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November 2021

IDA Document D-32883
Log: H 21-000443

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About This Publication

This work was conducted by the IDA Systems and Analyses Center under contract HQ0034-19-D-0001, project AI-2-4833, "Evaluation of SMART Program 2.0," for the Defense Laboratories and Personnel (L&P) Office/STEM in the Office of the Under Secretary of Defense for Research and Engineering. The views, opinions, and findings should not be construed as representing the official position of either the Department of Defense or the sponsoring organization.

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Executive Summary

SMART Program

The Science, Mathematics and Research for Transformation (SMART) Scholarship for Service Program was established by the Department of Defense (DoD) in 2006 to provide financial assistance for education in science, mathematics, engineering, and technology skills and disciplines that are needed in the DoD workforce.[1] The program provides scholarships (tuition and stipend) and in return, the students commit to completing summer internships while in school and a year of employment at their sponsoring facility (SF) for every year they receive scholarship support.

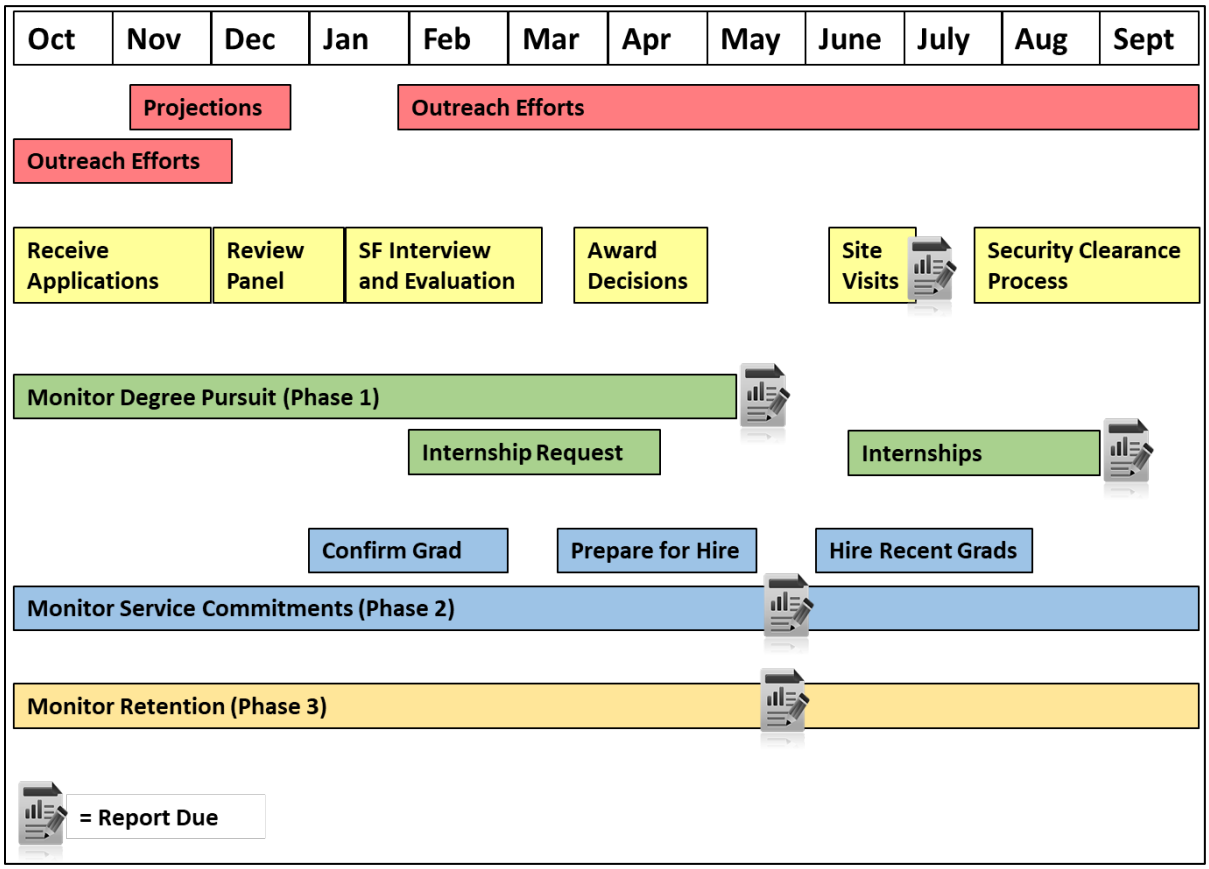
This process evaluation is a follow-up to one conducted in 2015–2018 (Balakrishnan, Buenconsejo, et al. 2018), herein referred to as SMART 1.0. In general, the SMART 1.0 analyses indicated that the program helped improve the quality of the DoD workforce, attracted some students who may not have previously considered the DoD as an employment option, and had mixed results regarding retention and diversity. As part of that evaluation, the Institute for Defense Analyses (IDA) provided recommendations to address improvements to program processes and to increase the likelihood of achieving particular SMART Program goals. For the current program evaluation, the SMART Program Office (SPO) asked IDA to conduct a new process evaluation of the SMART Program, which would include how the program has evolved since SMART 1.0.

The SMART Program has implemented some process changes in the past 5 years. These changes include: the requirement for the awardees to participate in a site visit to their SF prior to formally accepting the scholarship; the development of the SMART Information Management System (SIMS) in 2016; the creation of the SMART Advisory Council in 2016; the initiation and expansion of the SMART Scholar Symposium in 2017; recent changes to the SMART Portal for recording and sharing information across stakeholders; and a (now rescinded) requirement that scholars receive at least 1.5 years of financial assistance to ensure that they can participate in summer internships.

The SMART Program is inherently complex, with many stakeholders looking to address a broad set of workforce needs, and distributed across many facilities of the three Service Components as well as the Fourth Estate agencies. Additionally, at any one time throughout the calendar year there are concurrent processes. As noted in the figure below, for this process evaluation, we have grouped these processes into six stages and color coded them to indicate the groupings that are part of particular stages: a) planning and preparing (red), b) applications to

[1] 10 U.S. Code § 2192a.

awards (yellow), c) degree pursuit (green), d) service commitment (blue), e) retention beyond service commitment (tan), and f) oversight (not depicted in the figure).



The concurrent processes of the SMART Program over the course of a year. The "Report Due" icon reflects due dates for reports from the scholar or Sponsoring Facility.

This process evaluation report is organized according to the stages identified above, with a logic model for each section describing the processes of that section. The IDA research team relied on program documentation, interviews with SMART Program stakeholders, and programmatic data analysis. We note that due to the COVID-19 pandemic, the entire IDA team engaged in this program evaluation remotely. Thus, all meetings with the SPO, data collection interviews with stakeholders, and internal IDA team meetings were conducted virtually. To place the SMART Program in broader context, the IDA team also reviewed national education and employment data along with DoD science and engineer (S&E) workforce data. Additionally, the IDA team analyzed other programs that share some characteristics with the SMART Program to identify how this program is unique and to also look for potential lessons learned.

Process Findings

Planning and Preparing

In this stage, the SMART Program conducts workforce planning and preparation required for engaging the next cohort of scholars who have not yet applied to the program. The SMART planning process maps to the Office of Personnel Management's (OPM) workforce planning model in that the SPO and SFs engage in both operational planning (e.g., addressing current talent needs) and strategic planning (e.g., forecast future needs) based on the facilities' workforce objectives. The SFs identify their workforce needs and communicate them through the Component Liaisons,[2] and those needs are then aggregated by the SMART Support Contractor. These workforce projections are used during the selection process and subsequently inform outreach during the following year. In general, the SFs that use the SMART Program regard the program as integral to building their overall S&E workforce, but it is only one of several mechanisms they have for addressing workforce needs.

The workforce projections requested by SMART are based on the 21 identified disciplines and the expectation of the degree level (BS, MS, PhD) sought by the SFs to fill their occupational needs. Additionally, the SFs also take into consideration the DoD and component-specific Modernization Priorities[3] in projecting their workforce needs. Although the workforce projections for the SMART Program focus on desired disciplines, it is unclear as to how these academic disciplines map to the specific occupations that the scholars will fill at the SFs. Potential mismatches between occupation titles and discipline may lead to some incongruities between recruitment of applicants by discipline and the workforce needs by occupation.

Over the past few years, Congress has requested that the SMART Program work to increase diversity (racial, ethnic, and gender) of applicants and awardees. With reference to diversity metrics, the setting of appropriate benchmarks is not a simple task in that the demographic diversity of the U.S. population is different from the diversity of those who attend college, and among science, technology, engineering, and mathematics (STEM) disciplines there are large variances in the diversity by both discipline and degree level. The disciplines that are most sought after in the SMART workforce projections are disciplines with relatively poor diversity characteristics compared to the U.S. population. The SMART Program is taking steps to increase the diversity among applicants by conducting targeted outreach efforts. For example, in 2020 the SMART Program held multiple webinars to attract applicants from Historically Black Colleges and Universities (HBCU)s. Likewise, the SMART Support Contractor has engaged organizations that serve groups that are traditionally underrepresented in STEM as a means to increase applicant (and scholar) diversity.

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[2] Members of the SMART Support Contractor team, who are the main point of contact (POC) between the SMART Program, sponsoring components, and SFs.

[3] https://www.cto.mil/modernization-priorities/

There are some factors that seem to influence the prevalence of applications. For example, considerable differences exist across disciplines relative to the number of applicants. Although the SFs had ample choice of applicants for many disciplines there were some with relatively few applicants, potentially contributing to an apparent mismatch between occupational position and discipline. Another source of applicant variation was geographical factors related to the number of applications received from states with larger populations or from states with larger (in number or size) DoD facilities or SMART SFs in the state.

Application to Awards

In this stage, the scholars complete their application and the SMART Program convenes an initial selection panel to score applications and identify a set of qualified applicants for the second round of assessments conducted by participating SFs. During this second round of reviews, the SFs evaluate the selected applications and conduct applicant interviews to develop a final selection list of awardees. These award decisions are reviewed by the Component Liaisons, the Component Execution Leads, and the SPO to reconcile the selection of the same applicant by two or more SFs. During this period of the award cycle, (referred to as Phase 0 by the SMART Program), applicants receive offers for SMART awards.

There are some factors that seem to influence the award process. For example, SFs often identify which applicants to prioritize for the secondary review and interviews based on the applicant's selection of the facility as a preferred facility or location. Sponsoring facilities have identified this as an important factor suggesting that the applicant and facility are a mutually good fit that may lead to longer-term workforce retention. Likewise, many SFs reported a preference to select SMART applicants with a prior link to the SF, usually through another internship or STEM education/outreach program. The SFs may also filter applications that selected its geographical area. In an analysis of the 2020 cohort applications to awards, IDA found that 46% of scholars were selected by their first SF choice, 13% were selected by their second choice, and 8% by their third preference. Of the awards offered in 2020, only 33% were made to applicants by SFs outside of the applicant's top three preferences; however, several of these were linked to a preferred organization but at a different location or were geographically near one of their preferences.

In comparison to national STEM statistics, across all disciplines the SMART applicant pool is slightly more gender diverse and remains so at the awards stage. The level of diversity varies across racial and ethnic groups and indicates variances in the selection process. For example, compared to the national STEM education statistics, Black/African American applicants to the SMART Program are a higher percentage than the national percentage but SMART awards to Black/African American Scholars occurs at a lower percentage than the national data. Addressing the 'intersectionality' of gender and race/ethnicity, the SMART Program shows a promising trend in that representation of Hispanic, Black/African American, and Asian women is higher among SMART applicants then the national statistics, and those differences increase when looking at the percentages of awards.

After applicants are offered an award, awardees travel to the SF to participate in a mandatory site visit. There, they learn more about the SF, meet with staff, and use the experience to help determine if they would like to accept the award. At the site visits, the SFs also collect the necessary information to commence the security clearance process for each scholar. Site visits are a significant new process that started in 2016 to ensure that the decision to accept the award and service commitment was made with full awareness of the SF's work and geographic area. In 2020, however, the COVID-19 pandemic caused the SMART Program to pivot to virtual site visits for the 2020 cohort. Regardless of format (in person or virtual), both the scholars and SFs complete site visit reports. A review of a sample of site visit reports indicated some differences between those who participated in virtual site visits compared to those with in-person visits (e.g., scholars who visited virtually were much less likely to report forming a formal communication plan with their SF than scholars with in-person site visits). Additionally, the level of responsiveness to the site visit reports varied considerably, leading IDA to identify suggestions to improve response efficiency and the utility of the information provided in the reports for program oversight.

Degree Pursuit

This stage includes the scholar attending and completing the school/degree requirements and includes summer internships at the SFs. The degree pursuit stage is called Phase 1 by the SMART Program. To aid in the monitoring of degree pursuit, there are multiple reports that the scholars must complete. These include the annual reports completed in May that indicate how the scholar is progressing towards his or her degree requirements. This is an opportunity for scholars to inform the SMART Program on notable achievements during the year and any issues that have not been discussed directly with the SF or Component Liaison.

Each summer, scholars complete an 8 to12 week internship at their SF. This provides scholars with valuable work experience at their SF and an opportunity to see what their work may be like after they graduate. Due to the COVID-19 pandemic, the SPO waived the internship requirement over the summer of 2020. Still, some scholars were able to conduct their internship either in-person or remotely based on the specific facility conditions and workplace constraints. Scholars are required to complete an internship report upon completion of the internship. IDA reviewed a sample of these reports and noted that a number of scholars requested more flexibility in the length of the internships to extend their time to complete work at the SF and allow them to take part in team presentations or exercises. Scholars also noted that although the communication efforts made by the SF and SMART Program were critical for a smooth start and productive internship, there was room for improvement. Although some scholars reported a desire for greater work responsibilities during the internship, the internships were seen as valuable experiences overall, allowing for scholars to expand their professional and technical skills.

Although the security clearance process typically begins during the site visit, the SFs usually spend the academic year getting a clearance for the scholars so that they can intern at the SF the following summer. The process for obtaining a security clearance was identified as a problem in

SMART 1.0, and although the responsibility has changed from the SPO to the SFs, it is still a consistent problem based on most of the stakeholder interviews. However, one SF interviewee (out of 19 interviews) indicated they had a good working relationship with their own security office and that made the process easier then when it was completed by the SPO.

Service Commitment

In the Service Commitment stage, scholars are hired and begin to satisfy their service commitment. This stage, called Phase 2 by the SMART Program, begins when scholars complete their academic and internship requirements and begin government service as full-time employees at their SF. Phase 2 ends when the scholar completes their commitment to the SF.

The first activity in this stage is the conversion of a scholar to an employee, where the scholars are hired by their SF. Because the SFs are executing the hiring action, the individual SF rules and regulations apply and the SPO may have limited influence on the details of how it is executed. The Scholar Coordinator will contact the scholar several months prior to graduation to confirm his or her graduation date. The Scholar Coordinator works with the Component Execution Leads to generate the hiring paperwork for the SFs. Although some SFs use other hiring authorities, most utilize the SMART direct hiring authority. These SFs reported that the combination of the support they receive from the Scholar Coordinators and Component Execution Leads and their ability to use the SMART hiring authority allows for a relatively efficient hiring process for scholars. Occasionally, they reported running into issues with the security clearance process for the scholars, which can be a huge impediment to the entire hiring process. Per the stakeholder interviews, it does appear that the SMART hiring authority requirements are at odds with the SFs who can only hire under term employment.

The process of hiring (i.e., transition from Phase 1 to Phase 2) may take several weeks, and there is considerable variation across scholars and facilities on how long after graduation it may take before a scholar starts at their SF. Hiring time on average, across the existence of the SMART Program takes 8.3 weeks after a scholar graduates for them to start working. There is not a good benchmark measure to compare this against. A concern should be with hires that take extraordinarily long, and only 5% of scholars were hired after more than 26 weeks post-graduation. Although the time to employment can be 3 months, or longer for a quarter of the scholars who complete the program, the SMART Program provides the scholar with a stipend until they are hired. We note that the SMART Program is working to share lessons learned to facilitate the hiring of scholars in a timely manner.

The Service Commitment reports help track how scholars are doing during their Phase 2, but many of the Phase 2 reports reviewed for this evaluation were incomplete. Also worth noting is that some of the data gathered are redundant to data already collected during prior phases.

Retention Beyond Service Commitment

In the retention beyond the service commitment stage, scholars may continue to work for the SF. While the scholar has completed their commitment, the expectation is that they may stay with the DoD and continue to contribute to their SF. The SMART Program calls this stage Phase 3. Across the 21 disciplines, there does seem to be a difference in retention rates; this is something that could be explored more in the outcome evaluation that will follow this process evaluation.

Scholars are required to complete Annual Reports for 10 years after completing their service commitment. These post-service commitment (Phase 3) reports provide updates to the scholar's contact and current employment information, any additional educational pursuits, and notable achievements (e.g., professional awards, peer-reviewed journal publications, and conference presentations). The Phase 3 Annual Reports also provide a means for scholars to inform the SMART Program about suggestions for improving the program or issues with their SF. IDA provided some suggestions on modifying the Phase 3 Annual Reports to better understand long-term retention of scholars.

Through analysis of academic literature on factors that determine employee turnover and retention, IDA identified processes that may be relevant to long-term retention of SMART scholars. Three processes that are currently addressed to some degree by the SMART Program are: a) promote just and fair compensation policies, b) encourage social interconnections, and c) provide realistic job previews. There are three other processes that could potentially be implemented but there may be additional program costs: a) provide training and professional development opportunities, b) determine employee intentions, and c) use biodata to predict retention likelihood during the selection/award process.

Oversight

The SMART Program is complex, with many processes that occur in series as have been described in previous sections, but it also includes some processes that are ongoing or not part of the standard sequence of processes aligned with the progression of cohorts. Among those ongoing processes, there is general program oversight, records management, program adjustments, debt collection, and communicating with Congress and higher-level DoD leadership through the annual DoD Planning, Programming, Budget, and Execution (PPBE) process for resource allocation.

The SMART Program collects considerable information through scholar-generated and SF-generated reports. One of the main functions of these reports seems to be the identification of problematic issues that the Component Liaisons should bring to the SPO's attention. Modifications to some of these reports could potentially provide for an automated extraction of information that could be useful to the program.

