

**Report of the Committee of Visitors
For the Office of Workforce Development for Teachers and Scientists
(WDTS)**

**to the
Basic Energy Sciences Advisory Committee**

Review of Fiscal Years 2017-2022

**Washington, DC
September 18-20, 2023**

Executive Summary

The COV congratulates Dr. Ping Ge for demonstrating exceptional leadership and passion, and for achieving overall success in the management of the WDTS program. The entire WDTS team's dedication and hard work reflect excellent stewardship, and we commend their efforts in several key areas:

Increased Student Participation: WDTS has had a significant increase in the number of students participating in the WDTS program. This growth demonstrates the program's ability to attract and engage students effectively.

Development of the WARS Platform: The program's initiative in developing the WARS platform for data examination is praiseworthy. This platform has proven to be an invaluable tool for tracking the program's success and leading to data-driven decision making.

Effective COVID Response: The Program's response to the challenges posed by the COVID-19 pandemic was remarkable, especially in continuing the SULI internships and pivoting the National Science Bowl® to virtual. By implementing strategies that engaged students even during difficult times, the program has ensured the continuity of excellent training for the next generation of scientists.

Smooth Operation: Under Dr. Ge's leadership, the WDTS program is running smoothly, ensuring that all aspects of the program are well-coordinated and efficient.

While acknowledging these achievements, it is important to note that the program's growth and its evolving demands indicate a need for additional WDTS staff. Addressing this requirement will help sustain and further enhance the program's success in the development of the future energy workforce.

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Introduction

This report documents the findings from a Committee of Visitors (COV) that was assembled under the auspices of the Basic Energy Sciences Advisory Committee (BESAC) to evaluate the efficacy and processes and the resulting portfolio of the Office of Workforce Development for Teachers and Scientists (WDTS) within the Office of Science. The COV met at the Washington Hilton from September 18-20, 2023. This was the third in the series of COV reviews of WDTS; the first held in 2010, with a subsequent review in 2016.

The Charge to the Committee of Visitors

The charge to the COV was established in a letter from Dr. Asmeret Asefaw Berhe, Director of the Office of Science, to Dr. Cynthia Friend, chair of the Basic Energy Sciences Advisory Committee (BESAC). Dr. Simon R. Bare (SLAC National Accelerator Laboratory) was invited to chair the COV, with Dr. Tabbetha Dobbins (Rowan University) co-chairing. The charge letter is attached as Appendix 1.

The COV was asked to assess (1) the efficacy and quality of the processes used to solicit, review, recommend, monitor, and document application, proposal, and award actions; and (2) the quality of the resulting portfolio, including its breadth and depth and its national standing, benchmarked with other comparable Federal Science, Technology, Engineering, and Math programs. In addition to this standard charge, please comment on the effectiveness of the online technology development and evaluation activities in support of WDTS programs and outreach efforts to enhance the diverse and inclusive participation in WDTS programs that include:

- The Science Undergraduate Laboratory Internships (SULI)
- The Community College Internships (CCI)
- The Visiting Faculty Program (VFP)
- The Office of Science Graduate Student Research Program (SCGSR)
- The National Science Bowl® (NSB)
- The Albert Einstein Distinguished Educator Fellowship (AEF)

The WDTS Committee of Visitors Membership

The COV was comprised of:

- Dr. Simon R. Bare (Chair), Distinguished Scientist, SLAC National Accelerator Laboratory, Menlo Park, CA
- Dr. Tabbetha Dobbins* (co-Chair), Dean, School of Graduate Studies and Professor, Dept. of Physics & Astronomy, Rowan University, Glassboro, NJ
- Mr. Noel Blackburn, Chief Diversity, Equity, and Inclusion Officer, Brookhaven National Laboratory, Upton, NY
- Dr. Joan Broderick*, Department Head and Professor, Chemistry and Biochemistry, Montana State University, Bozeman, MT
- Dr. Padmaja Guggilla*, Chair and Professor, Associate Dean of Student Success, Alabama A&M University, Normal, AL
- Dr. Emily Smith, Professor, Department of Chemistry, Iowa State University and Chemical and Biological Sciences Division Director, Ames National Laboratory, Ames, IA
- Dr. Andrew Stack, Group Leader, Geochemistry and Interfacial Sciences, Oak Ridge National Laboratory, Oak Ridge, TN

*BESAC Member

The Review Process

The COV assembled at the Washington Hilton for a working dinner at 6:30pm on September 18, and adjourned at 4:30 PM on Wednesday, September 20, 2023. The agenda for the COV is attached as *Appendix 2*.

The first full day began with a welcome and review of the charge from Dr. Linda Horton, Associate Director of Science for Basic Energy Sciences followed by presentations from the WDTS staff. After each presentation there was ample time allotted for questions and engaging discussion. The sessions were interspersed with closed sessions for the COV members to deliberate and discuss. The evening of the first day was devoted to COV members writing their findings and recommendations to seed the subsequent discussions. At the end of the second day there was an extended closed session where the COV members deliberated to prioritize their major findings and recommendations. These were then shared with Dr. Ping Ge and the staff of the WDTS.

Major Recommendations of the COV

Science Undergraduate Laboratory Internships (SULI): The COV recommends that the WDTS and hosting Labs work together to develop and implement strategies to increase the number of SULI mentors. Mechanisms could include greater emphasis on DEIA, the inclusion of mentoring in annual performance reviews at the Labs, improved communications, and encouragement from Lab management to the scientific staff, and the implementation of excellence in mentoring / distinguished mentoring awards.

