximately 940 placements, of which more than 65 were from Minority Serving Institutions (MSIs), and approximately 41 percent were women. 97 percent of the participants reported receiving a high quality internship experience, with 98 percent reporting impacts to their educational and career goals, and would recommend SULI to their peers. As in prior years, participants continue to make notable contributions to research projects as evidenced by co-authorship in peer reviewed journals, patents, and/or presentations at scientific meetings. A new SULI eligibility category called "Recent Graduates" was implemented in the Summer 2019 Term application period, which replaced "Graduating Seniors" and extends the period of eligibility for graduates of 4-year institutions and community colleges to two years (formerly one year) between the date of graduation and the start of the SULI term. This change provides additional experience based learning opportunities for students considering a STEM research career and addresses recommendations from the 2016 COV review.

Community College Internships (CCI) — In FY 2019, approximately 25 percent of the participants were from MSIs. 98 percent of the participants reported receiving a high quality internship experience, with 100 percent reporting impacts to their educational and career goals, and would recommend CCI to their peers. In FY 2019 General Atomics (San Diego, CA) also joined the CCI program as a host institution.

Office of Science Graduate Student Research Program (SCGSR) — In FY 2019, SCGSR added new research areas that address STEM disciplines not well represented in academic curricula; that address STEM disciplines in high demand, nationally and/or internationally, resulting in difficulties in recruitment and retention at U.S. universities and at DOE laboratories; that address STEM disciplines for which the DOE laboratories may play a role in providing needed workforce development; and at the graduate student level that can address SC discipline-specific workforce development needs. Additionally, the program developed new convergence research areas (e.g. data science, microelectronics, and accelerator science) to address workforce needs able to fulfill SC's long-range vision on emerging frontiers in science discovery and innovation that increasingly require transdisciplinary approaches. Convergence is a recognized priority in the National Science and Technology Council CoSTEM Federal STEM Education 5-Year Strategic Plan, and it supports the Administration's goals for educating and training an American workforce for the 21st century economy. Since 2014, there have been 489 SCGSR awardees from 135 institutions across the U.S.

Visiting Faculty Program (VFP) — FY 2019 funding supported 55 faculty and 39 student placements, and of these participants, at least 23 were women and 24 were from MSIs. The Savannah River National Laboratory (Aiken, SC) also joined the VFP program as a host institution. All VFP Faculty participants reported a positive impact on their careers, with 98 percent expressing interest in continuing their research collaboration. All would recommend VFP to their peers. All VFP-Student participants reported receiving a high quality internship experience, with 98 percent reporting impacts to their educational and career goals, and would recommend VFP to their peers.

Albert Einstein Distinguished Educator Fellowship (AEF) — In FY 2019, one of the six WDTS sponsored AEF participants held a WDTS office appointment. In addition to engaging in WDTS programmatic activities, as nationally recognized STEM educators, the WDTS placed Fellow collaborated onsite with Brookhaven National Laboratory, the National Renewable Energy Laboratory, Fermi National Accelerator Laboratory, Argonne National Laboratory, and Los Alamos National Laboratory, applying their expertise to portions of the laboratories' STEM education outreach activities. In efforts to expand federal agency participation, the incoming 2019-2020 cohort includes a placement at the Department of Defense's Naval Surface Warfare Center, and WDTS established partnerships with other agencies who have expressed interest in hosting a Fellow for the FY 2019 application cycle (2020-2021 cohort), including USGS and the Smithsonian's National Air and Space Museum.

The National Science Bowl® — The National Finals of the 29th DOE National Science Bowl® took place in the Washington, DC, area from April 25 - 29, 2019. The Administrator of the National Nuclear Security Administration delivered congratulatory remarks to the 64 high schools and 48 middle schools at the finals, and conferred awards to the winning teams.

The National Science Bowl®'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 2019 National Science Bowl® Science Day for high-school finalists had as its theme DOE National Scientific User Facilities, comprising the most advanced tools of modern science, helping researchers propel the U.S. to the forefront of science, technology development, and deployment through innovation.

The Cyber-Challenge middle school activity continued in FY 2019. This Cyber-Challenge activity leverages NNSA's *Cybersecurity Workforce Pipeline Consortium* investments, and is based upon activities developed at Lawrence Livermore National Laboratory. The National Science Bowl® event 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 on additional activities sponsored under WDTS Outreach, Cyber Challenge events is being piloted at 4 different FY 2020 Middle School Regional Competitions hosted by DOE laboratories. This expansion will provide additional access to computational thinking activities prioritized in the CoSTEM Federal STEM Education 5-Year Strategic Plan, in alignment with the Administration's goals for educating and training an American workforce for the 21st century economy. It also expands DOE's portfolio of cyber challenge activities currently focused on more advanced STEM students.

Technology Development and On-Line Application — In FY 2019, under WDTS direction, the technical development performed by the Oak Ridge Institute for Science and Education (ORISE) for a National Science Bowl® alumni website commenced, with development for the National Science Bowl® Travel Portal completed and pending final testing and acceptance for launch in FY 2020. Additionally, the technical requirements and information architecture for a virtual National Science Bowl® training site on SC's website have been defined, with development commencing for a planned launch in FY 2020. Technical requirements for enhancements and features supporting WDTS online systems also include a national virtualized National Science Bowl® scoring system, a national virtualized Cyber Challenge capability developed in coordination with Lawrence Livermore National Laboratory, and integration of toolsets to establish a virtual workspace environment/portal for WDTS program collaboration with its program performers enabling labs to leverage, share, and use participant professional development content and capabilities. Additional development focused on embedded commercial outreach toolsets such as Handshake, and a STEM activity reporting tool with inputs that include event type, sponsorship, targeted audience(s), amplification, and connection to the 2018 CoSTEM 5-Year Plan on STEM Education. This reporting tool provides a single point-of-contact portal enabling facile data collection, management, and archiving in a manner that minimizes burdens of specialized unscheduled data calls to the DOE labs.