Conclusion and Process Recommendations

The SMART Program consists of many stakeholders (e.g., SPO, Component Execution Leads, SFs, SMART Support Contractor, and the scholars) who all play a role in a series of processes, with many of those processes taking place concurrently at any point in time and distributed geographically. Due to the SPO's continual effort to improve the program, Congressional- or DoD-directed requirements, suggestions from stakeholders, or recommendations from the prior IDA evaluation, SMART Program processes have evolved over time. In general, these changes have had a positive impact on the procedures and activities of the program associated with accomplishing its primary mission to provide financial assistance for education in STEM skills and disciplines needed in the DoD workforce. Despite the complexity of the program, each stakeholder demonstrated incredible flexibility in adjusting the program processes to address challenges created by the COVID-19 pandemic.

While the SMART Program is functioning well, there are a few process recommendations that might refine how the program functions. These include:

- Consider modifications to reports to ease completion and obtain information that could be more useful to the SMART Program.
- Address diversity by assessing the current state of the program (applications and awards), identifying the most pressing needs to focus on, and analyzing applicant supply metrics to determine how best to address those needs.
- Consider determining particular discipline needs (or limiting some) to influence how the program is used to address diversity or DoD modernization requirements. This would require a detailed understanding of discipline-by-discipline differences in applicant supply and employment metrics.
- Consider developing a formalized scholar-to-mentor program that facilitates program alumni to continue to be active members of the SMART community (e.g., as an additional stakeholder).

This process evaluation focused on the activities, procedures, and functions of the SMART Program. There will be a follow-up outcome evaluation that will focus on what the program produces and the impact the program has for DoD and the participants.

Contents

1. Introduction

A. SMART Program Overview

The Science, Mathematics and Research for Transformation (SMART) Scholarship for Service Program (hereafter referred to as the SMART Program) was piloted in 2005[1] and permanently established by the Department of Defense (DoD) in 2006 under the Program Element – National Defense Education Program.[2] The goal of the program is "to provide financial assistance for education in science, mathematics, engineering, and technology skills and disciplines that, as determined by the Secretary, are critical to the national security functions of the Department of Defense and are needed in the Department of Defense workforce."[3]

The program was implemented to support the DoD's science and engineering (S&E) workforce at laboratories and facilities that choose to participate in the SMART Program; herein referred to as sponsoring facilities (SFs). The SMART Program provides scholarships (tuition plus a stipend) for current and future scientists at the undergraduate and graduate levels (bachelors, masters, and doctoral degrees) across 21[4] different science, technology, engineering, and mathematics (STEM) disciplines. The SMART Program also provides scholars with summer internships at SFs in order to prepare each scholar for a position and career as a DoD civilian employee at a SF. In return, the students commit to completing a year of paid employment within the DoD civilian workforce at a SF for every year they receive the scholarship.

B. SMART Process Evaluation

A process evaluation assesses a program based on the structure of the program, the resources it plans to draw on to conduct particular functions, and activities in order to obtain expected objectives (Wholey, Hatry, and Newcomer 2010). A companion effort for many process evaluations is an outcome evaluation, which assesses if a program achieved its

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1 The program was piloted in response to the Fiscal Year (FY) 2005 National Defense Authorization Act (NDAA). See National Defense Authorization Act for Fiscal Year 2005 Report, Committee on Armed Services, United States Senate, S. Rep. No. 108-260, at 387 (May 11, 2004), https://www.congress.gov/108/crpt/srpt260/CRPT-108srpt260.pdf.

2 In the DoD's annual budget, the SMART Program is part of Program Element 0601120D8Z.

3 10 U.S. Code § 2192a.

4 The SMART Program originally included 19 STEM disciplines. This list expanded in 2018 to the current list of 21 disciplines.

goals and intended effect. This current report (referred to as SMART 2.0) is a process evaluation and will be followed up by an outcome evaluation. The rationale for this sequence of evaluations is that a process evaluation helps identify how a program functions towards particular outcomes, and therefore sets the stage for understanding how an outcome may come about. It can be useful to first understand the program details by conducting a process evaluation, particularly for a complex program like SMART that has multiple stakeholders executing it across several DoD Components (i.e., Department of the Army, Department of the Navy, Department of the Air Force, and other DoD Agencies) and at many locations.

A standard analytic tool for conducting a process evaluation is a logic model. This model is a graphic representation of causal and temporal relations between elements of the program. These elements include the program's *inputs* (i.e., resources, authorizations, and assets), which can be used to conduct particular *activities* in an effort to derive expected *outputs* (i.e., products) to achieve intended near-term *outcomes* and long-term *impacts*. The analysis of a logic model for a program may also identify key *external factors* that are outside the program's control but may affect the achievement of expected outcomes. The flowchart structure of a logic model may clarify the linkages among model elements, showing which activities are expected to lead to which outputs or where those linkages may or may not be appropriate. For this process evaluation, logic models were developed to depict how the SMART Program uses their resources to conduct particular functions with intended outputs and impacts. These logic models are shown at the beginning of each subsection of the process and findings section of this report.

1. SMART 1.0 Process Evaluation

The Institute for Defense Analyses (IDA) conducted a previous evaluation of the SMART Program in 2015 (called SMART 1.0 in the current evaluation), resulting in two final reports published in 2018 (Balakrishnan, Buenconsejo, et al. 2018; Balakrishnan, Acheson-Field, et al. 2018). In SMART 1.0, IDA examined how the program's goals were achieved (process evaluation) and the impacts of the program (outcome evaluation). The SMART 1.0 evaluations covered cohorts from the program's inception in 2006 through the 2015–2016 academic year, which summed to 2,021 scholarships to students attending 305 higher education institutions who were sponsored by 169 unique DoD facilities. The SMART 1.0 process evaluation was the first detailed evaluation of the program, and was guided by three research questions:

1. What are the SMART Program goals, design, and resources, and how have they evolved over time?
2. What is the SMART Program process? Has it changed over time and, if so, how and why?

3. From all stakeholder perspectives, is the SMART Program process helping to meet the program goals? Is the process for the SMART Program working as intended?

In order to address these questions, the IDA research team utilized a number of data sources: program documentation, over 150 interviews with SMART Program stakeholders, a scholar survey, programmatic data analysis, and a review of other federal Scholarship for Service (SFS) programs. In general, the SMART 1.0 analyses indicated that the program helped improve the quality of the DoD workforce, attracted some students who may not have previously considered the DoD as an employment option, but had mixed results regarding retention and diversity. Specifically, the SMART 1.0 Program evaluation resulted in a number of findings and recommendations:

1. The SMART Program goals have remained relatively consistent over time.
2. Overall, scholars and SFs reported being happy with the SMART Program processes. The growing interest in the SMART Program from 2006 to 2016 and scholars' overall satisfaction with the processes are a testament to the successful execution of the SMART Program. Nonetheless, the program has recognized the need for improvement in certain areas and has worked to identify and implement solutions.
3. The SMART Program conducts outreach efforts nationally and is a hiring mechanism consistently used to acquire high quality STEM talent for SFs. Additionally, the SMART Program has allowed SFs to maintain a reliable and consistent hiring mechanism despite federal hiring freezes in any given year.
4. The SMART Program is inherently complex. The complexity is evident across the levels of interaction and actions required for the SMART Program to exist: a) funding three levels of higher education degrees across 19 STEM disciplines;[5] b) placing scholars in S&E positions across many SFs across the DoD; c) serving the needs of multiple stakeholders across the DoD Research, Development, Test and Evaluation spectrum; and d) the program supports both new "recruitment" scholars joining DoD and existing DoD employees (retention scholars).
5. The implementation of aspects of the program and scholar experiences vary from Component to Component and facility to facility.
6. The administration of the SMART Program manages outreach, placement, academic pursuit, and scholar-monitoring activities, but the selection of scholars

[5] During SMART 1.0 there were only 19 disciplines recruited, which has since grown to 21 disciplines.

and their day-to-day work experience is managed at the facility and by the Components.

7. Optimizing the "fit" of the scholars based on their backgrounds and interest with the needs of the SFs has both benefits and challenges. Scholars and SFs are paired at the start of the scholarship allowing the scholar and SF staff to build a sustained relationship over the entirety of Phase I. But, with the early pairing, the scholar may have little information on the work performed at the SF or how the SF operates when they accept the award.
8. Communication across stakeholders and continuity of the program pose a challenge, but the program has been identifying ways to address these issues. The complexity of the program leads to communication challenges across all stakeholders, but most importantly, with the scholars.

2. SMART 2.0 Process Evaluation

The SMART Program has evolved and grown over the years. In an effort for continuous improvement and because of this evolution, the DoD STEM office within the office of the Under Secretary for Research and Engineering (USD(R&E)) plans to periodically evaluate SMART processes and outcomes to see how well changes are being implemented and their subsequent impact on program outcomes. A brief review of the SMART Program changes includes those in program management such as the initial change from the Air Force Office of Scientific Research (AFOSR) to the Naval Post Graduate School (NPS) in 2008, and the subsequent change to USD(R&E) in 2012. A technological evolution to the SMART Program resulted in the applications residing on an online portal in 2013, the development of the SMART Information Management System (SIMS) in 2016, and more recent changes to the SMART Portal for improved user capabilities.

The SMART Program has implemented some specific oversight changes since the SMART 1.0 evaluation. For example, the program added required site visits to the SFs by scholars to assist the scholar in making an informed decision regarding their acceptance of the scholarship and associated service commitment. The SMART Program also developed a multisite scholar event (SMART symposium) where SMART scholars are invited to present their own research and learn about research being conducted by other SMART scholars. Additionally, the SMART Advisory Council was created in 2016. This Advisory Council is comprised of representatives from the Office of the USD(R&E), and DoD Components participating in the SMART Program. The SMART Advisory Council provides recommendations regarding procedural guidance, program improvements, and policy. Finally, the SMART Program has changed the Support Contractor agency that runs the day-to-day execution of the SMART Program. As such, the lead Support Contractor

changed in 2016 from the American Society of Engineering Education to the current support contractor, the Logistics Management Institute (LMI).

The purpose of this SMART 2.0 evaluation is to review all of the program's processes, which will leverage what was done in the SMART 1.0 evaluation. This includes examining some of the same variables and features of the SMART Program as was done in SMART 1.0 to see how the program may have evolved and its procedures changed over the past 5 years with five additional cohorts entering the program. SMART 2.0 will also include the analysis of some variables and features that were not part of SMART 1.0. (e.g., differences across disciplines, efforts to increase diversity). The scope of the SMART 2.0 evaluation will include the entire history of the program (2006–2021), but with an emphasis on recent years 2018–2021.

The SMART Program is complex with multiple phases and simultaneous activities that might overlap one another during a given year. As shown in Figure 1, the program may be developing projected workforce needs and conducting outreach for the following year's applicants, while also receiving applications and reviewing current applicants to determine awardees. During the same year, the program monitors prior years' awardees as they pursue their degree, intern, and subsequently are hired once they graduate. Simultaneously, the program monitors scholars that are working to complete their service commitment and their continued retention within the DoD workforce. To provide an organizing structure to this process evaluation we developed logic models for each segment of the program.

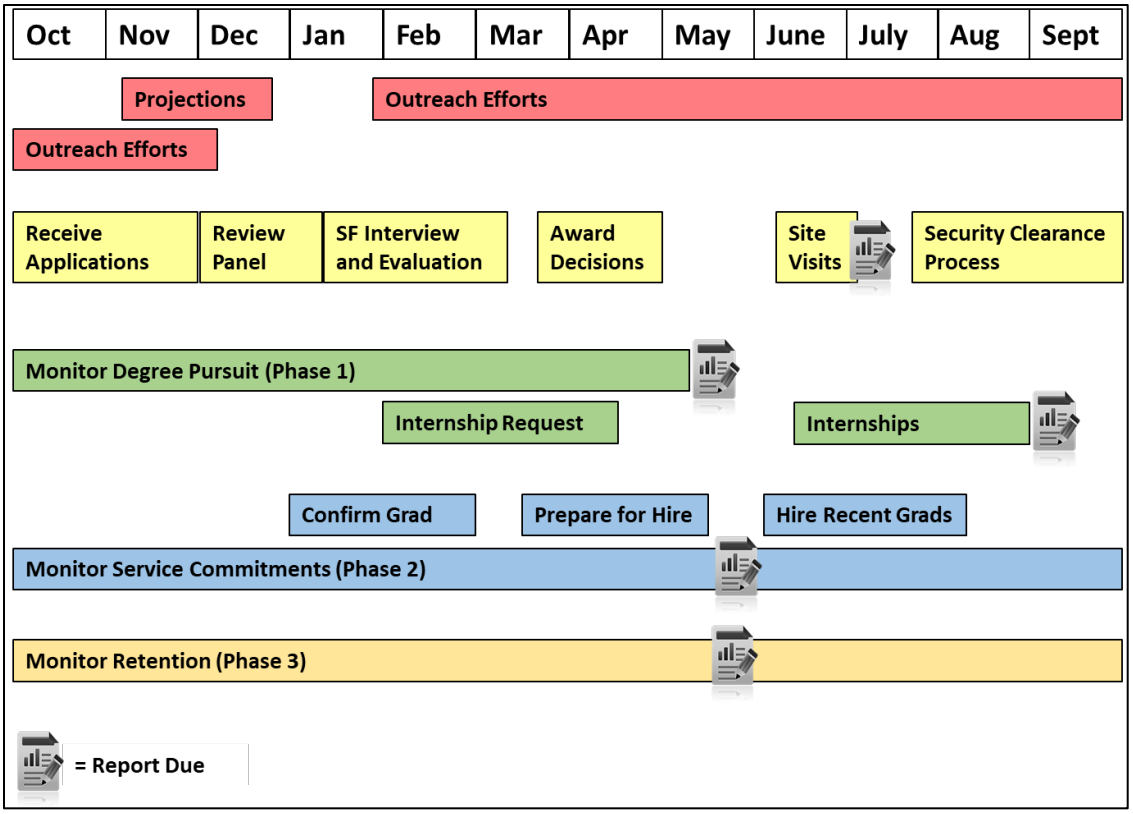

Figure 1. SMART Program Annual Cycle of Activities. The "Report Due" icon reflects due dates for reports from the scholar or Sponsoring Facility.

For purposes of this evaluation, we have divided the processes for logic models into five segments or stages as cohorts move through the program, and refer to them as follows:

- *Planning and preparing*. All the planning and preparation required for the next cohort of scholars who have not yet applied to the program.
- *Applications to awards.* The period starts when the scholars complete their application to the awarding of scholarships. During this period, applicants may arrange for site visits or participate in orientation sessions, but they do not receive award funding. The SMART Program Office (SPO) refers to this segment as Phase 0.
- *Degree pursuit.* This segment (or Phase 1) starts with the formal award of the SMART scholarship and ends when scholars complete approved degree requirements and internships.
- *Service commitment.* This segment (Phase 2) begins when scholars complete their academic and internship requirements and begin government service at their SF as a full-time employee. Phase 2 ends when the scholar completes their agreed upon commitment to the SF.

- *Retention beyond service commitment.* This segment (Phase 3) begins after scholars satisfy their commitment to the DoD, and may continue to work for their SF or may leave without incurring a debt.

In addition to the five stages, there is a sixth section of the findings that includes activities that cross stages. This set of ongoing activities are not stage specific and can be considered oversight functions.

2. Methodology

The sources of information specifically related to the SMART Program for this process evaluation included reviews of formal program documentation, stakeholder interviews, and data analysis. In addition, other DoD documentation (i.e., non-SMART), DoD personnel data, and national education data were considered.

The IDA team conducted the process evaluation during the COVID-19 pandemic; therefore, some plans were adjusted due to restrictions on gathering in person, travel, and working remotely. All real-time communication such as planning meetings, interviews, and briefings were conducted through phone or video conference calls. Additionally, the COVID-19 pandemic affected many of the SMART Program's processes; we attempted to identify when there was a difference in standard versus COVID-19 processes.

A. Documentation review

IDA reviewed a range of documentation, including material published for the scholars to learn about how the SMART Program functioned (i.e., Scholar Handbooks), policy documents that guided SMART functioning (e.g., SMART DoD Instruction (DoDI) 1025.09, SMART mentions in the National Defense Authorization Acts, DoD program planning documents), and documents generated during SMART functioning (i.e., reports generated by scholars and SFs at different points during the SMART processes).

1. SMART Handbooks

The SMART Scholar Handbook has changed some over the years. For the SMART 2.0 evaluation, IDA obtained Scholar Handbooks from 2010, 2011, 2013, 2015, 2016, 2019, 2020, and 2021. Scholar Handbooks provide scholars with detailed information on the program. Sections in the Handbook include: program contacts and definitions, the role of the SMART Support Contractor, numerous procedures and program requirements, descriptions of the SMART Program phases, reporting requirements, and descriptions of SMART stakeholders (e.g., DoD STEM Office; Air Force, Army, Navy, and other DoD organizations' execution and administrating offices; Air Force, Army, Navy, and other DoD facilities that sponsor scholars; and the SMART Support Contractor).

2. Policy Documents

A guiding policy document for SMART is Title 10, U.S. Code § 2192a, that provides the authority for the SMART Program. Additionally, DoDI 1025.09, *SMART Defense*

Education Program, provides detail on the responsibilities, managerial structure, and oversight for the SMART Program.

3. DoD Program Planning and Budgeting

One of the primary documents for the DoD's annual Planning, Programming, Budgeting, and Execution (PPBE) process relevant to the SMART Program is the *Justification Book for Research, Development, Test & Evaluation, Defense-Wide* volume. This document is generated annually and provides budget planning and execution data along with narrative descriptions of program goals and accomplishments. IDA obtained these documents for each year the SMART Program has been in existence (i.e., from 2006 to 2021).

4. Scholar- and SF-Generated Reports

Throughout the lifecycle of a scholar, they are required to complete various reports describing their actions, accomplishments, and feedback for the program. These include site visit reports when they first visit their selecting SF, annual reports in each phase of the program, and internship reports after they complete an internship session. The SFs also generate a version of the site visit reports after their first post-selection meeting. IDA obtained and reviewed a sampling of these reports for the current evaluation.

5. Similar Program Documentation

To provide context for the SMART 2.0 process evaluation, the IDA team reviewed several other programs (both DoD and non-DoD programs) that share features with the program. These reviews consisted of analyzing open-source information on the programs available through the Internet. These reviews highlighted salient characteristics of programs, and provide context of the range of scholarship and workforce development programs that potential applicants to SMART might consider as alternatives. The results of that review are presented as background information in Section 4 and Appendix A.