Community College Internships (CCI): The COV strongly encourages increased outreach efforts to reach the schools and students, to make them aware that there are outstanding opportunities for technical careers at the National Labs. The COV recommends emphasizing the technician mentor model for CCI so that it is leading to a skilled technical workforce. The COV suggests WDTS consider extending the acceptance of recently graduated community college students up to 2 years upon graduation into the CCI program, if not attending a 4-year institution.

Office of Science Graduate Student Research (SCGSR): There should be a concerted effort to increase the number of applications to the SCGSR program. The proposed effort could include encouraging more female scientists to participate, and capitalizing on RENEW Recruitment from e.g., Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribal Colleges and Universities (TCUs), and Minority Serving Institutions (MSIs).

National Science Bowl (NSB): Broadening participation remains a challenge overall, and for underserved communities, low participation is even more pronounced. The COV recommends the WDTS to explore strategies on recruitment to expand the pool of participants.

Albert Einstein Distinguished Educator Fellowship (AEF): The COV recommends increasing the applicant pool. An increase in stipend commensurate with other competing fellowship opportunities may help.

WDTS Application and Review System (WARS): The COV recommends that WDTS work with ORISE to simplify and standardize application procedures, where practical, and focus on ease-of-use more generally, particularly for mentors and applicants who may use the system only infrequently.

Budget: The COV fully supports increasing the WDTS budget to allow for additional staff to allow the programs to grow. However, there should be a commensurate increase in the budget to: (i) Allow an increase in participant stipend, (ii) Allow the full development of WARS 2.0, (iii) Provide travel for the WDTS staff (particularly with regards to outreach, recruitment for the programs), and (IV) Sustain the RENEW initiative, including the potential for adding new staff.

Major Findings of the COV

The size of the SULI program is currently limited in part by mentor capacity, space, and/or the ability to safely train and supervise the undergraduate student researchers, depending on the specific lab. The labs enthusiastically support the SULI program, and several of the Laboratory Education Directors, LEDs (or their equivalent title) indicated that further growth in the program would be welcome.

Stipends and support for participant housing in SULI program have increased twice in the past few years, and stipends are equitable across the board regardless of host lab.

Participation in the CCI program is significantly smaller than the SULI program. According to WDTS staff the CCI program size is limited in part by the number of lab mentors who are willing to mentor CCI trainees. There is a shortage of trained technical staff at the National Labs and the CCI program could be one source of the needed trainees.

The success rate for applicants through the SCGSR program is close to 100%. It is likely that the program in its current form does not appeal to all graduate students given the nature of the program – i.e., that the student commits to spending extended time away from their home institution and thus their support structure.

The NSB is a prestigious program and event which brings visibility to the STEM disciplines and to energy sciences. In 2023, more than 800 schools in nearly 280 congressional districts participated. This is a well-run program with the potential to have a major impact on students and communities. The deficiencies and needs for improvement are centered around increasing the number of participants, volunteers, and staff members.

The Albert Einstein Distinguished Educator Fellowship is a successful program that is having a strong impact on the careers of the teachers that participate. Informal data provided to the COV shows that approximately half of the participating teachers go into administration or other teaching support/advisory roles after completing the fellowship, with the other half going back into the classroom.

WARS is the main functionality used by WDTS for performing proposal submission, ranking and selection, supplemented by PeerNet for peer-review. The committee was impressed by the recent addition of functionality to WARS to automatically redact personally identifiable information (PII) from college transcripts and other sources. This is viewed as a critical tool, especially for students who may lack the software tools to be able to do this on their own.

Summary of Laboratory Education Director (LED) Virtual Town Meeting

The following LEDs were in attendance for the Zoom meeting with the COV members: Evangelina Shreeve (PNNL), Marcus Giron (NREL), Ken White (BNL), Kelly Bergman (Ames), Laleh Coté (LBNL), Moody Altamimi (ORNL), Meridith Bruozas (ANL), Arturo Dominguez (PPPL), Colette Flood (LBNL)

The above list of Laboratory Education Directors (LEDs) opened with an acknowledgement of the unique considerations of each laboratory when implementing their workforce development programs due in part to their varying surrounding environment, structure of their laboratory's workforce development program, size, funding, and sources of support. Despite these differences, they work together and communicate often, which was particularly beneficial during the COVID pandemic when many changes needed to be implemented to the workforce development programs. The LEDs expressed appreciation for the collaborative partnering with the WDTS office to address challenges and to meet the needs of each laboratory as well as the direct access they have to the WDTS staff. The evolving nature of mentoring caused by hybrid, remote, and tele- work at the laboratories is an area where LEDs anticipate working with WDTS to address the needs of the participants and mentors.

Most national laboratories have an established cohort of experienced mentors to call upon to host SULI, CCI and VFP participants. Many of the LEDs stated additional mentors could be available at their laboratories. On the other hand, others, including the smaller laboratories, may have challenges in identifying additional mentors. Another difference among the labs was the ability to find mentors for CCI participants. For example, PNNL has many community colleges in the area, and finding mentors for CCI participants is not seen as a challenge. Other LEDs expressed it was easier to find mentors for SULI participants compared to CCI students.

There was general agreement that having mentors from the skilled technical workforce, working with community college students, would be beneficial to the laboratory complex and provide a pathway for filling many important skilled technical positions; these often go unfilled at the time of this COV. Some examples of these unfilled scientific and operations positions include specialists in manufacturing, automation technology, electromechanical, computing, radiation safety, and health physics. Mentoring skills (e.g., defining projects) may need to be developed among this population who may not have previous mentoring experience. Some labs

have found alternative ways to develop mentoring programs among their skilled technical workforce. ORNL, for example, has over 100 interns this year funded from non-WDTS sources who are working in laboratory operations. At some laboratories, CCI interns are in paths to complete community college before enrolling in 4-year institutions or other training, and opportunities for this population of participants should be continued.