Evaluation — In FY 2019, WDTS completed a triennial program external peer review of SULI, CCI, and VFP. As in past program peer reviews, labs received individual guidance and feedback on their programs, with findings also used to advance operational baselines through complex-wide discussion and feedback. The peer review criteria, established by WDTS, evaluated whether host institutions are managing and executing SULI, CCI, and VFP through WDTS established Model Practices so that: 1) participants receive best-in-class faculty or intern experiences and, as a result of the program, have increased their preparedness for a STEM career; 2) the activities support DOE's goal "to develop the next generation of scientists and engineers to support Department missions, administer its programs, and conduct the research that will realize the nation's science and innovation agenda"; and 3) the programmatic baseline as defined by the WDTS Core Requirements is being met. The review criteria and inputs also included elements of the 2018 CoSTEM 5-Year Plan on STEM Education, so that the review's outcomes can help guide SC/WDTS when implementing that plan.

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 "Mini-Semester" experience that brings prospective applicants from underrepresented communities to DOE labs in a week-long immersion experience is proving successful and being adopted by increasing numbers of host labs. A complex-wide virtual career was also held where labs were able to access and recruit potential applicants using an online "recruitment booth" presence.

WDTS completed the LEDP online system migration from the Office of Scientific and Technical Information (OSTI) to the Oak Ridge Institute for Science and Education (ORISE) that integrates LEDP's equipment catalog, applications, reviews, and processing into WDTS 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. Updates to eligibility and use requirements better align LEDP to SC and DOE workforce mission priorities, as well as improves accountability for the excess donated equipment.

Activities and Explanation of Changes

(dollars in thousands)

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Workforce Development for Teachers and Scientists **$28,000**	**$20,500**	**-$7,500**
Activities at the DOE Laboratories $21,800	$14,500	-$7,300
Science Undergraduate Laboratory Internships *$13,600*	*$9,100*	*-$4,500*
Funding for SULI supports approximately 1,170 students. Student stipends, which have been flat for eight years, modestly increase to keep up with market value.	The Request for SULI will support approximately 785 students.	Funding will support 385 fewer students.
Community College Internships *$1,700*	*$1,100*	*-$600*
Funding for CCI supports approximately 150 students. Student stipends, which have been flat for eight years, modestly increase to keep up with market value.	The Request for CCI will support approximately 100 students.	Funding will support 50 fewer students.
Graduate Student Research Program *$4,500*	*$2,600*	*-$1,900*
Funding for the SCGSR program supports approximately 185 graduate students. Targeted priority research areas will be 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.	Funding will support 70 fewer students.
Visiting Faculty Program *$2,000*	*$1,700*	*-$300*
Funding for the VFP supports approximately 70 faculty and 45 students. Faculty and student stipends, which have been flat for eight years, modestly increase to keep up with market value.	The Request for the VFP will support approximately 62 faculty and 36 students.	Funding will support 8 fewer faculty and 9 fewer students.

(dollars in thousands)

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Albert Einstein Distinguished Educator Fellowship $1,200	$800	-$400
Funding supports 6 Fellows.	The Request will support 4 Fellows.	Funding will support 2 fewer Fellows.
National Science Bowl® $2,900	$2,900	$—
Funding continues 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.	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 $700	$500	-$200
Funding continues development and operation of the on-line systems, including continued enhancements for operations of the NSB.	The Request will continue development and operation of the on-line systems.	Funding will maintain operation of the on-line systems; the rate of development will be slowed.
Evaluation $600	$300	-$300
Funding continues support for evaluation activities, including data archiving, curation, and analyses. WDTS continues a systematic review of data-derived evidence from its current and past program participants, to be further augmented by the design and implementation of a longitudinal study of its cohorts of prior SULI participants, looking back more than 20 years.	The Request will continue support for evaluation activities, including data archiving, curation, and analyses.	No new longitudinal evaluation activities will be initiated.

(dollars in thousands)

FY 2020 Enacted	FY 2021 Request	Explanation of Changes FY 2021 Request vs FY 2020 Enacted
Outreach $800	$1,500	+$700
Funding supports 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.	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.	WDTS will increase support of activities such as those that promote inclusion and diversity; reflect one or more goals/objectives/pathways of the 2018 CoSTEM Five Year Plan on STEM Education; and/or prioritize recruitment of STEM students to DOE research and development workforce mission-relevant fields of study, and particularly to fields related to Office of Science research programs. Laboratories and facilities eligible for funding are those that hosted FY 2019 WDTS participants in SULI, CCI, VFP, and SCGSR.

Workforce Development for Teachers and Scientists
Funding Summary

(dollars in thousands)

	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request	FY 2021 Request vs FY 2020 Enacted
Other	22,500	28,000	20,500	-7,500
Total, Workforce Development for Teachers and Scientists	**22,500**	**28,000**	**20,500**	**-7,500**