B. Stakeholder Interviews

The IDA research team developed an interview protocol for each type of stakeholder. The interviews commenced with some background on the SMART process evaluation to provide perspective on the intent of the project. IDA developed a protocol for each distinct stakeholder group in order to address their particular roles, but each protocol had some questions about the full range of processes (e.g., planning, applications, awards, internships, hiring, and retention). IDA conducted 19 interviews across the Component Execution Leads (Army, Air Force, Navy, and Missile Defense Agency), the SMART Support Contractor (LMI), SF points of contacts, and the Director of the Historically Black

Colleges and Universities (HBCU) Program in the Office of the Secretary of Defense (OSD).

C. Data Analysis

Two different types of data sets were analyzed for this process evaluation. These include a broad range of data from the SMART Program and data not from the SMART Program that could be used for comparison.

1. SMART Data

The SMART Support Contractor provided extensive data based on specific IDA requests along with several spreadsheets containing data that they had compiled for the SPO. The range of data analyzed included:

- Projections for workforce needs to be addressed through SMART
- Applications across multiple cohorts
- Scholar and selection data across multiple cohorts
- Hiring and employment data across all cohorts

2. Comparative Data

In addition to the SMART Program data, IDA also analyzed national data to understand the talent pool that the SMART Program was drawing from. This national data (Integrated Postsecondary Education Data System) provided a perspective on variance across STEM disciplines, racial/ethnic categories, gender, and geographical dispersion across the United States.[6] Additionally, IDA analyzed anonymized Defense Manpower Data Center information on the DoD S&E workforce to provide an understanding of the personnel context within which the SMART Program was operating.

[6] Additional information and access to the data from the Department of Education's National Center for Education Statistics can be found at https://nces.ed.gov/ipeds.

3. SMART Program Goals

The assessment of the SMART Program requires an evaluation of programmatic achievements and metrics with respect to its strategic goals. One of the findings of SMART 1.0 was that the SMART Program goals had remained consistent through 2018 (Balakrishnan, Acheson-Field, et al. 2018; Balakrishnan, Buenconsejo, et al. 2018). However, as discussed below, there has been some evolution or expansion of those goals since then. This description of program goals, both explicitly stated in U.S. Code or DoD guidance and implicitly suggested by Program stakeholders, provides useful context on SMART Program processes and how they are conducted.

A. Sources

Statements of the program goals were derived from the following sources:

- *Science, Mathematics, and Research for Transformation (SMART) Defense Education*, Title 10, United States Code, Section 2192a, 2010.
- *Modification of Science, Mathematics, and Research for Transformation (SMART) Defense Education Program, National Defense Authorization Act (NDAA) for FY 2021*, House Resolution 6395, Section 242, 2021.
- *2021 SMART Strategic Initiatives*, Presented at STEM Advisory Committee Meeting, February 17, 2021. (SMART Program Office 2021)
- *SMART Evaluation 2.0: SPO Strategic Goals & Stakeholders*, SMART Program Office, dated August 26, 2020. (SMART Program Office 2020)
- Statements from SMART stakeholders, mentors, and managers documented in the SMART 1.0 evaluation reports (Balakrishnan, Acheson-Field, et al. 2018; Balakrishnan, Buenconsejo, et al. 2018).

B. Goal Statements

The primary, authorized goal of the SMART Program is "to provide financial assistance for education in science, mathematics, engineering, and technology skills and disciplines that, as determined by the Secretary, are critical to the national security functions of the Department of Defense and are needed in the Department of Defense workforce," as per Title 10, U.S. Code, Section 2192a. There also are goals or variations that stakeholders may have for the program. IDA derived 10 program goals from the

sources listed above, and each is summarized in Table 1 and discussed in more detail below.

Table 1. SMART Program Goals and Sources

Program Goals	Source(s)
"…provide financial assistance for education in science, mathematics, engineering, and technology skills and disciplines that, as determined by the Secretary, are critical to the national security functions of the Department of Defense and are needed in the Department of Defense workforce"	10 U.S. Code § 2192a
Foster a demographically diverse STEM community by entering partnerships with minority institutions of higher education and appropriate public and private sector organizations	NDAA 2021 2021 SMART Strategic Initiatives SMART 2.0: SPO Strategic Goals & Stakeholders
Attract and retain diverse STEM talent deemed relevant to national security needs, such as the DoD Modernization areas of study	10 U.S. Code § 2192a 2021 SMART Strategic Initiatives
Improve scholar retention beyond their service commitment	SMART Evaluation 2.0: SPO Strategic & Stakeholders 2021 SMART Strategic Initiatives Fundamental issue addressed in SMART 1.0
Improve the quality of the S&E workforce	Fundamental question posed in SMART 1.0
Promote SMART as a premier DoD program	2021 SMART Strategic Initiatives SMART 2.0: SPO Strategic Goals & Stakeholders
Engage with other DoD labs and facilities	SMART 2.0: SPO Strategic Goals & Stakeholders
Improve scholar communication and engagement	2021 SMART Strategic Initiatives SMART 2.0: SPO Strategic Goals & Stakeholders
Strengthen ties between Principal Investigators (PIs) at academic departments and scientists/engineers at DoD facilities	Identified as spillover benefit of program in SMART 1.0
Provide a reliable and consistent hiring mechanism to access personnel with specific skills	Comments from SF POCs in both SMART 1.0 and 2.0

1. Provide Education in STEM Skills and Disciplines

The first goal, taken from the original (2006) legislation for the SMART Program, lays out what the program is intended to accomplish: "…provide financial assistance for education in science, mathematics, engineering, and technology skills…" In the SMART

1.0 evaluation, this was regarded as the program's fundamental goal from which the other goals were derived.

2. Increase Demographic Diversity of S&E Workforce

From the beginning of the SMART Program, an implied objective of the program has been to increase the demographic diversity of the DoD science, technology, engineering, and mathematics (STEM) workforce in gender, race, and ethnic identity. The National Defense Authorization Act for Fiscal Year 2021 (NDAA) made this an explicit goal by requiring that the Secretary of Defense seek "…to enter into partnerships with minority institutions of higher education and appropriate public and private sector organizations to diversify the participants in the program…'' Recent SMART Program documents (*2021 SMART Strategic Initiatives* and *SMART 2.0: SPO Strategic Goals & Stakeholders*) confirmed that the SPO intends to actively reach out to the HBCU/MI institutions. The *2021 SMART Strategic Initiatives* also expressed the intent to "…increase the proportion of HBCU/MI scholars in the application, semi-finalist, and finalist stages as compared to 2018–2020."[7]

3. Address Critical National Security Needs

The original legislation stipulated that the SMART Program provide education in critical skills and disciplines, but did not specify what those skills and disciplines were. The *2021 SMART Strategic Initiatives* document provided additional guidance by identifying that those critical skills and disciplines are identified in the DoD Modernization areas of study. According to the current USD(R&E) web page on modernization priorities (https://www.cto.mil/modernization-priorities/) these areas are artificial intelligence; biotechnology; autonomy; cyber; directed energy; fully networked command, control, and communications (FNC3); microelectronics; quantum science; hypersonics; space; and 5G wireless technology.

4. Increase Retention of Scholars Beyond their Service Commitment

The SMART 1.0 evaluation provided data showing that SMART scholars leave DoD employment faster than a matched comparison group of S&E civilians who had not gone through the SMART Program. As a result, both of the recent SMART Program documents indicate the intent to improve scholar retention beyond Phase 2. In fact, the *SMART*

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[7] HBCU/MI refers to Historically Black Colleges and Universities and Minority Serving Institutions, which are institutions of higher education whose enrollment of a single minority or a combination of minorities (American Indian, Alaskan Native, Black/African American (not of Hispanic origin), Hispanic (including persons of Mexican, Puerto Rican, Cuban, and Central or South American origin), Pacific Islander, or other ethnic group underrepresented in science and engineering) exceeds 50 percent of the total enrollment (Title 20, U.S. Code, Section 1067).

Evaluation 2.0: SPO Strategic Goals & Stakeholders lists this as the "overarching goal" for the SMART 2.0 evaluation.

5. Improve the Quality of the S&E Workforce

From their interviews of SMART Program stakeholders, the SMART 1.0 evaluation team determined that a primary goal of the program was to improve the quality of the S&E workforce. And indeed, one of the primary findings from the SMART 1.0 evaluation was that the program was successful in achieving that goal: On a number of different indexes of quality, the results showed that, "…on average, the SMART scholar group was higher performing than those DoD civilian S&E workers hired through other mechanisms" (Balakrishnan, Acheson-Field, et al. 2018, iv). Interviews of SF points of contact (POCs) for the SMART 2.0 evaluation confirm that this continues to be an important goal of the program.

6. Promote SMART as a Premier DoD Program

Both program documents (*2021 SMART Strategic Initiatives* and *SMART 2.0: SPO Strategic Goals & Stakeholders*) propose to increase the visibility of the SMART Program by actively promoting it as a prestigious DoD program. The former document suggests that measures of success include the number of applications received and the number of mentions on social media. The latter document proposes specific methods for increasing visibility, including providing a storyboard near the USD(R&E) Office, disseminating scholar stories, and holding public outreach events.

7. Engage with DoD Labs and Facilities

The *SMART 2.0: SPO Strategic Goals & Stakeholders* document includes a goal for the SPO to engage with stakeholder facilities in an effort to ensure that scholars are satisfied with the SMART Program. The document includes a number of methods for promoting engagement, including holding twice yearly workshops (both virtual and in-person), providing training, disseminating best practices, and conducting roadshows.

8. Improve Scholar Communication and Engagement

Both recent statements of program objectives list improving scholar communication and engagement as a SMART Program goal. The *2021 SMART Strategic Initiatives* document indicates that this can be achieved by strengthening mentorship opportunities at the Component and SF level. The other document (*SMART 2.0: SPO Strategic Goals & Stakeholders*) also includes improvements to mentoring as a primary approach toward improving communication and engagement. In particular, this document suggests that the SMART Advisory Council study how each Component conducts mentoring in order to develop and codify a set of best practices. The second document also recommends re-

energizing the Ambassador program to increase collaboration and communication among SMART scholars.

9. Strengthen Ties between Principal Investigators (PIs) at Academic Departments and Scientists/Engineers at DoD Facilities

The SMART 1.0 evaluators interviewed academic advisors to SMART scholars to determine the relationship of the program to the institutions and individuals providing STEM education to the scholars. It was implicitly recognized that a good relationship between the academic institutions and the program was necessary to establishing and maintaining it. In SMART 1.0, this was not recognized as a formal goal, but rather a "spillover benefit" of the program. Nevertheless, the relations between academics and the SMART Program are perceived as an important ingredient to program success.

10. Provide a Reliable and Consistent Hiring Mechanism to Access Personnel with Specific Skills

In both SMART 1.0 and 2.0 assessments, SF POCs have commented that one of the most valued aspects of the program is that it has created a hiring mechanism that provides increased access to personnel with specific skill sets and educational backgrounds. Furthermore, this mechanism is reliable and consistent in that it is impervious to hiring freezes and other procedural roadblocks that plague the standard government hiring systems. Title 10, U.S. Code, Section 2192a, provides hiring authority for SFs to non-competitively hire SMART scholars, and to convert the scholar's position from an excepted service position to a career or career-conditional appointment without additional competition after 2 years of service. Some stakeholders do not regard this as a formal program goal, but rather a key enabling objective for improving the S&E workforce.

4. Comparative Overview of SMART and Similar Scholarship Programs

IDA reviewed a sampling of scholarship programs to inform this process evaluation of the SMART Program, and to provide some context to other programs that applicants may be considering in their decision to apply. The intent of this section is to provide relevant information on how the SMART Program compares to other scholarship programs from both the standpoint of a potential applicant and from a larger (e.g., Office of the Secretary of Defense or Congressional) oversight perspective. While the SMART Program may share some features with other programs, it has a unique set of characteristics that are not matched by any other program.

We identified 27 additional SFS supported by federal and non-federal organizations/funding streams. We also identified six scholarships that are not associated with a service commitment. Although the list of scholarships included here is not exhaustive, it is representative of the available programs (see Figure 2 and Appendix A). Expanding upon a previous report by IDA (Peña, Fehr, and Garbee 2016), we included programs that met the following criteria:

1. Ranged in location of required or recommended service commitment such that it could take place in a DoD facility, other federal facility, either federal or non-federal facility, or a non-federal facility;
2. Included both STEM-focused and non-STEM-focused programs;
3. Provided support for undergraduate degrees, graduate degrees, or to both (all) undergraduate and graduate degrees to include health professional degrees (e.g., dentistry, nursing, medicine, psychology).

Next, we describe those programs and then discuss why an applicant might choose the SMART Program versus other scholarship opportunities.

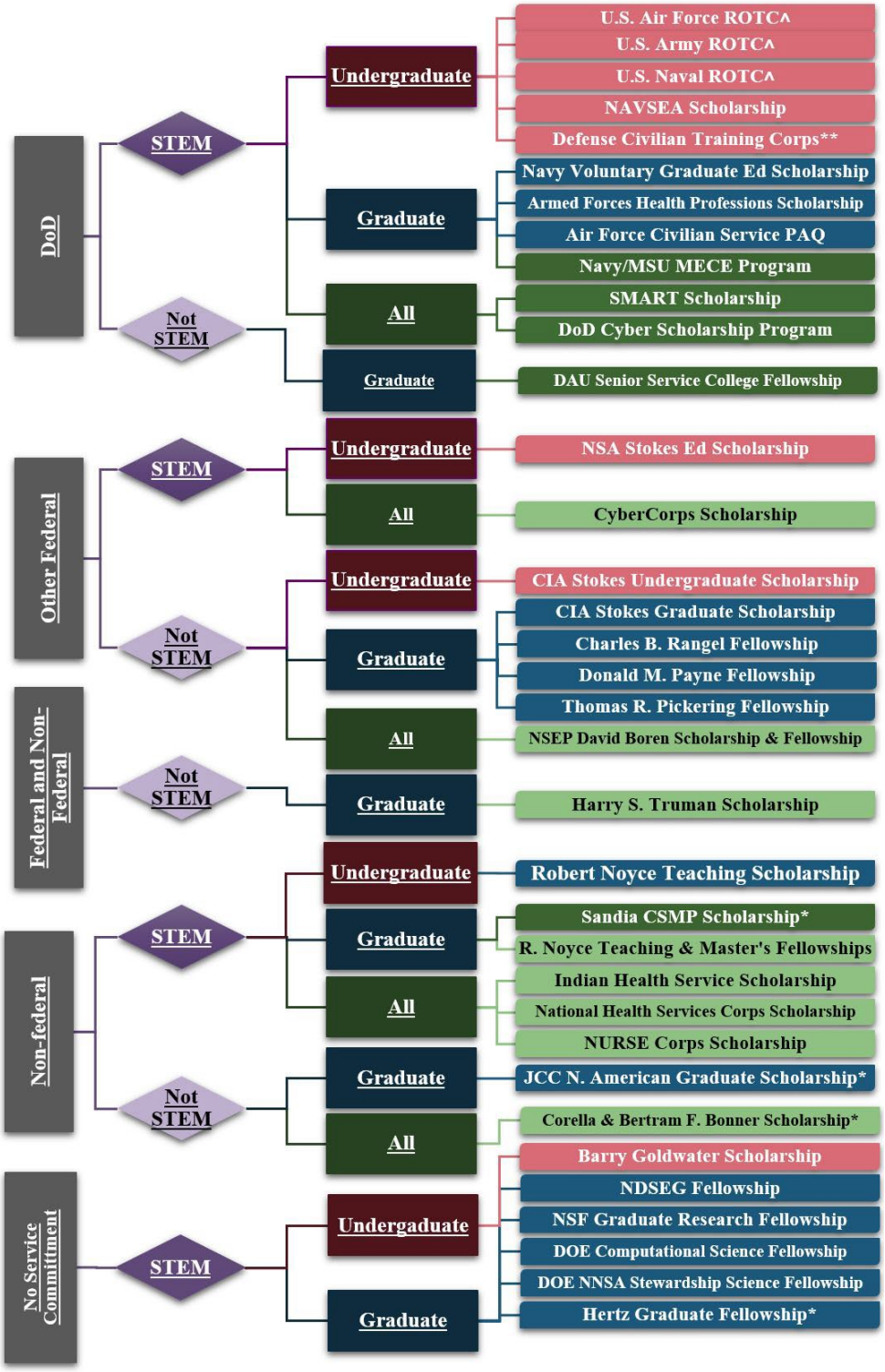

Figure 2. Select SFS Programs (unless indicated as those scholarships having no service commitment). Categorized by service commitment sector, support of STEM disciplines, degree level supported, and program name (color coded by degree level supported). Note: * Indicates non-federally funded; **Indicates that the program is currently under development; ▬ Indicates open to recruitment scholars; ^Indicates programs open to both STEM-focused and non-STEM-focused degrees.

A. Key Attributes of Scholarship Programs

We identified three basic attributes and phases of the process to manage the identified SFS programs: (1) service commitment duration and location, (2) discipline/degree focus, and (3) supported degree levels.

1. Service Commitment Duration and Location

Of the 34 scholarship programs included in this review, 27 have a required service commitment. Although the length of many of these commitments range from 1 year of service for each year of program support (1 for 1), there are a few that require a minimum of 5 years of service (Rangel, Payne, and Pickering Fellowships). Likewise, four programs require a minimum of 3 to 4 years (up to 10 years for Air Force pilots) of active duty service. In some cases (18 including the programs requiring active duty service), the program provides either a guaranteed position for the service commitment or assistance in securing said position (7 programs). Commonly, the location of the service commitment is associated with the source of funding such that programs supported by federal funds have service commitments in the DoD or other federal sectors. In the case that an award recipient is unable to obtain a DoD or federal position (e.g., recipient is unable to obtain the level of security clearance required for the position), many programs will work with the recipient to find alternative sectors/locations for completion of the service commitment.

Clearly, the programs that require active duty service commitment will take place within the DoD. There are, however, a number of other SFS awards that require the service commitment to be undertaken at a DoD facility or instillation. These 12 programs are listed in Table 2 below.