The LEDs expressed a strong desire to work with WDTS on programmatic changes and ensuring the programs remain responsive, not only to the needs of the participants (e.g., stipend and support levels), but also the workforce development needs at the laboratories. On this topic the LEDs would like to work with WDTS to continue the evolution of these beneficial programs to achieve maximum integration and to remove some “stand-alone” aspects of these programs. The LEDs expressed interest in working with WDTS on any expansion of the scope of the CCI program (e.g., to define housing and transportation needs).

Support was expressed for new sources of funding in FY22 and FY23 that enabled the development of additional partnerships and collaborations with MSIs; ongoing development is critical to achieve maximal impact on workforce development. Concerns were expressed that without consistent funding, some of the partnerships and collaborations will be irreparably damaged with negative implications for future workforce development. Stable funding is essential.

The WARS system is generally easy for the LEDs to use, the efforts of the WDTS staff to develop this system is greatly appreciated. Two areas of suggested improvement were noted. (1) For the program participants and the mentors, who do not use the system frequently, the system may not be as easy to navigate. Participants and mentors often turn to the LEDs for help with the system, which can challenge their existing workload. Tutorials, guides, or popup windows are seen as potentially beneficial additions to WARS. (2) There are differences in how WARS operates across its supported programs. Efforts to unify the operation of these system are recommended (e.g., differences with the VFP platform were called out).

The COV acknowledges the highly dedicated staff advancing workforce development at the National Laboratories and appreciate their hard work, their open, candid, and constructive feedback. The COV could easily have spent an afternoon discussing workforce development at the labs. Across the National Laboratories, the LEDs sit in a variety of places within their lab’s org chart. Some LEDs have direct communication to lab management while others are buried layers down (e.g., within the lab’s HR office). The COV suggests it could be advantageous for the LED to have a direct line of reporting to senior lab management which would strengthen the development of each lab’s workforce.

Changes in the Charge of the 2023 WDTS COV compared to the 2016 COV Review

Since the 2016 COV, there have been three significant changes to the charge of the 2023 COV, which are described in this section.

In 2016, the Pre-College Programs (AES and Science Bowl) were discussed briefly but were not part of the review. The charge to this 2023 WDTS COV was to review those programs with evaluation and recommendations in the same manner as the laboratory programs. This report contains comments on the recruitment and outcomes for those programs as well as the DOE National Laboratory-based Training programs.

WARS is used for collecting data on the applicants and outcomes and was first developed in 2013. Since the 2016 COV WARS has been fully utilized for participant and mentor data utilization and data visualization, enabling data-driven program evaluation and fully informed planning and decision making by WDTS. The COV strongly congratulates WDTS for leveraging the copious amounts of data collected by WARS to produce reliable analytics from the various programs and encourages them to use the data to their full extent to aid in the evaluation of the various programs.

DOE National Laboratory-based Training Programs

Science Undergraduate Laboratory Internship (SULI) Program Overview and Evaluation

Recommendations

Since the time of the last WDTS COV, the SULI program has grown, in line with recommendations from the last COV. Given the excellence of this program, and its alignment with the strategic objectives of WDTS, the current COV sees value in seeking further growth of the program. The COV recognizes that a limiting factor for sustainable growth is the number of mentors participating in this program complex wide. ***The COV recommends that the WDTS and hosting Labs work together to develop strategies to increase the number of SULI mentors.*** Mechanisms could include greater emphasis on DEIA, the inclusion of mentoring in annual performance reviews at the Labs, improved communications, and encouragement from Lab management to the scientific staff, and the implementation of excellence in mentoring / distinguished mentoring awards. While these are just a few examples of possible approaches, we recommend that WDTS works with the labs to identify other limiting factors in each lab's ability to host more SULI interns, and see whether these factors can be overcome. It may be helpful and more equitable to evaluate and assess each lab's participation on an intern per FTE, or per operating expenditures, or some other basis.

Findings

The number of SULI program participants has grown from 2,872 undergraduates during the last COV review to 5,231 internships with 3,738 unique participants during the period FY17 - FY22; SULI is a large, vibrant, and successful program that brings hundreds of undergraduate students to DOE labs each year. While the majority of these students participate in a 10-week summer program, smaller numbers participate in 16-week fall or spring programs. The size of the program is currently limited in part by mentor capacity, space, and/or the ability to safely train and supervise the undergraduate student researchers, depending on the specific lab. The labs enthusiastically support the SULI program, and several of the LEDs indicated that further growth in the program would be welcome.

Labs seeking funding for outreach activities often begin by proposing outreach efforts to WDTS, and WDTS funds the successful outreach proposals. These lab-based outreach efforts are often focused on undergraduate institutions in the local area of the lab and are designed to strengthen ties between the lab and potential SULI 'feeder' schools, and thereby increase applications from students wanting to participate in the SULI program. The overall success rate of SULI applicants over the six years since the last COV is 44%. Stipends and support for participant housing have increased twice in the past few years, and stipends are equitable across the board regardless of host lab.

Impact of COVID

COVID 19 had a significant impact on the SULI program. By the time of the COVID shutdown in March 2020, SULI offers had already gone out to successful summer applicants. These applicants were given the option of either participating in SULI during the 2020 summer in a virtual format or deferring to the following summer. While many chose to participate virtually in 2020, a significant fraction deferred to 2021. Despite these blips in participation numbers due to COVID impacts, the SULI program has continued to grow in the years since the last COV. ***The COV commends WDTS and participating Lab staff for the exceptional work they pursued to minimize the negative impact of COVID on the SULI program and to safely ensure the wellbeing of their interns.***

Comments

WDTS effectively administers the SULI program for the Office of Science. The integration of the WDTS Application and Review System (WARS) as a program management tool has enabled the office to develop metrics in monitoring and evaluating programs. The DOE Office of Science Speaker Series is indicative of the quality professional development activities offered by WDTS to the SULI Interns. This series offers valuable career development information for the next generation of SULI STEM professionals.