Table 2. List of Scholarship Programs with Required DoD Service Commitments

SMART
Air Force ROTC Program
Army ROTC Program
Naval ROTC Program
Navy Sea Systems Command Scholarship (NAVSEA)
Navy Voluntary Graduate Education Program (Navy VGEP)
Armed Forces Health Professions Scholarship (Armed Forces HPS)
Air Force Civilian Service Palace Acquire Program (AFCS PAQ)
Navy/Morgan State University (MSU) Masters of Engineering in Cyber Engineering (MECE) Program
DoD Cyber Scholarship Program (CySP)
Defense Acquisition University (DAU) Senior Service College Fellowship
NSA Stokes Educational Scholarship Program

A number of federal agencies and programs have awards associated with service commitments outside of the DoD. These programs and their service commitment locations are listed in Table 3. Of note, the Harry S. Truman Scholarship is the only award in the current review that requires awardees to complete their service commitment in a public service position either in the nonprofit/advocacy sector or federal government. Because the location of the service commitment is open to the awardee, the program is not listed in Table 3.

Table 3. List of Scholarship Programs with Required Federal (non-DoD) Service Commitments

Award	Service Area
CyberCorps Scholarship for Service	U.S. Government cybersecurity position
CIA Stokes Undergraduate Scholarship	Central Intelligence Agency (CIA)
CIA Stokes Graduate Scholarship	Central Intelligence Agency (CIA)
Charles B. Rangel Fellowship	State Department Foreign Service
Donald M. Payne Fellowship	U.S. Agency for International Development (USAID) Foreign Service
Thomas R. Pickering Fellowship	State Department and U.S. Consulate/Embassy (overseas)
National Security Education Program – David L. Boren Scholarship	Unspecified Federal employment

Finally, a number of the reviewed SFS programs have awards where the service commitment is to take place in non-federal locations. Although these programs may seem to allow more flexibility in terms of location (e.g., geographic, organizational) for the service commitment, some do have specific restrictions on location (e.g., Indian Health Service Scholarship requires the service commitment be at an Indian health facility). These programs are listed in Table 4.

Table 4. List of Scholarship Programs with Required Non-Federal Service Commitments

Robert Noyce Teaching Fellowship
Robert Noyce Teacher Scholarship and Master Scholarship Programs
Sandia National Laboratory Critical Skills Recruiting Master's Program (CSMP)
Indian Health Service Scholarship
National Health Services Corps (NHCS) Scholarship
NURSE Corps Scholarship
The Jewish Community Center (JCC) North American Graduate Scholarship
The Corella & Bertram F. Bonner Scholarship

2. Discipline/Degree Focus

Similar to the SMART Program's support to students pursuing degrees in a variety of STEM fields,[8] many of the programs reviewed in this paper also support STEM-focused degree pursuit. We include a handful of programs that support non-STEM degrees as a comparison (see Figure 2). A majority of the programs with DoD or federal service commitment locations in this review support STEM-focused degrees. Additionally, the six programs without service requirements also support STEM-focused degrees.

It is important to note that although we categorize programs as STEM (or not-STEM) focused, this does not necessarily indicate that the programs are open to all STEM disciplines. Many of the programs support degrees in very specific fields and, at times, the discipline is tied to a given degree level (e.g., dentistry). Table 5 lists the programs that are open to all STEM disciplines, specific STEM disciplines, and professional health (STEM-based) disciplines. Note that although the ROTC programs are listed as STEM-specific degrees, ROTC supports all degrees. However, there is an emphasis on STEM-focused degrees in some Services (e.g., Naval ROTC) more than others.

Table 5. List of STEM-focused Scholarships

All STEM	Specific STEM	Health-focused STEM
SMART	AFCS PAQ	Armed Forces (HPS)
Air Force ROTC	Navy/MSU MECE Program	Indian Health Service Scholarship
Army ROTC	DoD CySP	NHSC Scholarship
Naval ROTC	NSA Stokes Scholarship	NURSE Corps Scholarship
NAVSEA Scholarship	CyberCorps	
Navy VGEP	R. Noyce Teaching Fellowship	
NDSEG	Sandia CSMP Scholarship	
Barry Goldwater Scholarship	R. Noyce Teacher & Master's Scholarship	
NSF Graduate Research Fellowship	DOE Computational Science Fellowship	
Hertz Graduate Fellowship	DOE NNSA Steward Science Fellowship	

[8] For the SMART Program, the STEM disciplines include: aeronautical and astronautical engineering; biosciences; biomedical engineering; chemical engineering; chemistry; civil engineering; cognitive, neural, and behavioral sciences; computer and computational sciences and computer engineering; electrical engineering; environmental sciences; geosciences; industrial and systems engineering; information sciences; materials science and engineering; mathematics; mechanical engineering; naval architecture and ocean engineering; nuclear engineering; oceanography; operations research; physics.

3. Supported Degree Levels

As mentioned previously, the listed programs offer scholarships across a range of degrees, with some supporting only specific degree levels (undergraduate, graduate [master's or doctoral], or professional/technical [medicine, dentistry, nursing]) while others are more flexible and support both undergraduate and graduate degrees or graduate and professional degrees. As far as we can tell, none of the programs in this review support postdoctoral fellowships.

Most of the SFS programs reviewed here are considered to be recruitment scholarships in that the programs have been created to attract new employees (recruitment scholars) into the supporting organizations sector or more directly, into its workforce. Five of the reviewed programs are open to recruitment scholars *and* offer opportunities for current members of the workforce to pursue graduate degrees or knowledge, skills, and abilities (known as retention scholarships). Of the retention scholarships, two (Navy/MSU MECE Program and Sandia CSMP Scholarship) employ scholars to spend a few months acclimating to the organization before they enter graduate school to pursuit their degrees on a full-time status. The other three retention scholarships (SMART, DoD CySP, and DAU Senior Service College Fellowship) are open to current DoD employees for pursuit of advanced degrees.

B. Why Make the SMART Choice?

This review highlights only a handful of potential scholarship programs available to students. But how does the SMART Program compare to its peer programs in terms of program attributes? What other programs might attract potential applicants? And what other programs might Components/agencies utilize other than the SMART Program?

First and foremost, the SMART Program is one of the few programs open to current employees (retention scholars). In fact, the only other award within the DoD that supports STEM-focused graduate degree pursuit by retention scholars is the DoD CySP. This latter program, however, is fairly restrictive in terms of approved degree disciplines (only cybersecurity) and universities that the scholars can enroll in (only universities designated as a National Center of Academic Excellence in Cybersecurity) while the SMART Program is open to a broader set of STEM disciplines and universities. It should be noted that there are some localized, tuition-reimbursement-type programs that exist, but none as comprehensive and flexible as the SMART Program.

In terms of recruitment scholars, there are a number of factors that highlight the uniqueness of the SMART Program in comparison to the other programs we reviewed. Assuming that a potential applicant or oversight organization is interested in programs supporting STEM degrees, Figure 3 identifies a number of potential decision points (i.e., sequential tables from the bottom left to the top right) that might arise: (1) funding source;

(2) service commitment sector; (3) discipline support; (4) flexibility in location of matriculation; (5) whether the award provides a position in the workforce for the scholar after degree completion; and finally (6) the length of the service commitment. Note that the order of these decision points is hypothetical and any potential scholar may use a different ordering in the factors they use to make a decision or even some other factors not listed here. As one moves from one decision point to the next, programs that possess key attributes at each point filter out with each step.

As described in the previous section, a majority of the programs reviewed here are federally funded. Table A in Figure 3 illustrates a sample of programs supported by federal and non-federal funding. This table includes both scholarships with and without service commitments. From here, a potential applicant may be interested in service commitment sectors, possibly with a focus on those that support the DoD, which are listed in the next successive table (Table B). Notice that at this point, the SMART Program fits the categories of federally funded and providing direct support to the DoD via the required service commitment.

Again, as shown previously, there are a number of programs that support the DoD via service commitments, which necessitates that the programs work closely with the DoD to identify current and future workforce needs. Once the decision has been made to focus on DoD-supporting programs, another factor that distinguishes scholarship programs at this point is whether the program supports degree pursuit for scholars interested in a wide range of STEM-focused disciplines or if the program is selective of only specific STEM disciplines. The programs to consider during this decision point are listed in Table C of Figure 3. Although a number of the federally funded programs that support the DoD service area is relatively lengthy, when the focus of the support (STEM or domain-specific within STEM), the number of applicable programs drops considerably.

After deciding to focus on STEM-wide programs, another decision point that may be of interest to a potential scholar could be to awards that support matriculation at any university or are limited to specific universities. Programs that address this decision point are highlighted in Table D of Figure 3. At this point, the scholar has decided to apply to federally funded programs that support the DoD service area as well as allow the scholar to pursue a degree in a wide range of STEM disciplines and does not limit the scholar to attend a specific university for their degree. The next critical decision point is whether the award is associated with a guaranteed position within the DoD civilian workforce after degree completion (see Table E in Figure 3). This decision is based on the knowledge that the programs that support the DoD workforce also provide scholars with security clearances, as applicable, which is considered a significant benefit.

Finally, in the sequence of decision points shown in this example, the length of the service commitment is compared, with the SMART Program having a 1:1 ratio of scholarship to service commitment. In contrast, for example, the Air Force Civilian

Service's PALACE Acquire program has a 1:3 ratio, meaning that for every year of the scholarship a participant has a continuing service commitment of 3 years. In this hypothetical sequence of decision points, the SMART Program is the remaining program offering a unique set of features compared to its peer programs in terms of program attributes and attractiveness to potential scholars in terms of key program requirements and benefits. The SMART Program also offers DoD Components and agencies a unique opportunity to support the DoD workforce by not only attracting potential scholars (who later become DoD employees) with a reasonable scholarship to service commitment, but by also allowing scholars to attend the university or college of their choice. Additionally, the SMART Program's support of a wide-range of STEM disciplines means that they can address the DoD's workforce needs from a much broader and diverse approach than a domain-specific program can.

To summarize, compared to other STEM scholarship programs, the SMART Program is the only one to provide *all* of the following features:

- Scholarship funded by the federal government,
- Commitment to DoD service sector,
- Support for a wide range of STEM disciplines,
- Choice of university or college,
- Guaranteed position in DoD workforce upon graduation, and
- Favorable obligation ratio of 1 year of service for every year of education support.

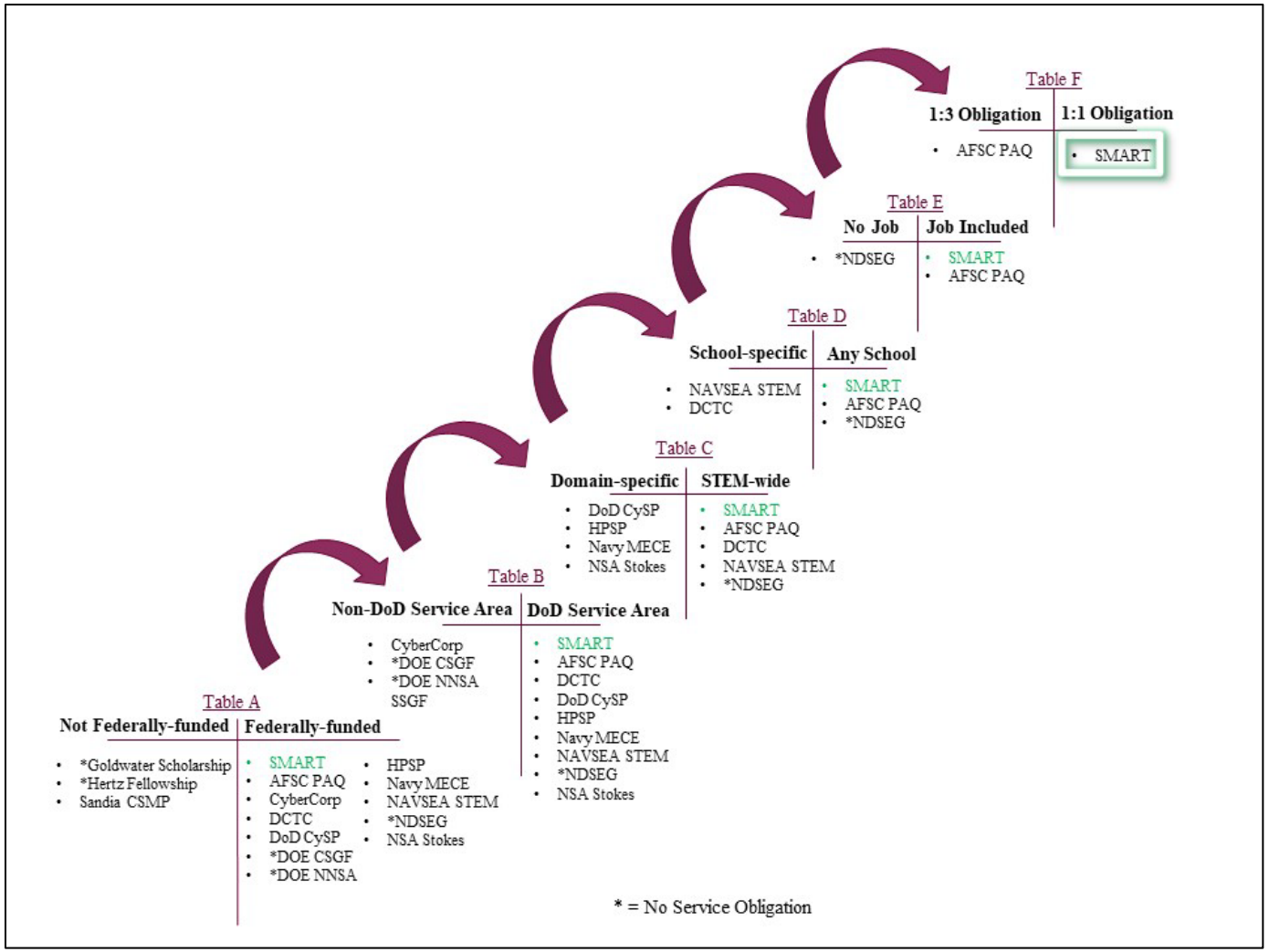

Figure 3. Key decision points regarding STEM-focused scholarship programs. Note that the programs listed in each table are ordered left-to-right based on a hypothetical sequence of decision points that might eliminate some of the 'other' programs as they are compared to the SMART Program along particular deciding features.

5. Process Findings

The process findings are presented in six sections: a) planning and preparing, b) applications to awards, c) degree pursuit, d) service commitment, e) post-service commitment, and f) ongoing activities that occur across stages. At the end of each section, the IDA team offers some options to consider to address some of the findings. Each of the first five sections includes a logic model to show within a particular stage. The logic model includes the inputs and resources that support the set of processes, the activities, and the potential outputs, outcomes, and impacts of those activities.

A. Planning and Preparing

While many processes occur concurrently during the calendar year and may influence different SMART Program phases, functionally the first stage (i.e., set of processes) involves planning and preparing for subsequent activities. In this stage, the SMART Program conducts workforce planning and preparation required for outreach to inform the next cohort of scholars who may apply to the program. The logic model displayed in Figure 4, shows that the DoD and the SPO set general strategic goals for the program, determine the expected personnel needs that the SMART Program may contribute to the DoD, and conduct outreach to engage with potential applicants to meet those needs. Generally speaking, the SMART Program planning process maps to the Office of Personnel Management's (OPM) workforce planning model in that the SPO and SFs engage in both operational planning (e.g., addressing current talent needs) and strategic planning (e.g., forecast future needs) based on the facilities' workforce objectives. The SFs identify their workforce needs and communicate them through the Component Liaisons (CL),[9] and those needs are then aggregated by the SMART Support Contractor. These workforce projections are used during the selection process and subsequently inform outreach during the following year. Some of the outreach may specifically target particular schools, demographics, and disciplines, while other outreach efforts may be more general in nature. Basically, the SFs that use the SMART Program regard it as integral to building their overall S&E workforce, but it is only one of several mechanisms they have for addressing workforce needs.

[9] Component Liaisons are members of the SMART Support Contractor team, who are the main point of contact (POC) between the SMART Program, sponsoring components, and SFs.

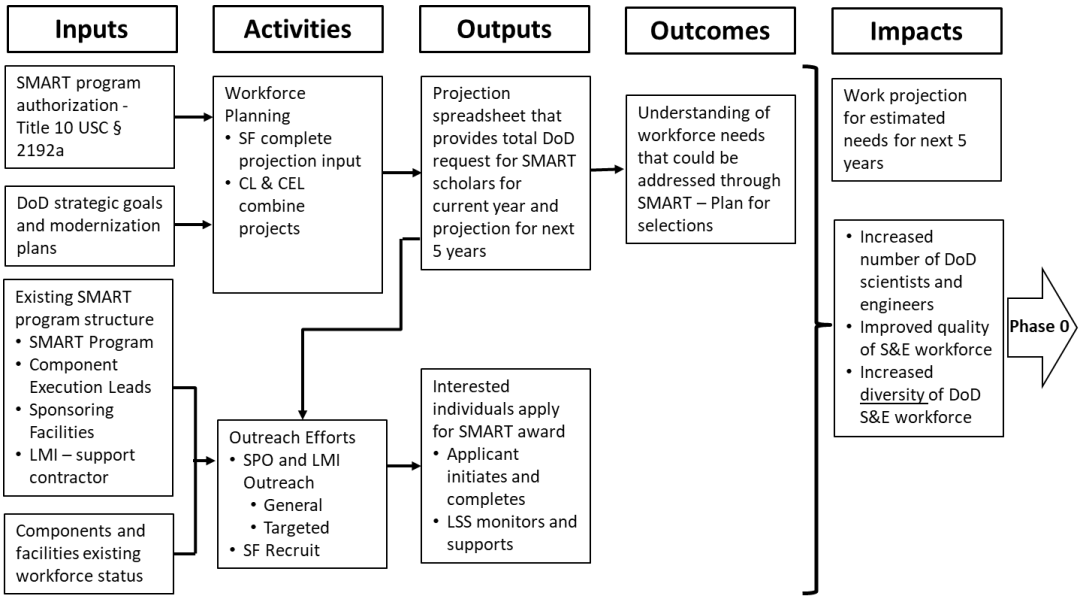

Figure 4. Logic Model of the Workforce Planning and Preparing Processes

1. SMART Workforce Planning

Each year, the development of needs (i.e., workforce planning) for the SPO starts with the Support Contractor working with the Component Execution Leads[10] and the SF to complete the projection spreadsheets by listing the number of SMART Scholars they might need for the upcoming cohort year including the disciplines (i.e., one of the 21 SMART categories of college majors), degree levels, and the link between the request and the DoD's Modernization Priorities. There is also a request for a longer-term projection to indicate the types of workforce needs in the subsequent 5 years. In 2021, the SPO simplified the workforce planning approach by asking SFs to reply to three questions:

- What range of scholar selections do you plan to make for 2022?
- Are these projections greater than, less than, or equal to your 2021 selections?
- What STEM disciplines, degree levels, and DoD modernization areas are you projecting to select?

The Component Execution Leads combine all of the projection spreadsheets from their Service and provide the SMART Support Contractor and SPO with one master-service projection. The expectation is that the SFs will ask for the upper bound of what they may need. After the information is consolidated by component and the information is

[10] Component Execution Leads are the office in each Service or Fourth Estate agency that oversees the use of SMART within the particular Component (Service or Fourth Estate agency). They are authorized to determine which SFs might participate in the SMART Program, coordinate efforts within a Component, approve service agreement amendments, and determine process for debt collection for scholars in their Components that fail to satisfy their commitment.

collected from the Fourth Estate agencies, it is then totaled to provide an estimate of the types of applicants being sought. The primary functional purpose of this projection is to help determine the number/percent of applicants that may be placed in the selection portal pool to ensure that there are enough applicants to select from but to not overwhelm the SFs who have to interview and review the applicants they may be interested in selecting.

Depending on the Component, SMART Program stakeholders (Component Execution Leads, Fourth Estate Component Liaison, SF points of contact, and SF S&E managers) have varying involvement in workforce planning for the SMART scholar selection process. Additionally, each Component decides if the S&E managers (considered bottom-up) or if the Component Execution Leads (top-down) drive workforce planning. Regardless of the workforce planning approach, each participating SF identifies their SMART scholar needs by evaluating their core competencies, diversity needs, DoD and Component Modernization Priorities, and anticipated changes (e.g., retirements, areas with retention concerns) in their current workforce to determine their workforce needs.

2. Comparison to OPM Workforce Planning Process

OPM has developed a general workforce planning process for U.S. Government agencies. This process occurs at two levels: *operational* planning to ensure that the present supply of talent meets current needs versus *strategic* planning to forecast future, longer-term needs based on the organization's strategic objectives. Both types of workforce planning apply to the SMART Program in that projections are made for the upcoming selection cycle as well as projecting needs 5 years in the future.

a. Operational Planning

Operational planning is primarily concerned with comparing current and near-term personnel needs (demand) with available resources (supply) and identifying/mitigating potential gaps. At the operational level, demand is based on the current needs of the SMART Program's Components and SFs. Note that these needs are only those expected to be filled by the SMART Program and are not the SFs' total personnel requirements. Thus, Components typically use a bottom-up process where the SFs are primarily responsible for determining demand. On occasion, the Component Execution Lead, with support from their Component Liaison, may adjust a given SF's projection list in order to give the SF an opportunity to realign their administration of scholars currently at the SF before adding to their future workforce needs list. (For the facilities in the Fourth Estate there is no clear higher-level review of the projection lists, except by the SMART Program Office.)

The SPO can exert limited control of the current supply of applicants because the supply is based on those already attending degree-granting programs in the needed disciplines. This supply of degree-seeking individuals is based on national trends. However, if the supply of applicants in a given year lags the operational demand for certain

disciplines, the SPO can increase the supply for the current year by expanding the proportion of applicants who pass from the first to the second round of the selection process (normally at approximately 50% of applicants). For future years, additional outreach could be conducted in targeted areas where the supply in applications was low as compared to the need identified by the sponsoring facility requests.

b. Strategic Planning

Strategic planning for the DoD S&E workforce that the SMART Program may augment is a Department-wide activity, which is beyond the scope of this program evaluation. This includes identifying the workforce needed to address the National Defense Strategy along with supporting strategic documents on modernization, Component-specific planning, and ongoing workforce analysis.

Within the context of the SMART Program, strategic workforce planning is performed by the SPO with input from the Components and SFs. The SPO must determine the extent to which the program is producing the mix of STEM skills and demographic characteristics that are consistent with the program's goals and objectives. If not, the program needs to develop a plan to mitigate those inconsistencies. For instance, the SPO could develop a new outreach plan that targets needed skill disciplines or underrepresented demographic groups. Such a plan would be systematically implemented and the outcomes closely monitored to determine whether the plan should be modified.

3. Projected Need Compared to Applications and Awards

The workforce needs identified through the projection spreadsheets during the workforce planning stage are used in the application review process to help reduce the number that need to be reviewed by the SFs. During a data collection interview with IDA, the SMART Support Contractor indicated that when there are a large number of applicants in a particular discipline, only the top ranked applicants (twice the number of the projected need for a discipline) based on the initial review will be forwarded for SF second round review. The SPO re-examined how applications were selected to move onto the second round review in order to ensure that the potential scholar pool was meeting the workforce needs of the SFs. For example, the SPO determined that the workforce projections were not a good indicator for which applications are selected both to move forward and to receive an award. As such, the process for identifying semi-finalists (i.e., applications that make it to the second round review) began with a broad call for workforce projections in order to identify the greatest need by discipline. This information was combined with the number of applications received in a given STEM discipline, the number of facilities in need of expertise in that field, historical trends regarding scholar selection in the STEM discipline, and the anticipated cohort size (which is dependent on the program budget). If

there are not a lot of applications for a particular discipline, then all applications may be placed in the portal for SF review.

There appears to be significant variability across disciplines in the number of applications versus the projected need, and there is also considerable variability in the number of high quality (i.e., those ranked at an 80 or higher by the initial review panels), as shown in Table 6. The table captures the flow of the application to selection process for each STEM discipline. This process is preceded by the initial projections from the SFs, letting SPO know about workforce needs (i.e., demand, as used in the context of 'supply and demand'). As a response to this demand signal, the table shows the applications completed, the number of these completed applications that were given high scores (80 or greater), and ultimately the number of offers extended.

Table 6. Projections to Awards (2020 Application Cycle)

Discipline	Projected	Completed Applications	High Quality	Offered
Aeronautical and Astronautical Engineering	49	242	119	40
Biomedical Engineering	8	127	40	4
Biosciences	1	164	84	6
Chemical Engineering	5	85	33	6
Chemistry	17	100	54	4
Civil Engineering	41	106	53	25
Cognitive, Neural, and Behavioral Sciences	12	52	23	4
Computer Sciences and Computer Engineering	204	494	260	147
Electrical Engineering	209	186	85	106
Environmental Sciences	10	30	12	7
Geosciences	6	40	27	13
Industrial and Systems Engineering	33	37	27	17
Information Sciences	41	46	34	21
Materials Science and Engineering	23	74	57	14
Mathematics	35	101	45	27
Mechanical Engineering	98	380	190	82
Naval Architecture and Ocean Engineering	9	17	4	9
Nuclear Engineering	4	10	6	0
Oceanography	9	12	10	4
Operations Research	34	3	3	3
Physics	26	95	45	14
Total	**874**	**2401**	**1211**	**553**

Using a supply and demand rubric, there are a few patterns for how the projected need (i.e., demand) is supported with enough quality applications (i.e., supply) for subsequent awards. For example, some disciplines have more applications than the projected need and more are rated as high quality than the number of awards, such as computer science, aeronautical/astronautical engineering, civil engineering, mechanical engineering, and physics. This pattern suggests a healthy situation where there was a sufficient supply of high-quality applicants to satisfy a considerable percentage of the projected need. A second pattern is where the there are fewer quality applications than the projected need, such as with electrical engineering and operations research. In this second pattern, there are not enough quality applications (supply) to satisfy the projected need (demand), so there is a potential that a SF will compromise quality to meet the need. This might indicate that additional outreach should be conducted in those particular disciplines to provide an adequate supply in subsequent years.

When SFs are planning to address their workforce needs, it is usually with specific occupations or positions in mind. Alternatively, the SFs may utilize academic disciplinary expertise as a guide for their workforce planning needs. Our analyses indicate, however, that the degrees and the occupations that SMART graduates obtain are not always a clear match (see details provided in Table A in Appendix B).

There is a strong connection between disciplines and occupations, in that many people who get a particular degree frequently take a position with a similar name (e.g., mechanical engineering graduates becoming mechanical engineers, chemistry degree holders become chemists). However, there is not always a clear one-to-one correlation between academic disciplines and occupations. Of the 2,291 scholars who were hired into DoD positions after graduating, the top three degrees those scholars obtained were electrical engineering (513 graduates), mechanical engineering (415 graduates), and computer science (351 graduates). For electrical engineering degree recipients, 55% went into electrical engineer positions, 20% general engineer positions, and 3% went into computer scientist or computer engineer positions (note: there were some scholars where no occupation title was listed or unclear how it could be categorized). For mechanical engineering graduates, 52% went into mechanical engineer positions, 23% went into general engineer positions, and 5% went into aerospace engineer positions. For computer science graduates, 46% went into computer scientist positions, 10% into general scientist positions, and 6% into electrical engineer positions. A more extreme mismatch occurs in mathematics degree holders, where 40% went into operations researcher positions, 23% went into general scientist positions, and only 11% went into mathematician positions. An alternative perspective is looking at which disciplines are most likely to be tapped to address particular positions (see details in Table B in Appendix B where we list the top three disciplines for each job category filled by SMART scholars).

4. SMART Outreach

The SPO is responsible for the oversight of outreach efforts in regards to the submission of high-quality completed applications and award acceptances by scholars. The projected needs of the SF inform the outreach strategy for each year. Two types of outreach processes are relevant to the SMART Program. First, there is the process of increasing the number of applications by undergraduate and graduate students, conducted by the SPO. Second is the process of recruiting students into the government STEM workforce conducted by the SFs. Although this second process is not under the control of the SMART Program, it is relevant because most SFs regard the SMART Program as a part of their overall program for recruiting S&E workers. In addition, recruitment of retention scholars is largely left up to the SFs. Hence, we discuss the SPO and SF processes separately below.

5. Outreach Conducted by the SMART Program Office

Outreach is a central process for the SMART Program in that it addresses a number of explicit and implicit program objectives. These objectives are described below, along with a discussion of how the SMART Program processes are used to meet those objectives. Note that an assessment of how these objectives are being met or how best to assess them in the future will be included in the subsequent Outcome Report.

a. Improve Quality of DoD S&E Workforce

One of the central goals of the SMART Program is to improve the quality of the S&E workforce by attracting high-quality STEM talent into the DoD laboratories and facilities. Outreach is tied directly to workforce planning, which, as described earlier in this section, utilizes both operational and strategic planning. Some SFs report that they leverage different scholarship programs to fill their workforce needs. For example, they analyze where (i.e., what discipline, job category) they have retention issues and use the SMART Program to fill those positions. By doing so, these SFs report that they are able to attract and hire very qualified STEM professionals for niche areas. In fact, one SF reported to IDA that their hiring managers are so happy with the quality of scholars drawn in by the SMART Program that they are more apt to review resumes and select potential new hires from the SMART candidate pool than from resumes collected at other recruitment efforts like conferences.

b. Promote SMART as a Premier DoD Program

Another goal of the SMART Program is to increase visibility of the program to position it as the scholarship of choice in the minds of target audiences. The SPO has worked with its Support Contractor to develop both specific outreach plans and strategies and outreach products (e.g., printed material, webinars, social media campaigns) in order to meet this goal. The Support Contractor outreach team provided the SPO with a detailed report of their 2019 and 2020 outreach efforts and subsequent changes to the rates of both started and completed applications. One of the main thrusts of the 2019 and 2020 outreach efforts was to increase program awareness and application submissions. The focus to promote awareness of the program is supported by the ways in which applicants report hearing about the program. For example, in 2020, the top six ways in which an applicant reported learning about the SMART Program included: internet searches, SMART website, social media, university personnel (e.g., faculty, staff, financial aid counselor), conference exhibits, and though parents or friends (LMI 2021).

Through interviews with stakeholders, IDA learned that the Support Contractor's outreach team organizes events throughout the year. However, the efforts are more concentrated during application season (August through November). These efforts include attending career fairs, professional society conferences, meetings focused on specific

STEM disciplines or research areas, as well as social media and targeted email campaigns. To support outreach efforts, there are a few members of the support contract office (e.g., Scholar Coordinator and Component Liaisons), as well as the SMART Program POC from select SFs who often join the outreach team during outreach events. The goal of these efforts is to promote direct contact with academic institutions, departments, and individuals by engaging with broader university communities; create associations with education and professional societies; increase online presence; and create and leverage alumni networks.

Outside of their work for the SPO, the Support Contractor shared (during stakeholder interviews) that they had conducted an analysis of rates of the propensity to serve[11] across the United States. They reported that they are exploring ways in which the propensity to serve can inform outreach efforts. Focusing outreach efforts in areas where there is a greater propensity to serve within the young adult population (i.e., soon entering college or actively pursuing a degree) might seem ideal, as the potential scholars in these areas may already be familiar with various SFs and their missions. On the other hand, there may be some benefits to focusing outreach in areas where fewer people may be familiar with the DoD or SFs' missions. For example, in order to expand the reach to populations that are not regularly linked with DoD research (e.g., universities without significant DoD research grants, cities where there are many students but few DoD labs/facilities so the DoD is not normally thought of as a common employer).

1) Promote Direct Contact with Academic Institutions, Departments, and Individuals by Engaging with Broader University Communities

Prior to the COVID-19 pandemic, the Support Contractor held outreach events at universities with strong STEM programs near conferences. In doing so, the Contract Support office aimed at reaching both potential scholars and faculty/staff at the university as well as building "durable" relationships with faculty and administrators who may be able to support students in applying to the SMART Program. For example, the Support Contract outreach team visited 19 universities in 2018 and 40 universities in 2019, of which 24 visits were in conjunction with conference locations. The Support Contractor reported that applications were submitted by students from 39 of 40 schools they visited, which suggests that they were able to achieve their intent of increasing awareness of the SMART Program and number of applications received. They also note that these universities "did not have SMART presence during the 2018 outreach season and produced a significantly lower number of applications in the previous years (LMI 2020, 14). As such, between 2018

[11] "Propensity to serve" is typically associated with the military in that the measure is used to indicate an individual's interest (e.g., attitudes towards the military, future career plans include military service) in military service and not the likelihood that the individual will enlist (Woodruff, Kelly, and Segal 2006). The increased desire or openness to serve (i.e., propensity) can be expanded beyond military service to include a general desire to serve in support of the greater good.

and 2019 they report a 167% increase in started applications and 140% increase in completed applications for students from campuses where the Support Contractor held in-person or virtual events to publicize the SMART Program.

Another strategy used by the Support Contractor outreach team to connect with academic institutions was to employ a geographically targeted "college tour" to incubate the benefits of SMART Program participation to potential scholars by meeting with deans and faculty at select universities. One such effort was the "Southeast College Tour" of 2019. The purpose of the tour was to visit universities with strong STEM programs and to engage with more diverse schools in the southeastern United States.[12] Again, the outreach team reported an increase of 144% of started and 138% completed applications between the 2018 and 2019 application seasons from these universities.

2) Increase Online Presence

The Support Contractor outreach team has regularly used social media as a tool to reach STEM students across the United States. Because the general age range for SMART Program applicants is between 18 and 24 years of age, many of who are active on social media, the team focused on developing compelling and strategic content, strategic messaging, and collaborating with partners to increase virtual followers in their 2019 efforts. Through these initiatives, the outreach team has seen significant increases in the SMART Program's online following on all major social media platforms (e.g., Twitter, Facebook, LinkedIn, Instagram, and YouTube).

As mentioned earlier, one of the primary ways that applicants hear about the SMART Program is through the SMART website. Although a 2019 analysis by the Support Contractor shows that more than one-half of SMART's website traffic was a result of directly navigating to the site or through an organic search, a good number (16%) of visits were due to clicking on the website link through emails. One successful approach is the promotion of the SMART Program through Scholarship America's email blast, which, in 2020, was sent to more than 90,000 contacts. The outreach team discovered that of the multiple emails sent by Scholarship America to its listserv, the first email regarding the SMART Program led to a spike in started applications in 2020 (LMI 2020; LMI 2021).

The Support Contractor outreach team noted that their 2020 advertising goals included attracting the highest quality of perspective applicants, increasing engagement among stakeholder groups, and increasing brand recognition and awareness among target

[12] The Southeast College Tour included: North Carolina State (Raleigh), Duke University, University of North Carolina (Chapel Hill), North Carolina A&T State University, University of North Carolina (Charlotte), Clemson University, University of Georgia, Georgia Tech, Clark Atlanta University, Auburn University, University of Alabama (Birmingham), University of Alabama (Huntsville), Sewanee – University of the South, Vanderbilt, Tennessee State University.

audiences. Their strategy to achieve these goals was to focus on increasing a following on social media platforms, drive webinar audiences, and drive SMART website traffic. These efforts seem to have paid off as they reported a large boost in the number of impressions, video views, and support of applications. This was particularly true for started applications for minority candidates. For example, 14% of Black/African American students who submitted an application reported hearing about the SMART Program through a National Society of Black Engineers email blast. Likewise, 4.7% of Hispanic or Latinx students submitting applications reported learning about the program through digital and print ads in the *Hispanic Network* magazine (LMI 2021).

Other efforts include webinars that air in real-time and are posted to YouTube, making the information easily accessible to potential applicants and social media. These posts highlight star scholars and the work that they are doing with the goal that potential scholars will identify with the featured scholar and apply to the SMART Program. The Support Contractor is planning to send out press releases announcing SMART Program awardees that can be shared widely on the SMART Program website, through social media, and with universities as another way to increase applications.

3) Create Associations with Educational and Professional Societies

Because of the ongoing COVID-19 pandemic, the outreach team modified their efforts to reach potential applicants via virtual engagements while still adhering to their outreach action plan for the year. The outreach team participated in sponsor exhibitions at 8 virtual conferences to increase diversity in the SMART Program;[13] hosted 4 webinars and joined 2 additional webinars with partner organizations;[14] provided support to SMART Program Ambassadors (see below) who held 13 events; and made visits to 8 universities (in-person Texas tour, remaining virtual), 3 high schools, and one STEM center. Per their analysis, the conference presentation and webinar efforts lead to engagement with individuals from 252 different universities (where the majority of individuals were students). The webinars had a significant impact on rates of submitted applications. In particular, 42.7% of participants in the "Let's Hit Submit" webinar submitted an application (LMI 2021).