Recruitment for the SULI program occurs in two parts: 1) Through the utilization of a comprehensive and well-maintained WDTS website, email systems to inform and communicate with prospective applicants and stakeholders, leveraging the capabilities of the Office of Science Public Affairs along with other mechanisms, and 2) In large part through the participating labs, who propose outreach/recruiting efforts that are then funded by WDTS. During the COV review period of FY2017 – FY2022, the SULI program has hosted 5,231 internships resulting in 3,738 unique participants of which 38.5% female participants and 18.7% STEM URMs. WDTS should advocate Labs to focus recruitment attention on growing these demographics for the program. During this period the composition was approximately 3% freshmen, 19% sophomores, 38% juniors, 19% seniors, 10% graduating seniors, and 11% recent graduates depicting a well-distributed internship program.

Community College Internship (CCI) Program Overview and Evaluation

Recommendations

The CCI program offers an outstanding opportunity to promote the skilled technical workforce at the DOE labs. While the program is clearly successful, the view of the COV is that there is an opportunity to increase the capacity to bring more community college students into the program. **The COV recommends increased outreach efforts to reach the schools and students, to make them aware that there are outstanding opportunities for technical careers at the National Labs. The COV recommends re-emphasizing the technical training intent of CCI in communications with labs and candidate recruitment. The COV recommends that community college students be allowed to apply for and participate in CCI programs for two years following their receipt of a 2-year degree. The COV recommends modifying the CCI program structure to provide for more flexibility for community college students, who frequently have different circumstances than traditional college students: provide options for participation in the CCI program part-time (i.e., half-time for 20 weeks rather than full-time for 10 weeks), allow flexibility in housing, and increase stipends.** The COV encourages WDTS to consider mechanisms by which CCI interns can become a pilot program for on-boarding new technical workers, akin to an apprenticeship program while continuing to offer opportunities to community college students who plan to enroll in 4-year institutions. WDTS is encouraged to work with the labs to increase mentor participation in the CCI program, including technical staff who are not PhD-level scientists. Both the labs and the potential technical workers benefit from this program, and perhaps there are better ways to communicate these benefits to all stakeholders to increase participation in the program. **The COV supports and encourages WDTS to continue efforts at supporting alumni networks, including forming panels, workshops, and the like, to connect former participants in the program who themselves are empowered to recruit.** We note the success of the LinkedIn network established for the SCGSR program as an example.

Findings

Participation in the CCI program is significantly smaller than the SULI program. According to WDTS staff the CCI program size is limited in part by the number of lab mentors who are willing to mentor CCI trainees. We heard that some lab mentors view the CCI program as an inferior program to the SULI program and thus the labs

have difficulty in recruiting mentors. Thus, there appears to be a mismatch between who knows about this program and who benefits from it. The acceptance rate (also called success rate) is 32.0% (participants/completed applications) and 39.3% (participants/Eligible and Compliant applications), respectively. Discussions related to increasing candidate recruitment focused on the value and efficiency of recruiting at 2-year schools in the vicinity of each lab, given that community college students might be less willing or less able to relocate for a lab training program. While CCI participants currently must be full-time students, the program could grow by opening eligibility to part-time community college students, as well as recent community college graduates. ***The COV suggests WDTS consider extending the acceptance of recently graduated community college students up to 2 years upon graduation into the CCI program, if not attending a 4-year institution.*** Moreover, many community college students are non-traditional, e.g., balancing career advancement with gainful employment. Thus, the COV further suggests that WDTS consider allowing non-full-time students to be eligible for this program.

Impact of COVID

As was the case with the SULI program, COVID 19 had a significant impact on the CCI program with the lowest number of participants during FY2020 of 76 interns. The 2020 summer applicants were able to defer to the following terms based on their availability. Despite this blip in participation numbers due to COVID impacts, the CCI program continued to grow in the following years. ***The WDTS and participating Lab staff should again be commended for the exceptional work to minimize the negative impact of COVID on the SULI program and safely ensure the wellbeing of their interns.***

Comments

WDTS prepares community college students for technical careers and/or to pursue 4-year degrees through laboratory research experiences in the Community College Internship program. Since the last COV the acceptance rate (also called success rate) is 32.0% (participants/completed applications) and 39.3% (participants/Eligible and Compliant applications), respectively. The CCI was also designed as a pipeline to participation in the SULI program. During this period, 12.8% of CCI students subsequently participated in SULI (64 out of 498 unique students).

Recruitment for the CCI program also occurs in two parts: 1) through the utilization of a comprehensive and well-maintained WDTS website, email systems to inform and communicate with prospective applicants and stakeholders, leveraging the capabilities of the Office of Science Public Affairs, and other mechanisms, and 2) in large part through the participating labs, who propose outreach/recruiting efforts are then funded by WDTS. During the COV review period of FY2017 – FY2022, the CCI program hosted 556 internships resulting in 498 unique participants of which 36% female participants, 27.2% STEM URM, and 276 participants (49.6% of total) were from 93 MSIs (58.5% of all participants' academic institutions). WDTS and the labs should focus recruitment attention on growing these demographics for the program.

Visiting Faculty Program (VFP) Overview and Evaluation

Recommendations

The VFP program should explore strategies to accommodate a diverse array of academic institutions by offering multiple entry points and corresponding compensation packages tailored to the career levels of participants at their respective home institutions. The COV recommends that the stipend is commensurate with experience of the visiting faculty (to account for salary variations among assistant, associate, and full professors).