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[13] These conferences included the National Society of Black Engineers, National Association for College Admission Counseling, Hispanic Engineer National Achievement Awards Cooperation Great Minds in STEM, Women of Color in STEM, American Indian Science and Engineering Society, Society for the Advancement of Chicanos/Hispanic and Native Americans in Science, Society of Hispanic Professional Engineers, and Society of Women Engineers.

[14] These partner organizations were the Army Educational Outreach Program (AEOP) and the Defense Threat Reduction Agency (DTRA).

4) Create and Leverage Alumni Networks

Another key effort that the Support Contractor's outreach team was involved in during 2020 is the update to the SMART Ambassadors Program. The program, which began in 2019, was recommended by IDA in its 2018 SMART 1.0 Process Evaluation Report as a way to implement a widely recognized outreach mechanism to attract quality future workforce to the DoD. The Ambassadors are SMART scholars who can join outreach efforts on campus and serve as a source of information for potential applicants. The Ambassadors also serve as a way to build a campus presence and increase awareness about the SMART Program (i.e., using word-of-mouth marketing by current scholars) (Balakrishnan, Buenconsejo, et al. 2018). The Support Contractor's office worked with the SPO to modify the Ambassador's program by making the resources more streamlined, creating a broader community of Ambassadors, and creating a network of SMART scholars. They also linked the program priorities to the Fiscal Year (FY) 2016–20 DoD STEM Strategic Goals. The Support Contractor team identified four objectives for the Ambassador Program:

- Creating a community among SMART scholars and potential applicants through networking and fostering a collaborative environment
- Increasing the number of qualified applicants in order to increase the potential talent pool for the DoD (in line with Goal 3 of the DoD's STEM strategic plan)
- Increasing applicant diversity which will also increase diversity of the SMART Program and DoD talent pool
- Enhance visibility to increase awareness of the SMART Program, particularly in target markets

The redesign of the program in 2020 reduced the number of Ambassadors from 40 to 24, allowing the Support Contractor to build relationships with each Ambassador and solicit feedback and lessons learned from the pilot year to plan for additional program improvements in future years. The Support Contractor also developed a toolkit for Ambassadors that contains ideas, presentations, and other items to increase communication by and with Ambassadors by all stakeholders (from potential scholars to the Support Contractor). In 2020, the Ambassadors represented the SMART Program through email and one-on-one communication with potential and current scholars, participating in larger information sessions or speaking to their classes, and participating in social media videos (LMI 2021).

6. Recruitment Conducted by the Sponsoring Facilities

a. SMART as a Component of the Sponsoring Facility Recruiting Process

It is generally recognized that passively recruiting STEM workers through the USAJobs board is not effective, and S&E agencies must actively recruit people into their workforce (Brykcznski, Flattau, and Nek 2013; Neal 2019). And indeed, as per stakeholder interviews it seems that a regular practice is for the SFs to conduct their own active recruitment programs that focus on local colleges and universities. In addition to the SMART Program hiring authority, there are several other direct hiring authorities that SFs can use to facilitate the hiring process. These authorities permit SFs to expedite the hiring process by removing veterans' preference, rating, and ranking, as well as the typical selection procedures. SFs also have a number of DoD and Service scholarships and internships, other than SMART, that they can use to attract students before graduation.

In this context, SMART can be viewed as part of the SF recruiting process. Although SMART may provide only a portion of the SF's S&E workforce, it provides some unique advantages for SF recruiters. First, it expands access to those with advanced degrees (Masters and PhDs). Second, it provides the opportunity to hire S&E workers from universities outside of the SF's local contacts in that the program has a national reach. Third, it allows recruitment of candidates with niche skills and capabilities not covered by the current hiring authorities. Between 2017 and 2020, the DoD hired a total of 8,363 educated, early career S&E personnel. Of those hired, 685, or 8.2% were SMART scholars entering into Phase 2 of their commitment.

b. Sponsoring Facilities as Recruiters for the SMART Program

In addition to being recipients of the SMART Program, SFs are allowed, and even encouraged, to advertise and actively engage in outreach for the SMART Program, with support from the SPO. The Human Resources Officers at some SFs do outreach for the SMART Program at career fairs. Many SFs have a full-time staff member whose main responsibility is on recruitment—this may include for internships or the general workforce. Those SFs with a dedicated recruiter report improved alignment between scholars, interns, and new hires and the SFs' mission and workforce needs. Recruiting can also happen at the Component or Service level. In these cases, the Component (e.g., Air Force) will also include the SMART Component Liaison in the recruiting event.

Additionally, a number of SFs explained that because they participate in a variety of other STEM internship programs, these interns learn about the SMART Program during their time in the technical departments of the SFs and many subsequently apply to the SMART Program. Although the SMART Program provides significant financial support to the scholar, the SFs also feel that they are responsible for ensuring that the scholar not only remains in the program but continues to contribute to the SFs' workforce for the

distant future, thus requiring a considerable investment from the SF as well. Because SFs feel they are making a big commitment to the scholars, they reported to IDA their preference to select scholars who have completed another internship (or similar program) such that the scholar is "known" to the SF and research team. It is common for SMART applicants to have prior relevant internship experience. For example, in an analysis of 2020 application data, out of the 32.7% of applicants who responded to the question regarding prior experiences, 53.4% of responses indicated previous DoD, federal, or Defense-related internship experience. It is important to note that although this number is large, it reflects responses where more than one program was selected by the applicant (i.e., applicants may have selected 2+ responses) and the responses reflect only those that were provided (i.e., 67.3% of applicants did not provide a response to this question, thus the actual percentage of applicants with prior relevant internship experience is not clearly understood). Finally, some SFs report that it is easier to build mentoring relationships with students who they are familiar with in some other capacity. The hope is that these scholars are familiar with the SF and its mission, which might increase retention in niche STEM areas.

A number of SFs engage in recruitment activities with local universities. One benefit to local recruitment is that many students may be familiar with the SF and its mission. SFs reported using Handshake,[15] a career-services platform open to university students as a way to recruit and keep in touch with potential applicants. Some SFs also use Handshake to socialize the SMART Program to universities within a geographic region (e.g., the Midwest). The SFs are recruiting for themselves, outside of the SMART Program, but because the Component Liaison and Support Contractor office provide outreach materials, the SFs are easily able to incorporate SMART Program information into their efforts. These efforts extend beyond universities and the SFs reported that they also recruit at conferences and professional meetings focused on increasing diversity of their workforce (e.g., Society of Women Engineering, Hispanic Engineering Society). Another reason SFs recruit from local universities to reduce the long-term retention issue that arises when scholars and new-hires are far away from home or their desired living location. These SFs report that they focus on recruitment (and award selection) based on a number of factors, including the existence of ties to the SFs' areas in order to improve long-term retention rates.

Recruitment by the SF is not limited to actively seeking out applicants—it also includes sharing information with potential applicants who have questions about the SMART Program or SF. For example, when potential scholars reach out to the SPO or Support Contractor with questions regarding a SF, depending on the nature of the questions, they may be directed to the Component Liaisons. Again, depending on the

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[15] Colleges and universities use Handshake to store student resumes, cover letters, and transcripts. Students are able to build profiles and list academic interests while employers can review these profiles or post open jobs or internships. For more information, see the Handshake website: https://joinhandshake.com/

question, the Component Liaison may answer the question or put the potential applicant directly in touch with the SF POC. By doing so, the Component Liaison is also alerting the SF to who might be interested in working at that SF. The SF POC will then forward the inquiry to scientists or branch chiefs within the facility so that several people are aware of the potential applicant's interest in joining their team. Similarly, if a potential applicant reaches out to a SF's Public Affairs Office (which often happens as applicants inquire about the alignment of the SF's work with their research), the applicant is directed to the SF's recruitment POC who will use the communication as a recruitment opportunity. Such communication increases a research manager's interest in bringing the potential applicant onboard. Finally, the SFs are invited to join the SPO and Support Contractor team during webinars to answer any relevant questions that might arise. The SFs see this as a networking advantage for both the SFs and the potential applicants as they can make virtual introductions, increasing the likelihood that the applicant will rate the SF high in their location match and the SF's decision to select the applicant for the award.

7. Foster a Demographically Diverse STEM Community

Another goal that has been articulated by both the SPO and stakeholders and one that also appears in the 2021 SMART Strategic Initiatives is increasing the demographic characteristics[16] of SMART applicants (and therefore awardees). As noted in Balakrishnan et al. (2018), the FY10 SMART Program budget request explicitly focuses on outreach to underrepresented minorities as potential applicants. From that point forward, increasing application rates among these groups has served as a goal, activity, and metric. However, it was not until FY14 that the percentage of SMART applicants from HBCUs or MSIs was reported annually.

More recently, the SPO and Support Contractor have taken a number of actions to improve demographic diversity of SMART scholars. For example, the Support Contract office held a webinar titled, "Fostering Diversity." Of the registrants for this webinar, 15.2% submitted a completed application. Additionally, as described above, the Support Contractor has engaged in a number of directed advertising efforts that has affected the number of completed applications submitted by scholars in underrepresented minorities. Additionally, the outreach to conferences focused on diversity in STEM seems to be paying off as the SMART Program has been steadily increasing the rates of applications submitted by underrepresented minorities over the past few years (see Table 7).

[16] Diversity in this case refers to the categories of gender, ethnicity, and race.

Table 7. Number of Applications by Race

	Applications Submitted		
Race	2018	2019	2020
American Indian or Alaska Native	17	18	16
Asian	145	194	243
Black/African American	186	283	316
Hawaiian or Pacific Islander	3	6	3
White	1339	1648	1558
1+ Race Selected	128	143	173
Did Not Respond	121	145	136

8. Considerations for Outreach

The target population for the SMART Program are students in college who are on their way to attaining a STEM degree, since an applicant must be matriculated and in good standing at a university. A significant consideration for recruitment is the variance between the makeup of STEM degree holders and the population as a whole. As shown on Table 8, Table 9, and Table 10, the population of STEM graduates[17] is substantially less diverse in gender, race, and ethnicity versus the general population.

Table 8. Gender Diversity, U.S. Population versus STEM Degree Holders and SMART Applicants

	US Population [2019] (US Census Bureau 2019)	STEM Degrees Awarded [2018] (NCES 2019)	SMART Applicants (2018-2021)
Male	49.3%	63.7%	62.8%
Female	50.7%	36.3%	37.2%

[17] The National Center for Education Statistics (NCES) tracks the number and demographics of students who graduate each year, so those data were used. The number of students in school and working towards particular majors or degrees at any one time is not measured, so is not available for comparison.

Table 9. Racial Diversity, U.S. Population versus STEM Degree Holders and SMART Applicants

	US Population [2019] (US Census Bureau 2019)	STEM Degrees Awarded [2018] (NCES 2019)	SMART Applicants (2018-2021)
American Indian or Alaskan Native	1.3%	0.4%	0.8%
Asian	5.9%	14.3%	9.3%
Black or African American	13.4%	7.1%	13.1%
Native Hawaiian or Pacific Islander	0.2%	0.2%	0.7%
White	76.3%	74.1%	69.6%
Mixed Race	2.8%	3.9%	6.0%

Table 10. Ethnic Diversity, U.S. Population versus STEM Degree Holders

	US Population [2019] (US Census Bureau 2019)	STEM Degrees Awarded [2018] (NCES 2019)	SMART Applicants (2018-2021)
Hispanic or Latino	18.5%	11.5%	12.0%%
Not Hispanic or Latino	81.5%	88.5%	88.0%

This gap in diversity among STEM graduates highlights the issues for outreach to encourage applications from a diverse, representative pool of SMART scholars. The SPO has struggled to overcome this gap in the gender and ethnic dimensions when comparing SMART applicants to the national population, but the applicant pool does look very much like the pool of STEM graduates, as shown in the right-most columns in Table 8, Table 9, and Table 10. Regarding the race of applicants, however, the SPO has approached closing the diversity gap, which may be a consequence of the ability to target racially diverse candidates at HBCU/MIs and MSIs. In the next section we will discuss the application to award process, and will discuss the variability of diversity demographics during the selection and awards process.

a. Gender Diversity by STEM Field

Gender diversity in STEM differs considerably by STEM field, as shown in Table 11. For example, in 2018, female graduates were awarded 36% of STEM degrees across disciplines, however they were awarded less than 25% of aeronautical engineering, computer science and computer engineering, electrical engineering, mechanical engineering, naval architecture and ocean engineering, nuclear engineering, and physics degrees.[18] Conversely, females were awarded a majority (i.e., over 50%) of degrees in biosciences, cognitive, neural, behavioral sciences; environmental sciences; and oceanography. The composition of SMART applicants tended to emulate national trends,[19] in that the fluctuations across disciplines are consistent. However, in all fields, the SMART Program received a greater percentage of applications from females than the national percentage of degrees awarded to female students. Subsequently, the program made awards to a greater percentage of female scholars than national graduates within a discipline for most disciplines.

Table 11. Gender Statistics for SMART's Female and Male Applicants and a Comparison to the National Statistics (2017–2018) across Disciplines

Discipline	Female Applicants	Female %	National %	Male Applicants	Male %	National %
Aeronautical and Astronautical Engineering	72	19	15	299	81	85
Biomedical Engineering	86	50	46	86	50	54
Biosciences	185	69	63	84	31	37
Chemical Engineering	97	52	32	91	48	68
Chemistry	92	55	49	74	45	51
Civil Engineering	72	39	29	112	61	71
Cognitive, Neural, and Behavioral Sciences	54	67	73	27	33	27
Computer Sciences	235	29	23	578	71	77
Electrical Engineering	87	23	18	294	77	82
Environmental Sciences	44	81	56	10	19	44
Geosciences	44	58	40	32	42	60
Industrial and Systems Engineering	26	39	28	41	61	72
Information Sciences	29	44	32	37	56	68

[18] Data comes from NCSES https://ncsesdata.nsf.gov/builder/ipeds_c

[19] The percent of female graduates in each STEM field was determined using data available from the Integrated Postsecondary Education Data System (IPEDS) from NCSES, which can be accessed here: https://ncsesdata.nsf.gov/builder/ipeds_c.

Materials Science and Engineering	52	39	30	80	61	70
Mathematics	89	50	41	89	50	59
Mechanical Engineering	182	22	15	658	78	85
Naval Architecture and Ocean Engineering	11	35	18	20	65	82
Nuclear Engineering	11	34	16	21	66	84
Oceanography	20	74	55	7	26	45
Physics	56	31	22	122	69	78
Total	**1544**	**36**		**2762**	**64**	

On a discipline by discipline analysis, the SMART Program had a consistently higher percentage of female applicants in each STEM field compared to national STEM graduate percentages. The number of applicants varied by discipline with more male applicants (64%) than female applicants (36%) overall because of the disproportionate number of applicants to STEM disciplines.

a. Racial and Ethnic Diversity by STEM Field

The composition of SMART applicants tended to emulate national trends in racial and ethnic diversity, wherein disciplines that had greater participation from racial and ethnic minorities in the national population, such as biomedical engineering, chemistry, and cognitive, neural, and behavioral science, similarly had a higher percentage of SMART applicants from racial and ethnic minority descriptions. However, those fields tend not to be the disciplines that are most sought after by SFs according to the projections submitted. Fields with a greater number of applicants, such as mechanical engineering, tended to have less racial and ethnic diversity.

The relative difference (i.e., comparison of the SMART Program to the national data) in racial and ethnic diversity for each STEM field is depicted in Figure 5. The size of each circle represents the number of applicants in each field. The color of each circle represents the relative difference between SMART applicants and national STEM graduates, wherein a red circle indicates that SMART applicants of that race/ethnicity make up a smaller percentage of total applicants when compared to national STEM graduates for that same race/ethnicity, while blue circles indicate that SMART applicants make up a larger percentage of total applicants when compared to national STEM graduates. For example, in computer sciences, there were many applicants who identified themselves as White as indicated by the relatively large circle, but this percentage for SMART applicants was below the percentage of White computer science majors in the national data as represented by the shade of red filling the circle. In computer science, we can see that the percent of Mixed Race applicants to SMART was relatively higher than the percentage of Mixed Race college graduates as represented by the blue circle.