Findings

The VFP is focused on opportunities for professors, and secondarily their students, to collaborate with researchers at the National Laboratories. As such, this program is a valuable tool for increasing research opportunities at especially non-R1 institutions. Overall, the COV finds that the VFP program is well-run and having a positive impact on those who participate in it. As evidence, WDTS cited survey data that showed the program was having a uniformly positive impact on those who went through the program and that usually (85% of the time) resulted in follow-on collaborations with the institution. A poignant example of the success of this program was given in the form of a faculty member who obtained a VFP grant, after being previously funded as a graduate student through their former Ph.D. advisor's VFP grant.

The WDTS VFP program is commended for its success which has now been copied by other SC programs, e.g., RENEW.

Like the other programs, the COV finds that WDTS staff responsible for the VFP program performed admirably during the COVID crisis.

Comments

Members of the COV noticed that a key component for the visiting faculty who obtain VFP grants would be to use the project as seed funding to a sustained research program. A metric of success for the VFP program may be the number of participants who subsequently have success in applying to DOE funding opportunity announcements. Success would be aided by providing grant writing training to the VFP participants. There are a host of possible opportunities available from various sources, ranging from in-house workshops conducted by National Laboratories to webinars and other resources. By making some form of grant writing resources available, it would maximize the ability of the VFP recipients to leverage their VFP grant to a sustained research collaboration at their host institution.

The Department of Energy's Office of Science (DOE SC) should engage in strategic collaborations with discipline-specific professional organizations to enhance its visibility and effectively attract prospective candidates for its programs. Establishing regular and targeted communication channels with Points of Contact (POCs) representing various universities is also advisable.

Office of Science Graduate Student Research (SCGSR) Program Overview and Evaluation

The SCGSR program's goals are to prepare graduate students for science, technology, engineering, or mathematics careers critically important to the DOE SC mission. Supplemental awards are given to outstanding graduate students to allow them to spend three to six months conducting part of their doctoral research at a DOE National Laboratory in close collaboration with a DOE National Laboratory scientist.

Recommendations

There should be a concerted effort to increase the number of applications to the SCGSR program. The COV's opinion is that a success rate of almost 100% implies that it is likely that some proposals are being funded that are not rated at the highest level. **The proposed effort to increase participants could include capitalizing on RENEW Recruitment from MSIs, HSIs, TCUs, and HBCUs together with other modifications that could make the program more attractive to female scientists (only 30% of awardees are women).** One possibility is an evaluation of whether modifying the program to allow two or more shorter stays in addition to the current requirements would attract a more diverse group of applicants and/or increase the number of applications.

There should be better tracking of publications and presentations at conferences that are an outcome of this program. This should include an annual report that consists of a publications list (and planned publications) and other metrics of the project. Mentors should be reminded to enter publications in WARS. One method to track publications that result from participants in this program is to use their ORCID IDs.

The COV is not aware of lab-wide professional development opportunities at the National Labs for SCGSR participants. We suggest that the participants are exposed to opportunities within the DOE complex, perhaps leveraging some of the successful activities from the SULI program.

Findings

The current 51 priority research areas of the program are determined in collaboration with the eight SC Research and Development offices. These priority research areas are updated every funding cycle. The number of priority research areas has increased from 22 in 2014 to 51 in 2022.

There was a 20% increase in the stipend to compensate for the increased living costs in September 2022.

There are two solicitations per year with an overlapping period to allow re-application. The application process is through the WARS online application system. A significant effort has been expended to develop WARS and make it as helpful and intuitive as possible to the applicant and to the WDTS staff. The website is replete with a large amount of information to assist in the application process, including video tutorials for applications.

The program is running as a well-oiled machine. The program has an efficient and rigorous process for soliciting, reviewing, recommending, monitoring, and documenting applications, proposals, and awards.

The success rate for applicants through the program is close to 100%.

It is likely that the program in its current form does not appeal to all graduate students given the nature of the program – i.e. that the students commit to spending extended time away from their home institution and thus their support structure. Additionally, the PI also needs to agree to this, which may be more of an impediment to participation. Also, many students have families with children, and temporarily moving to a new location would be difficult or perhaps impossible. If these students could participate remotely (perhaps with a few shorter trips to the lab) there may be more participation from a wider group of students with a wider range of family/personal circumstances.

A LinkedIn group has been established for current awardees and alumni to allow for continued professional development.

Impact of COVID

As with the other programs, the COV finds that WDTS staff responsible for the SCGSR program performed admirably during the COVID crisis. Awardees were given three options: to postpone the project, to conduct the research remotely via a hybrid mode, or to modify the project scope.

Pre-College Programs

National Science Bowl (NSB) Overview and Evaluation

Recommendations

The NSB is a highly commendable program which is impactful for both the participants and coaches. **Broadening participation remains a challenge overall, and for underserved communities, low participation is even more pronounced. The COV recommends the WDTS to explore strategies on recruitment to expand the pool of participants.** A publicity campaign to educate everyone on the benefits of having diverse participants would also be useful.

Findings

The NSB is a prestigious program and event which brings visibility to the STEM disciplines and to energy sciences. In 2023, more than 800 schools in nearly 280 congressional districts participated. The students who travel to the national competition can participate in “Science Day”, a one-day event featuring scientists from the national laboratories as speakers. In 2023, a focus on national laboratory scientists from diverse populations was made. This is likely to have a long-lasting impression on the students and teachers who attended.

This is overall a well-run program with the potential to have a major impact on students and communities. The areas for improvement are centered around increasing the number of participants, volunteers, and staff members.

There is an urgent need to recruit more female coaches, and coaches from diverse populations, to act a role model for the student teams. There should be an effort to capitalize on the contacts, conference attendance, and other outreach and partnerships developed for listening tours and teacher participants in SC-RENEW to reach potential coaches. Recruitment of coaches from urban school districts is also necessary. Working with professional societies (local sections) could be useful to meet the recruitment goals. To meet the goal of increasing diversity, there may be a need to engage a volunteer or staff member who will serve as ambassador focused on maintaining diversity. With new coaches in general, and specifically those from diverse backgrounds, a peer-to-peer (coach-to-coach) mentoring program for one cycle would be useful to quickly onboard new coaches. This is already ongoing with the “coach clinic”. The recommendation is for intentionality in informing new coaches from underrepresented groups about the mentor partnerships for part of their recruitment process– and preparing the community.

Impact of COVID

As expected, the pandemic caused a large drop in participation. In 2020, a fast pivot to virtual for all except five (5) regional events had to occur. The competitions in 2021 and 2022 were fully virtual. The virtual competitions are score-based and not “head-to-head” because the buzzer systems online could not be relied upon for delivering timely results.

Prior to the pandemic, regional competitions required travel support to be done by the schools. The pandemic exposed the need for online participation, which reduced this cost barrier. In 2023, thirty (30) out of the 115 regional competitions were held online. There were twenty-one (21) new schools added in 2023 potentially due to the opportunity to participate virtually. Clearly, online and virtual is a value added for increasing participation and may set a useful structure for onboarding new teams from low-income communities.

Comments

The nationwide teacher shortages created challenges for this program, which relied heavily on teacher volunteers to engage with LEDs and student teams. It is unclear whether WDTS could directly impact this trend. However, the recommendations for lowering the barrier for new coaches to understand how to form a team and effectively compete could help to tap into a new pool of volunteers. Outreach had been developed to add five (5) new Middle School in Alaska Native and Native American communities to the regional competitions. Additionally,

Society of Hispanic Professional Engineers (SHPE) sponsors a regional competition and NOBCCChE will be re-establishing a competition hosting at their conference.

Albert Einstein Distinguished Educator Fellowship (AEF) Overview and Evaluation

Recommendations

The committee finds that this program is working as intended to bring the experience of accomplished K-12 educators into federal agencies and congress, but that the recruitment still needs to be bolstered with the end of the pandemic. **The committee recommends exploring methods to increase the applicant pool. An increase in stipend commensurate with other competing opportunities may help.** An important caveat that may render this recommendation moot, however, is that the WDTS program manager indicated that applications for FY23 were on track to exceed former years by a significant margin.

Findings

The COV found that this was a successful program that was having a strong impact on the careers of the teachers that participate. Informal data provided to the COV showed approximately half of the teachers going through this program go into administration or other teaching support/advisory roles after participating, with the other half returning to the classroom. During the fellowship, WDTS cited examples of teachers impacting their host institutions by helping to design educational programs, learning about the operations of the federal government, numerous other professional development opportunities and strongly interacting with other fellowship recipients. This all had a positive impact on the teachers and the program is viewed as highly successful.

Increasing travel to conferences by the program managers might be a way to promote the program more broadly and return the number of applications to their pre-pandemic levels.

Impact of COVID

The number of applications for this program understandably plummeted during COVID. However, with the “end” of emergency measures for the pandemic, the number of applications has not returned to pre-pandemic levels. A more competitive stipend will ensure top quality teachers are applying to and being selected for the fellowship.

WARS (WDTS Application and Review System) Overview and Evaluation

Recommendations

The COV commends WDTS and ORISE development teams on adding critical functionality to the WARS system. However, there are some improvements in the system that could be made. The COV recommends that WDTS work with ORISE to simplify and standardize application procedures, where practical, and focus on ease-of-use more generally, particularly for mentors and applicants who may use the system only infrequently.

Findings

As presented, WARS is the main functionality for performing proposal submission, ranking and selection, supplemented by PeerNet for peer-review. The committee was impressed by the recent addition of functionality to WARS to automatically redact personally identifiable information (PII) from college transcripts and other

sources. This is viewed as a critical tool, especially for students who may lack the software tools to be able to do this on their own.

During the COV, WDTS discussed the ongoing modernization to updated Microsoft .NET framework (the old version becoming unsupported). Despite the time-consuming nature of this upgrade, this is a necessary step to take as an unsupported system is a security risk or other unintended consequences.

In conversations with laboratory education directors (LEDs), some deficiencies in the WARS system were highlighted. Firstly, it was discussed that uniformity among program applications should be prioritized where prudent, in order to minimize the amount of training needed (e.g., from mentors moving from one program to another). For example, the VFP program is apparently treated differently than the SULI or CCI in that approval from all stakeholders is required at each stage before *any* application can advance, a requirement not used for other programs. Secondly, the LEDs highlighted ease-of-use concerns and stated a desire for documentation on how to use the system to be posted publicly (e.g., “How-To”s and FAQs posted on the WDTS web-site). This would benefit mentors who use the system only infrequently, and easily found documentation may have beneficial effects on their willingness to participate in WDTS programs.

Semiannual reminders to all mentors from WARS to input accomplishments would be useful.

Comments

Despite the difficulty of implementing this in WARS, the COV urged WDTS to look for ways to track outcomes from WDTS projects. The requirement to have an ORCID to apply for a fellowship or internship was viewed as a work around that could allow WDTS to track research outcomes (peer-reviewed publications), but not run afoul of the Paperwork Reduction Act or require an impractical software revision to WARS.

Other changes in WARS since the 2016 COV has been the ability to follow up with participants (mentors and trainees) on deliverables with an email which places a “ban” or “hold” until the deliverable is uploaded. This enables better control over deliverables. As well, one new feature in WARS is the ability to redact personal information within the software. Prior to this feature the number of applications rejected without review due to not following the guidelines to remove/redact personal information was higher and presented a barrier to applicants who did not have access to printing and other software resources to carry out redactions. This demonstrates the data evaluation and responsiveness of WDTS to the needs of the community with a focus on lowering barriers to be more inclusive.