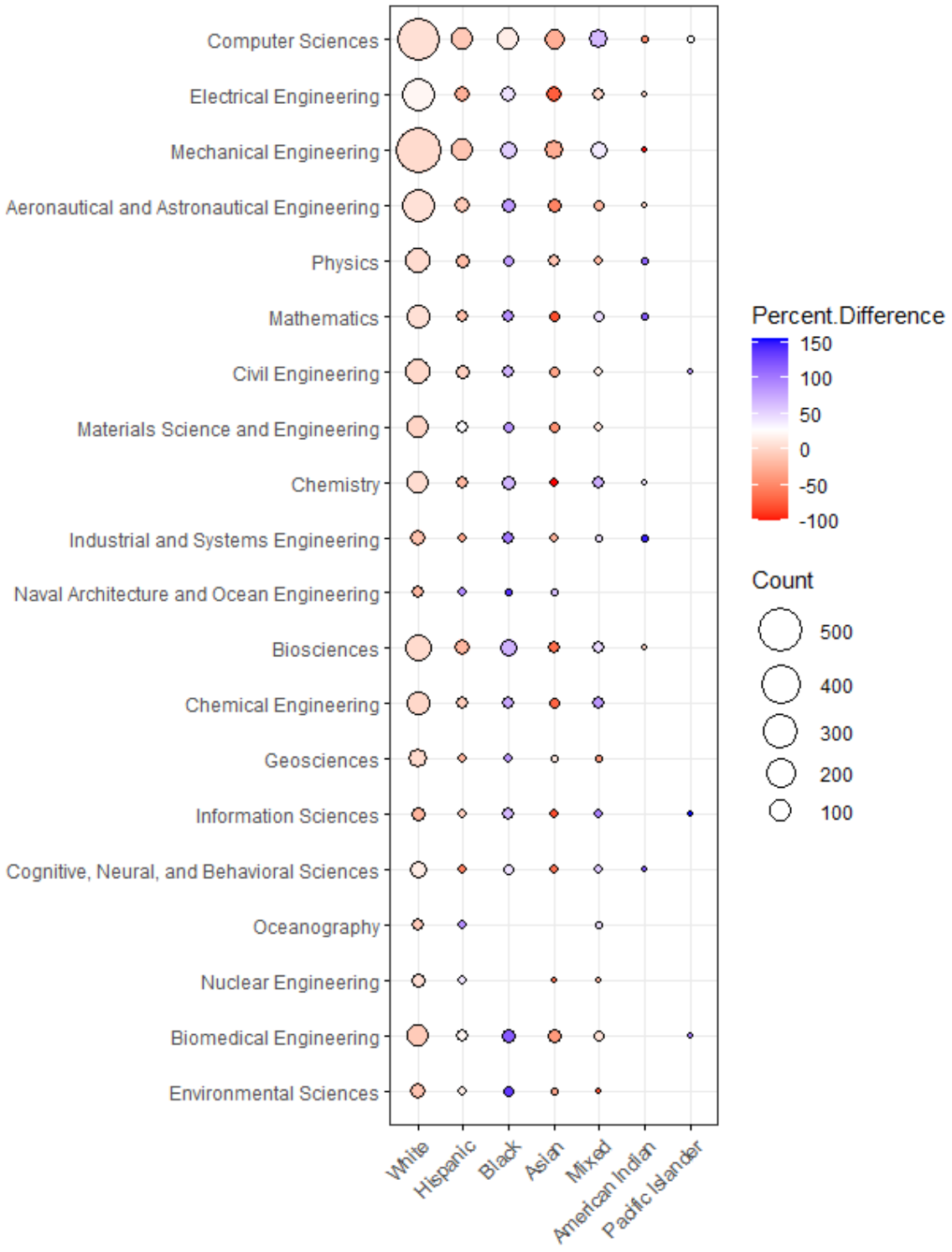

Figure 5. Racial and Ethnic Distribution of SMART Applicants by STEM Field across 2018 and 2019

In general (i.e., looking down a column of circles indicating a single race or ethnic group), across 2018 and 2019, the percentage of SMART applicants identifying as White

was below the national percentages of degrees awarded to White students for most STEM fields as indicated by all circles being some shade of red. The SMART Program tended to receive a greater percentage of applications from Black/African American and Mixed-race students than the national percentage of degrees awarded for most STEM fields, as represented by the predominantly blue shaded circles in those columns. Conversely, the program tended to have a smaller percentage of Asian and Hispanic applicants than the national percentage of degrees awarded for most STEM fields as indicated by the predominantly red circles in those columns. Because the national percentage of American Indian and Pacific Islanders is well below 1%, if an applicant identifying as American Indian or Pacific Islander applied to the SMART Program in any given degree, this is considered greater than the national percentage of national degrees awarded to American Indian or Pacific Islander students. Likewise, if no applicant identifying as American Indian or Pacific Islander applied to the program given any degree, this is considered less than the national percentage of national degrees awarded to American Indian or Pacific Islander students.

B. Phase 0 – Application to Awards

Several of the key aspects of how the SMART Program functions occur during the application to awards stage. Important decisions are made based on applications that flow through the review and selection process towards making the best overall set of awards based on multiple priorities (e.g., funding education for DoD critical disciplines, SF's workforce needs, Congressional direction, and DoD Modernization Priorities). In this stage, as shown in the logic model for applications to awards in Figure 6, applications are completed, the SMART Program convenes an initial selection panel to score applications and identify qualified applicants, who are then reviewed by participating SFs. After that, the SFs conduct applicant interviews to develop a finalized selection list of awardees. These award decisions are reviewed by the Component Liaisons, the Component Execution Leads, and the SPO to reconcile the selection of the same applicant by two or more SFs.

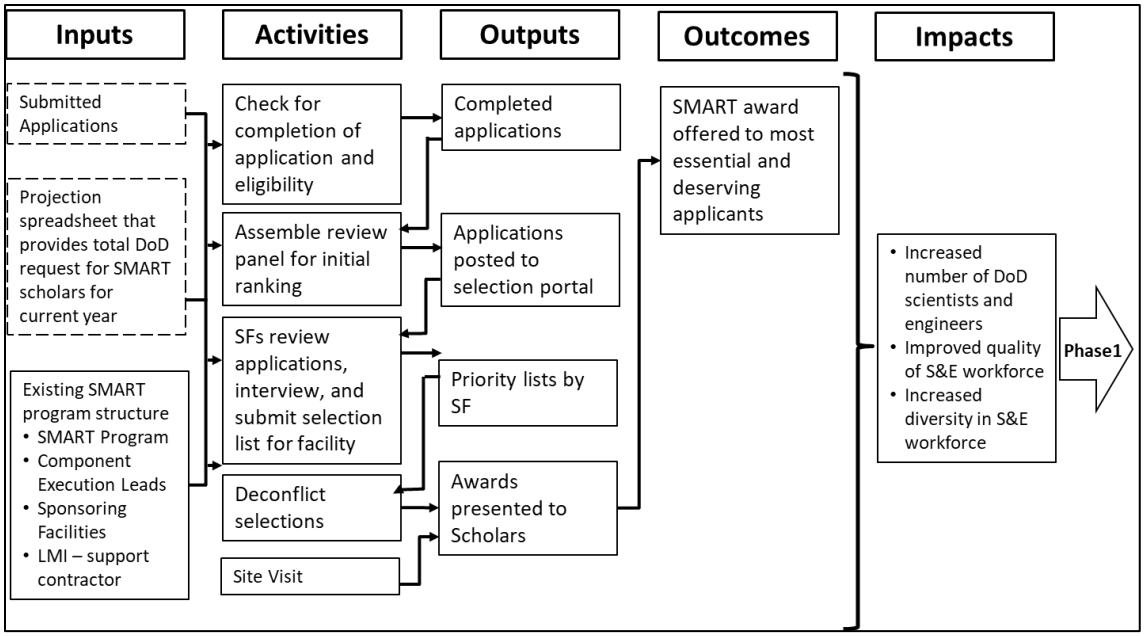

Figure 6. Logic Model: Phase 0 – Application to Awards

During this period of the award cycle, applicants receive offers for SMART awards. The submitted applications serve as the primary input for the subsequent activities, outputs, and outcomes of the model (e.g., review of applications and selection of awardees). It is during this stage that the SPO may have the most direct impact on the outcomes of the SMART Program, in that they may promote the completion of strong applications for SFs to review and select, and may shape how the awards are distributed across disciplines or other factors.

After a candidate is selected, they will be notified via email and provided the login information to the Awardee Portal. All award documents, including service agreement and SF POC contact information, are located on the portal. The potential scholar is asked to review the documents and contact the SF POC to ensure that they know/understand the various requirements of the program (e.g., what the internship and work at the SF will look like). The potential scholar has 2 weeks to accept the award and to complete additional paperwork, complete an orientation, contact the SF POC to schedule the site visit, and confirm the scheduled visit. They are also required to schedule an on-boarding call with the Scholar Coordinator to go over all award info and answer questions. These steps, including the site visit allows the potential scholar to fully understand the SMART Program and commitment and provides the scholar with several opportunities to decline the award before funding is disbursed.

1. Applications

The objective of the outreach efforts described in the previous section is to increase the number of qualified applications for review and selection for a SMART award. Multiple SMART stakeholders, such as the SPO, the Support Contractor, and the SFs, play a role in the recruitment of applicants to the program. As shown in Figure 7, there appears to be a geographical relationship with applications driven primarily by state population and the existence of SMART SFs. State population appears to be a clear factor in that the three states with the highest population (i.e., California, Texas, and Florida) contribute many applicants while the states with the smallest populations (i.e., Wyoming, Vermont, and Alaska) produce the fewest applicants. Additionally, moderate populations that also have SFs active in the SMART Program tend to produce a higher relative number of applicants.

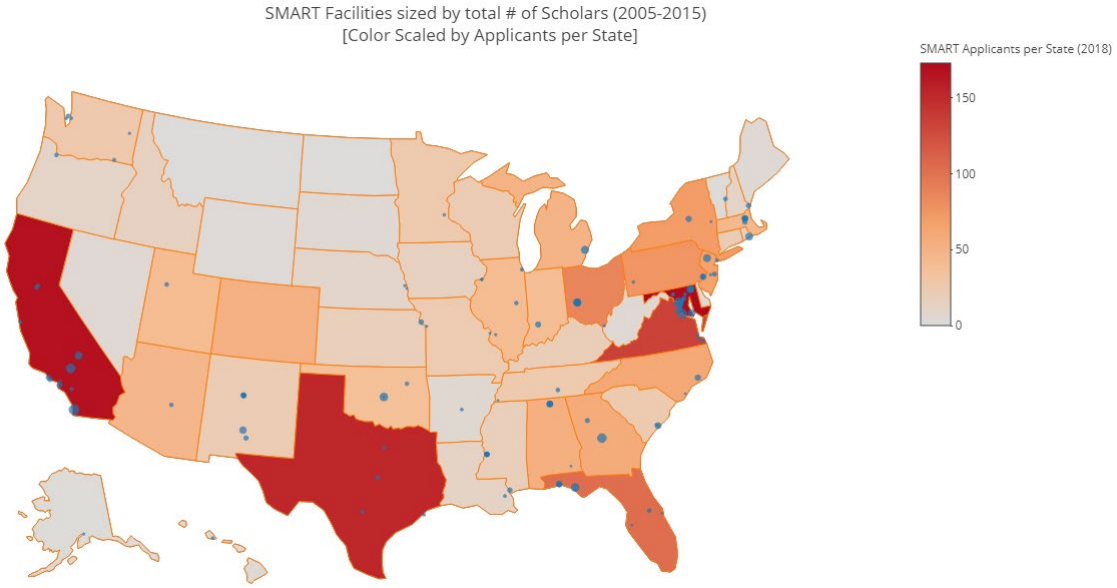

Figure 7. Applicants by state and location of SFs. The darkness of the state indicates the relative number of applications coming from a particular state. The blue circles indicate the location of SMART SFs, with the size of the circle indicating the number of scholars.

2. Scholar Eligibility and Application Process

The SMART Program website[20] lists the eligibility criteria that applicants must meet. Although these criteria have changed slightly due to legislative changes since the program's inception, as of 2021, students are considered eligible if they are:

- A citizen of the United States, Australia, Canada, New Zealand, or United Kingdom at time of application

[20] See https://smartscholarshipprod.servicenowservices.com/smart?id=smart_index

- 18 years of age or older as of August 1, 2022
- Requesting at least 1 year of degree funding prior to graduation
- Able to complete at least one summer internship (multi-year scholars only)
- Willing to accept post-graduation employment with the DoD
- A student in good standing with a minimum cumulative GPA of 3.0 on a 4.0 scale
- Pursuing a technical undergraduate or graduate degree in one of the 21 STEM disciplines, as described in the SMART Program Overview in the Introduction section
- Can submit a college transcript from the fall of the previous year from a regionally accredited U.S. college or university, OR be pursuing a graduate degree at a regionally accredited U.S. college or university.

Each year, the application season runs from August 1 to December 1. The SMART Support Contractor runs the application site (known as the Application Portal). The portal guides applicants through the application process and provides guidance regarding the required documents. For example, each applicant provides their contact information, and demographics (e.g., citizenship, military/veterans status, gender, ethnicity, race, disability). Applicants also provide information on their proposed area of study, up to three Sponsoring Facility (or geographical area) preferences, and a personal statement (including educational and professional goals; factors/experiences leading scholar to field of study; how working for the DoD civilian workforce will further technical/professional goals; and how the applicant's experience, interests, and goals will further the DoD mission). Finally, in addition to references, applicants provide information regarding their academic background (including most recent transcript), professional and other pertinent (community/volunteer activities, leadership, and teamwork) experiences, awards/honors, publications/presentations, and other DoD educational programs that they have participated in.

3. Evaluation and Selection for Awards

Overall, the applicant evaluation process has not changed much from that described in the SMART 1.0 Process Evaluation Report (see Balakrishnan, Buenconsejo, et al. 2018), with the exception of a greater utilization of the Application Portal, a centralized web-accessible system maintained by the SMART Support Contractor where applications can be reviewed, information about the application process can be accessed, and information can be submitted by reviewers. In general, there is a two-stage evaluation process, with the first stage being a review and ranking of all completed applications by a panel of subject matter experts in the 21 STEM disciplines of interest to the SMART Program (academics

and DoD personnel) which filters the applicants to well-qualified candidates. An average of three reviewers (one academic, one DoD, and one additional reviewer) score each application, creating a ranked list of scholars by discipline. The additional reviewer (either DoD or academic) is selected by an algorithm to ensure fairness of reviews. The workforce projection matrix submitted by the SF at the start of the planning process dictates the number of applications by discipline that move onto the second stage. In the past, if there were adequate numbers of applications for a discipline, the number of applications moved to the second stage was twice the projected need or the top 50% ranked applications. These applications were then uploaded to the portal where they were available for evaluation by the SFs. Alternatively, for disciplines where there were relatively fewer applications (e.g., there was a need for 50 scholars and only 60 applications in that discipline were received), then all of the qualified applications might go forward, regardless of rank. As noted earlier, the SPO examined the award review process and made modifications for the 2020–2021 application cycle. Based upon the disciplinary needs communicated through the workforce projections call, the SPO considers the number of applications received in each discipline, the number of SF interested in that discipline, historical trends related to the selection of scholars in that discipline, and the program budget as determining factors for which applications move onto the second stage of review. The SFs have 6 weeks to review applications in the portal, conduct interviews, and identify their selections.

The SFs conduct the second round of evaluations, including interviews with candidates, and consolidate and prioritize candidate selections within the different offices/laboratories at the SF. Although each SF approaches this round of evaluations differently, most SF POCs that were interviewed by IDA explained that they send out an initial tasker asking for volunteer reviewers, who are usually from the divisions, laboratory, and offices that are seeking SMART scholars. Many SFs reported that in order to make the review process manageable, the SF POC for the SMART Program first filters applications to identify applicants that they would prefer to review further. The primary filter mentioned was that applicants list the SF as one of their top three choices. The SF POCs noted that applicants who list the SF in their top three selections have a better understanding of the SF's mission and geographical area and thus, are more likely to accept the SMART award and possibly remain at the SF well into the future. Also, as mentioned in the previous section on outreach, many SFs reported an affinity to select SMART applicants who have served at the SF in some previous capacity, usually through another internship program. There is a high likelihood that these applicants will select the SF as a top choice, which supports the SFs' approach to filtering these applications. Additionally, some SFs reported using the SMART Program to fill positions in specific or niche areas within the 21 STEM disciplines so they also filter applications in those areas. In these cases, the applicant may not have selected the SF as a top three selection, but there may be a clear link of discipline and the facility need. Likewise, SFs may also filter applications that selected its

geographical area, and as such, the SF may not be listed in the top three selected sites, however the geographical match may lead to long-term retention success for the SF.

Another data point used to assess applications is the college or university of the applicant. Of note, many SF POCs interviewed by IDA reported that the college/university information for the applicants was not included in the portal during the 2020 evaluation period, although it was available during previous reviews. The change required that they reach out to the Component Liaison to receive this information separately. Another issue reported by the SF is the inability for SF or Command managers to create portal accounts for division POCs. Although some SF hiring managers are able to create recommender and reader accounts on the portal, this does not appear to be a consistent function available to all hiring managers and SF POCs. To remedy account creation for portal access, the SF POC or hiring manager reaches out to the SMART Support Contractor to create the needed accounts. This process might be streamlined if the SF POC had the ability to create accounts for relevant parties.

In order to select an applicant for an award, the SMART Program and the SF requires that the reviewer conduct an interview of the applicant to ensure that there is a mutually good fit. One SF relayed to IDA that typical applicant interviews cover a variety of topics including: a description of how the SF fits within the larger Component and the DoD, understanding the pay scales and how they relate to the degree of the new employee, the process for promotions at the SF, the SF's history with the SMART Program (e.g., how many scholars have gone through the SF and are currently there), professional development, life in the geographical area, and the culture of the SF. Another SF POC described that during the applicant interview, it is critical for the SF to be cognizant of what the potential scholar wants and what the SF can give in terms of career growth in order to maximize the likelihood that the scholar will stay within the DoD workforce. Most of the interviews are conducted virtually or by telephone, but applicants who are local to a SF may be invited to do a tour and talk face-to-face. After the reviews and interviews are complete, the SF POC or hiring manager gathers the list of selections and generates a final list of rankings. Some SFs reported developing a point system to weight different reviewer criteria to create the final ranking. In some cases, the Director at a SF may review the final rankings and make adjustments based on criteria that he or she deems critical for success and retention (e.g., they may move local scholars up on the final rankings).

The SFs' final selection of applicants (i.e., those that the SF would make an offer to if allowed) is expected to exceed the number of awards they will be able to make based on SMART Program budget constraints. This over selection is done so that if an applicant declines the award, the SF already knows whom they would select as an alternate, which allows the SMART Program to move more quickly through the awards process than if they had to repeatedly go back to SFs to ask for additional applicants to which they would like to offer awards. Also, occasionally the SF may be allotted additional SMART scholars as

the awards process progresses or if their initial selections decline the award. The SFs reported that the most common reason for declining include when a scholar has a better offer or a more desirable location.

4. Selection Factors and Awards

It is a common occurrence that more than one SF selects a potential applicant. This can happen at the facility-level, Component-level, and cross Component. The deconfliction process at the facility is straightforward. The SF POC or hiring manager will meet with the SF Director and hold a call with the two or more offices in that SF that have ranked the applicant at the top of their lists. After thorough discussions, the Director will select the final ranking (and which office will receive the scholar if they accept) after taking into account the match between the applicant's background and potential for a lengthy career at the SF. In the case of Component-level deconfliction, the Component Liaison will look at how the scholar ranks across the different SFs desiring that candidate and where the candidate has ranked each SF or geographic location. They also give consideration to who will be able to hire the candidate for the long-term, which depends to some degree on budget. The Component Liaison will speak with all selecting SFs to identify the best overall fit for both the candidate and the SF. For cross-selection resolution, the SMART Contract Support office gets involved and first looks at where the candidate ranked for each selecting SF. The candidate will be assigned/awarded to the SF that ranked them the highest; however, this decision is made in conjunction with a candid discussion with the candidate to take their preference into account.

Applicant/Scholar preference of a SF is a strong consideration in that applicant to award process. Most of the scholars who receive awards are sponsored by the facility that they listed in their three preferences. A comparison of the scholar preferences and ultimate sponsoring facilities was completed for the scholars from the 2020 application cohort. Of those, 46% of scholars were sponsored by their first choice, 13% by their second, and 8% by their third preference selection. Only 33% of scholars were not selected by an exact match to one of their preferences.