WDTS Outreach Overview and Evaluation

WDTS uses numerous modes of outreach to potential program participants with the goals to: (1) Raise awareness of DOE and Office of Science research, STEM training and career opportunities, (2) Engage diverse individuals and institutions at all educational levels, and (3) Recruit more applicants from all backgrounds, especially those from underserved and marginalized communities. Their intentionality outreach has four pillars: meeting potential applicants where they are, addressing barriers in the application process, innovating new models and scaling what works (i.e., evaluating outreach efforts for effectiveness), and leveraging partnerships for a coordinated effort. These efforts are commendable.

Recent outreach includes working with science communication experts to achieve consistent branding, with a cohesive website, social media, and outreach materials. Improving the appeal of the WDTS webpage was recommended in the 2016 COV report; this has been achieved. Traffic to the WDTS webpage is reported to have increased. All viewed outreach materials contain visually appealing images and, importantly, stories and pictures that will allow a diverse audience to “see themselves” participating in the programs.

Some notable outreach activities include outreach at 2- and 4-year institutions of higher education as well as conferences that serve marginalized groups in STEM. Expanding these efforts to additional MSIs, including institutions that may not have established or extensive research infrastructure, and therefore higher barrier to participation, is recommended. Including program managers from e.g., BES, BER, HEP, ASCR offices is already planned and will be beneficial to broaden the understanding of research projects within these offices. Additional impact may be achieved with effective partnering with scientific societies that have programs targeting high school (e.g., American Chemical Society Project SEED), undergraduate and graduate (e.g., American Chemical Society Young Chemists Committee) students.

COVID brought changes to many aspects of how WDTS operates including how they communicate with potential program participants. Overall, these changes resulted in materials (e.g., easy to follow videos with application instructions) that remain effective and have positive benefits in reaching new audiences. Other examples include office hours with WDTS staff (e.g., in the evening when potential AEF participants may be finished with formal teaching duties), workshops, tutorials and other materials to explain the application process and lower the barrier to application. Other positive changes include “coach clinics” for NSB mentors and online internship fairs.

In addition to national laboratory teams, WDTS also works effectively with the Office of Science Communications department on press releases and some social media platforms, such as X, formerly known as Twitter (consistent with DOE policy). WDTS also has an annual program to fund outreach efforts through the national laboratories to expand the reach of their outreach.

WDTS RENEW

Recommendations

The WDTS RENEW program was piloted in FY22 and has shown strong promise in achieving its goals and objectives *making the program an excellent addition to the overall SC RENEW Initiative*. As such, the COV recommends the continued support for WDTS RENEW, as it is essential to sustain these planned pathways and evaluation programs without interruption to not further alienate the communities it was intended to serve, but to expand SC’s broadening participation effort. In addition, and based on the expansion of the Visiting Faculty Program (VFP), *the COV recommends SC to consider utilizing the FAIR Initiative as seed funding to accelerate the research capabilities of participants*.

Findings

WDTS conducted 12 of the 14 listening sessions which informed the SC RENEW Initiative of the types of support needed by the communities unfamiliar with the DOE’s research enterprise to broaden participation in the SC priority research areas. As a result, WDTS is well positioned to develop the types of programs which can yield favorable outcomes for SC and leverage its broad reach to involve the intended communities for this SC initiative. The COV recognizes the importance of SC’s continued support of WDTS RENEW programs, so the intended communities do not feel these efforts are “one and done” or just a “current trend” response to a national concern. Sustaining or increasing the level of support for the WDTS RENEW programs is essential for the successful implementation to achieve building research capacity at the participants’ home institutions and to obtain the desired engagement. Including WDTS in the FAIR process by developing FOAs for VFP faculty to develop the research infrastructure and engage in research at the home institution can be a game changer for the future of DOE’s innovation goal for the nation.

Comments

Through the SC RENEW Initiative, WDTS developed new pathways for students and educators from non-R1 MSIs, Community Colleges, emerging research institutions, and underrepresented, underserved groups (URGs), to promote equitable access to STEM training opportunities, build science identity, and cultivate a sense of belonging. WDTS piloted two programs under this initiative 1) For Students - WDTS RENEW Pathway Summer Schools for High School and Early Undergraduate Students at DOE National Laboratories, first cohort implemented in Summer 2023 at Ames, ANL, FNAL/BNL, ORNL, and PNNL, second cohort review completed with new DOE labs and 2) For Faculty - Extended research collaboration via the Visiting Faculty Program with DOE labs (from 1 to 3 terms) and Parallel tracks for research capacity and STEM teaching and learning at home institutions. WDTS will also lead the assessment and evaluation for SC-RENEW, in collaboration with SC research programs, DOE national laboratories, and ORISE while developing Broadening Participation through Intentionality Driven Outreach and Engagement and further developing an innovative Workforce Development Ecosystem. COVID 19 did not have a significant impact on the planning and implementation of the WDTS RENEW project as it started on the back end of the pandemic.

Appendix 1



Department of Energy
Office of Science
Washington, DC 20585

Office of the Director

Dr. Cynthia Friend
The Kavli Foundation
5715 Mesmer Avenue
Los Angeles, California 90230

Dear Dr. Friend:

Thank you for your continuing service as Chair of the Basic Energy Sciences Advisory Committee (BESAC). I greatly appreciate the International Benchmarking report, which is inspiring similar assessments by other advisory committees in the Office of Science, and the recent report on the scientific justification for a U.S. domestic high-performance reactor-based research facility. With the completion of these activities, I would like BESAC to take on the following charge:

Establish a subcommittee of BESAC to serve as a Committee of Visitors (COV) to examine the activities of the Office of Workforce Development for Teachers and Scientists (WDTS) within the Office of Science over the fiscal years 2017 - 2022. This will be the third COV for the WDTS program, all overseen by BESAC. The most recent COV, completed in December 2016 and approved by BESAC in February 2017, provided an important examination of the activities within the program. That COV report confirmed the effectiveness of the WDTS programmatic structure and activities that resulted from a major restructuring in response to the first WDTS COV completed in May 2010.

For this COV, please assess (1) the efficacy and quality of the processes used to solicit, review, recommend, monitor, and document application, proposal, and award actions; and (2) the quality of the resulting portfolio, including its breadth and depth and its national standing, benchmarked with other comparable Federal Science, Technology, Engineering, and Math programs. In addition to this standard charge, please comment on the effectiveness of the online technology development and evaluation activities in support of WDTS programs and outreach efforts to enhance the diverse and inclusive participation in WDTS programs that include:

- The Science Undergraduate Laboratory Internships (SULI)
- The Community College Internships (CCI)
- The Visiting Faculty Program (VFP)
- The Office of Science Graduate Student Research Program (SCGSR)
- The National Science Bowl® (NSB)
- The Albert Einstein Distinguished Educator Fellowship (AEF)

The COV review should be conducted in accordance with the standard Guidance for the Department of Energy Office of Science Committee of Visitors Reviews. In assembling the subcommittee, please include diverse representation from BESAC. Due to the continued impact of the pandemic, a virtual or hybrid in-person/virtual COV meeting can be considered. The Oak Ridge Institute for Science and Education (ORISE) will provide the logistics support for the meetings.

It would be advantageous if BESAC approved the review report prior to the end of 2023. I want to thank you and BESAC for undertaking this important function for the Office of Science.

Sincerely,

A handwritten signature in blue ink that reads "Asmeret Asefaw Berhe".

Asmeret Asefaw Berhe
Director
Office of Science

cc: H. Kung, SC-3
P. Ge, SC-3.3
L. Horton, SC-32
K. Hochberger, SC-32

Appendix 2

Agenda for WDTS Committee of Visitors (COV) Review September 19-20, 2023

First Day – September 19, 2023 (9:00AM ET - 5:00PM ET)

Breakfast: 7:30 AM – 8:45 AM ET

Time	Topic	Lead(s)
30 mins	COV Introductions and Logistics <ul style="list-style-type: none"> Member Introduction Charge 	BESAC Chair COV Chair
30 mins	WDTS Overview and Future Vision <ul style="list-style-type: none"> Programmatic overview; Major accomplishments addressing 2016 COV; 2023 COV; Future Vision 	Ping Ge, Director, WDTS
10 mins	Break	
45 mins	Science Undergraduate Laboratory Internships (SULI) and Community College Internships (CCI)	Brandi Toliver, PM, SULI/CCI/VFP
25 mins	Visiting Faculty Program (VFP)	Brandi Toliver, PM, SULI/CCI/VFP
30 mins	Breakout Session for SULI/CCI/VFP	COV Committee
60 mins	Lunch, 12 PM – 1:00 PM ET	
45 mins	Office of Science Graduate Student Research (SCGSR) Program	Igor Slowing PM, SCGSR
30 mins	Breakout Session for SCGSR	COV Committee
30 mins	National Science Bowl® (NSB)	Jan Tyler, PM, NSB/AEF
15 mins	Albert Einstein Distinguished Educator Fellowship (AEF)	Jan Tyler, PM, NSB/AEF
10 mins	Break	
45 mins	WDTS Application and Review System (WARS) <ul style="list-style-type: none"> Overview Management and Development Plan Data Analysis and Visualization (DAV) 	Yolanda White, Lead, Websites/Online System/Ping Ge ORISE WARS Development Team (Demo)
30 mins	Wrap-up / Discussion	COV Committee
15 mins	Feedback/Debriefing	All

Second Day - September 20, 2023 (9:30AM ET - 5:00PM ET)

Breakfast: 7:30 AM – 8:45 AM ET

Time	Topic	Lead(s)
30 mins	Outreach <ul style="list-style-type: none"> • Overview and Major Activities • WDTS listening sessions 	Kelly Day/Ping Ge
30 mins	Evaluation <ul style="list-style-type: none"> • Overview • Short-term and longer-term projects 	Ping Ge ORISE Assessment & Evaluation
10 mins	Break	
45 mins	WDTS RENEW <ul style="list-style-type: none"> • Evaluation of SC RENEW • Pathways for Students and Educators 	Ping Ge/Igor Slowing/Jan Tyler ORISE Assessment & Evaluation
60 mins	Lunch, 11:30 AM – 12:30 PM ET	
30 mins	Partnership with DOE national labs - Peer Review of Laboratory Management (SULI/CCI/VFP) <ul style="list-style-type: none"> • Processes, outcomes, impacts • Core Requirements, Model Practices, Implementation Plans 	Ping Ge/Brandi Karen Skubal (DOE/EM, prior SULI/CCI/VFP PM)
45 mins	Laboratory Education Director Virtual Town Meeting <ul style="list-style-type: none"> • COV discussion and Q/A with representative DOE host lab program officials 	DOE Labs (tentative list: AMES, ANL, BNL, LBNL, PNNL, SRNL, PPPL, NREL, and ORNL) No WDTS participation here
10 mins	Break	
45 mins	WDTS – COV Discussion & Q/A	Ping Ge/ Brandi Toliver/Igor Slowing/ Jan Tyler/Yolanda White/Kelly Day
90 mins	Writing to complete a first good draft before leaving	COV committee
15 mins	COV Closeout & Departure	COV committee