Of the 33% of scholars not exactly matched to one of their preferred SFs, the breakdown of those is:

- 15% were selected by a SF that was organizationally linked to one or more of their preferences in that the SF was part of the same lab or organization as a preference, but in a different location or different division
- 12% of awardees were selected by a SF that was not easily linked in some way to the scholars' preferences or geographic location
- 2% were selected by an organization with a similar mission/function to one of their preferences

- 2% were local to their selecting SF in that they went to school in the same state as the SF
- 2% listed no preferences at all

Recall that many SFs have indicated that their primary filter for the second round of application evaluation is whether the applicant selected the SF as a preferred location. A considerable percentage (33%) of awardees did not have their final sponsor as one of their preferred locations. Thus, there are some facilities that are willing to consider some applicants without being a selected preference. In some cases, as mentioned earlier, awarding SFs share organizational characteristics (e.g., location, mission) with the applicant's preferences. The applicant quality may also play a role in that decision, in that SF might be drawn to high-quality applicants and willing to overlook that the SF was not a preferred choice. We analyzed the review panel scores of the awardees to see if there was a difference across groups of awardee/SF match/mismatch (e.g., awardees to their first, second, or third preference; awardees to facilities in the same location; awardees to SF that appear to be a complete preference mismatch; see Table 12).

Table 12. Analysis of Awards offered by Match and Mismatch of Scholar Sponsoring Facility Preference (applications received in 2020 for awards in 2021)

Category	N	Mean Score	Standard Deviation	Median Score
Any Preference Match (Sum)	**373**	**84.6**	**9.0**	**86.3**
1st Choice	256	84.5	8.9	86.3
2nd Choice	70	85.5	7.9	86.8
3rd Choice	47	82.4	10.6	84.8
All Preference Mismatches (Sum)	**185**	**84.3**	**10.1**	**86.5**
Facility or Component Match	107	83.5	10.4	86.0
No preferences listed	11	77.1	15.2	77.3
Complete mismatch	67	86.1	8.4	87.7

The review panel scores of SMART applicants were also analyzed in order to determine if there was a relationship between the review scores and likelihood of selection by a preferred SF. There was not a difference in review panel scores between scholars who were selected by one of their preferred facilities versus those who were not. This implies that SFs do consider the preferences of scholars in that the majority of awards are characterized by a match between scholars' preferred SF and where they are ultimately select, but also that SFs are willing to offer scholarships to high-quality candidates for whom they are not a preference.

5. Diversity by Selection Process

Each of the stages of the selection process described above (completed applications, approved by review panel, and selected by SF) stands as a hurdle that an applicant must clear in order to receive a scholarship offer. Although the SPO has a goal of improving scholar diversity, as noted earlier, they do not have direct control over who is selected for award by the SF, and therefore, on scholar diversity. In terms of scholar diversity, it is important to understand how different groups are impacted by these stages of selection.

a. Gender Diversity by Selection Process

Figure 8 shows the survival rate for male and female applicants in different stages of the application process across 2018 and 2019 data.[21] In our analyses, we identified four stages of the application process (i.e., application submission, review of applications by the panel, second stage review by the SFs, and selection of the application for award) so there are three transitions between stages for an applicant to "survive." The difference between genders at each step of the application process is minimal, such that male and female applicants are selected or eliminated at relatively similar rates, with female applicants having a slightly smaller chance of being selected at each stage of the application process. Among female applicants, 94.3% of those who submitted an application were eligible; 79.2% of those who were eligible were approved by the review panel; and 21.5% of those who were approved by the review panel were awarded a SMART scholarship. Similarly, among male applicants, 94.3% of those who submitted an application were eligible; 83.2% of those who submitted an eligible application were approved by the review panel; and 22.0% of those who were approved by the review panel were awarded a SMART scholarship. The differences between genders at each stage of the application process was small: 16.1% of female applicants who submitted an application received a SMART scholarship, while 17.2% of male applicants who submitted an application ultimately received a scholarship, as shown in Figure 9.

[21] Survival analyses are used on data with multilevel or hierarchical structure to identify outcome data at the time of an event of interest (or multiple times of interest) (Austin, 2017).

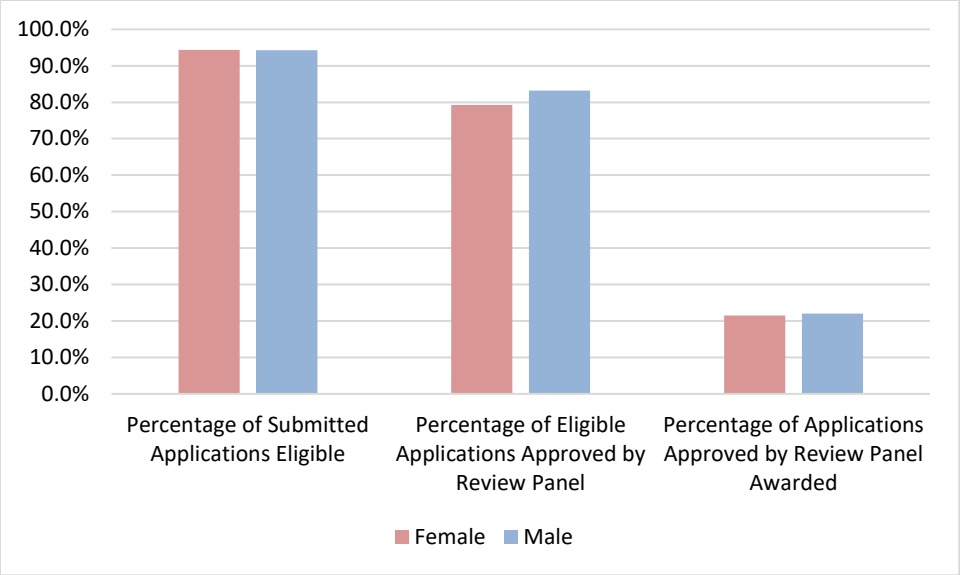

Figure 8. Application to Award Survival Percentage by Gender across 2018 and 2019 Application Data

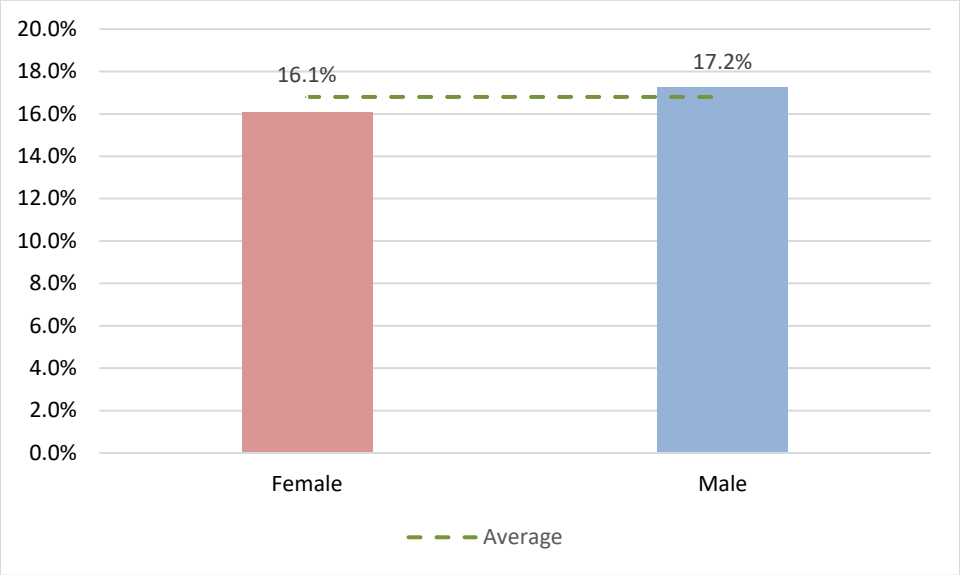

Figure 9. Percent of Submitted Applications Awarded Scholarships by Gender in 2018 and 2019

b. Racial and Ethnic Diversity by Selection Process

Figure 10 shows the survival percentage of applications in different stages of the process by race/ethnicity[22] across 2018 and 2019 data. For example, among White

[22] Race/ethnicity are reported together as a single set of categories to be comparable to national statistics on race and gender as reported by NCES. NCES rules for collecting race and ethnicity data can be found at https://nces.ed.gov/ipeds/report-your-data/race-ethnicity-collecting-data-for-reporting-purposes

applicants, 95.5% of those who submitted the application were eligible; 82.9% of those who were eligible were approved by the review panel; and 23.6% of those who were approved by the review panel were awarded a SMART scholarship. In contrast, among Black/African American applicants, 89.1% of those who submitted an application were eligible; 70.6% of those who submitted an eligible application were approved by the review panel; and 12.5% of those who were approved by the review panel were awarded a SMART scholarship. While the difference across races at each step of the process is not that large, the differences are additive from step to step so that in the end the differences across race are quite substantial as shown in Figure 11. For example, 19.0% of White applicants ultimately are awarded scholarships, while 7.8% of Black/African American applicants ultimately are awarded scholarships (see Figure 12).

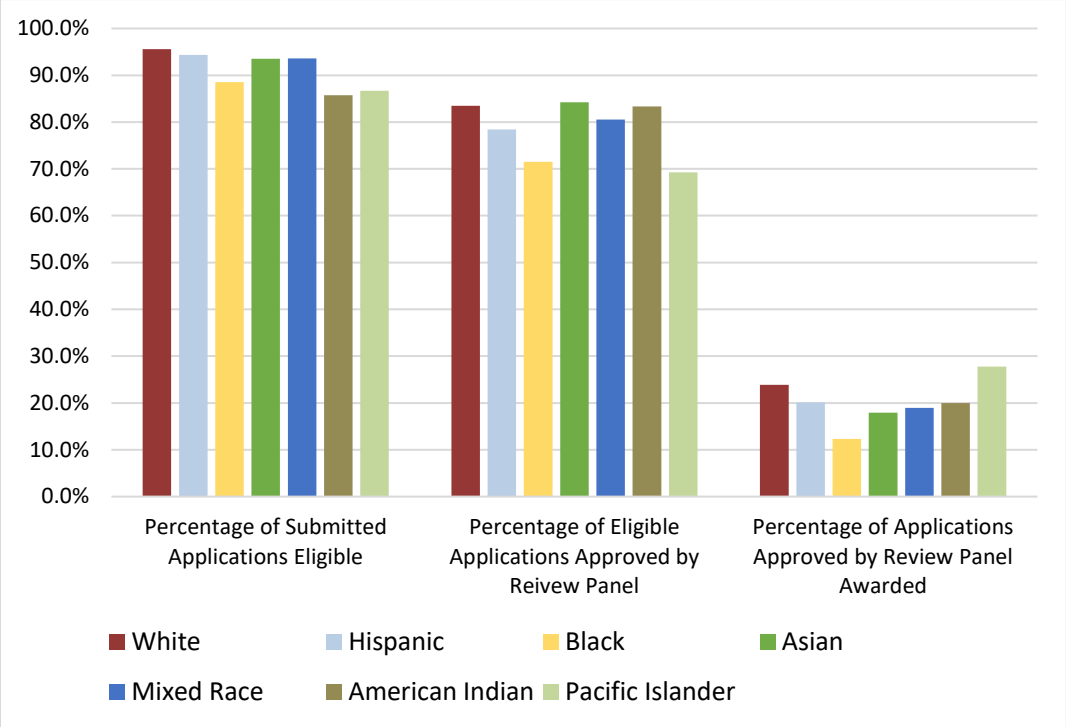

Figure 10. Application to Award Survival Rate of Applications by Race/Ethnicity across 2018 and 2019

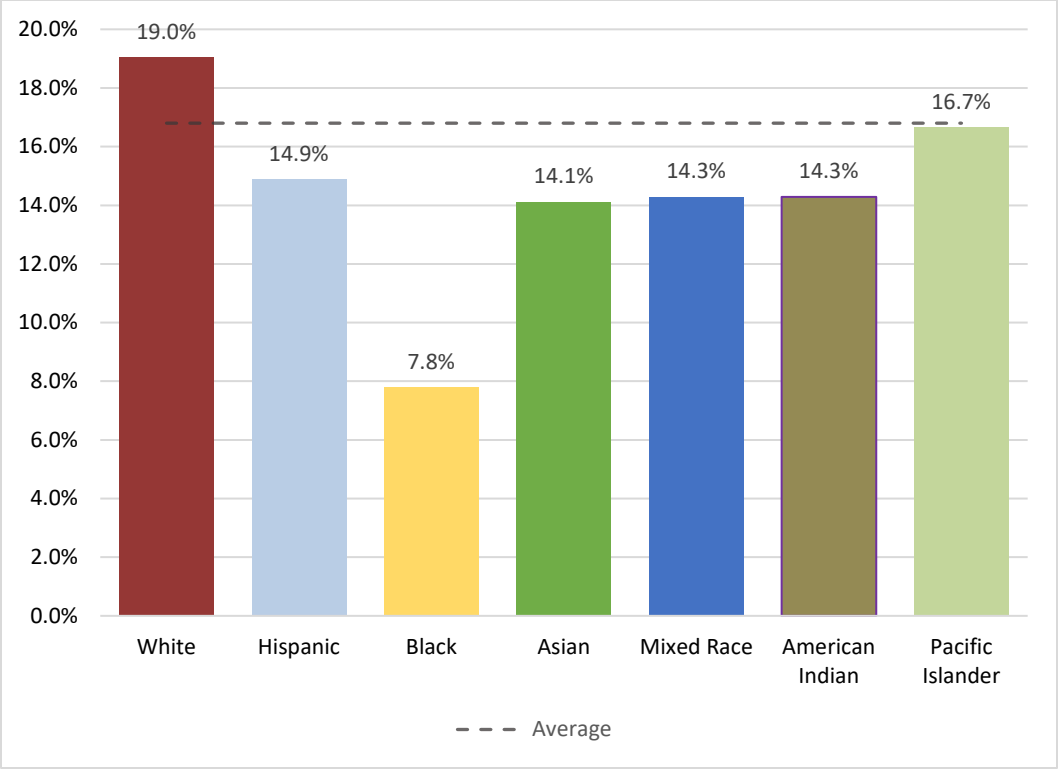

Figure 11. Percent of Submitted Applications Awarded Scholarships by Race/Ethnicity in 2018 and 2019

c. Intersection of Gender and Race/Ethnicity by Selection Process

The survival percentages for applications by gender and race is shown in Figure 12. Overall, American Indian, Asian, Black/African American, and Hispanic female applicants had a higher chance of ultimately receiving a scholarship than their male counterparts, while Mixed, Pacific Islander, and White female applicants had a lower chance of ultimately receiving a scholarship than their male counterparts.

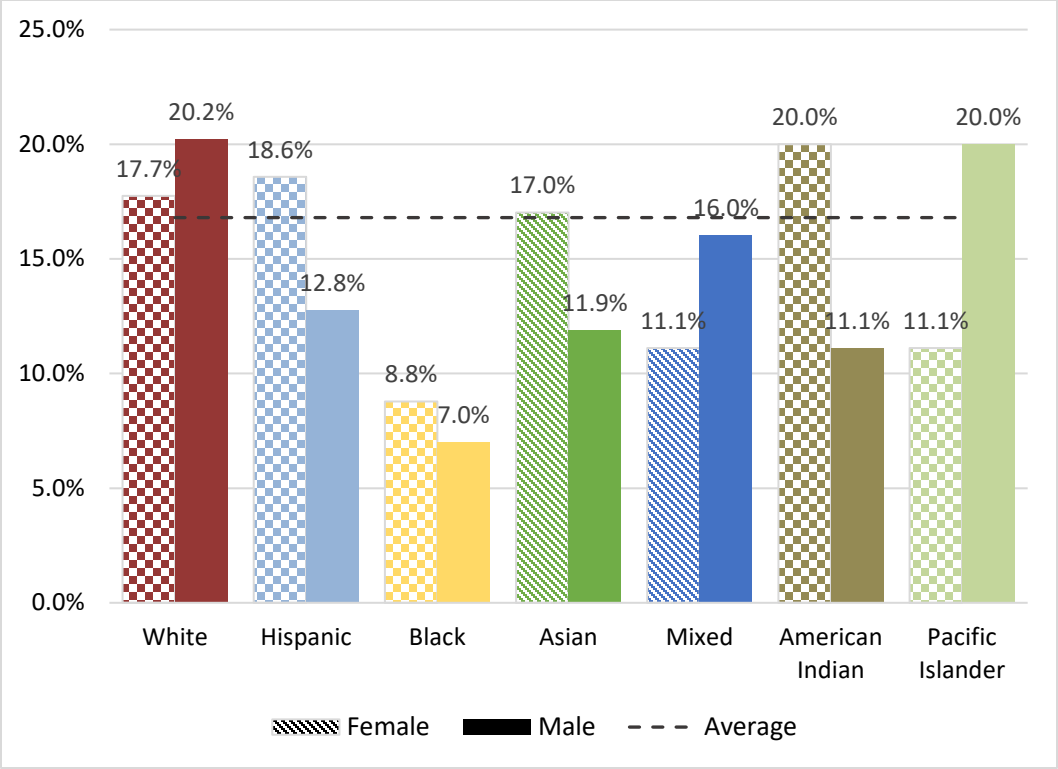

Figure 12. Percent of Submitted Applications Awarded Scholarship by Gender and Race/Ethnicity in 2018 and 2019

6. Sponsoring Facility Site Visits

The previous process evaluation report for the SMART Program (Balakrishnan, Buenconsejo, et al. 2018) noted that communication across the stakeholder community posed a challenge in terms of the continuity of the program. However, the SMART Program has taken several steps to improve communication with scholars and stakeholders. One such initiative was the implementation of a site visit of the SF for scholars prior to their commitment to that facility.

Prior to 2015, scholars attended an orientation program at the SPO (at that time in Monterrey, California) which focused on familiarizing the scholars with the DoD and the SMART Program. Occasionally, S&E managers briefed the scholars, but aside from these instances, scholars were not formally introduced to the leadership, mission, vision, and environment of the SF where the scholars would participate in internships and complete their service commitment (Phase 2) requirements. In 2015, the SMART Program launched the site visit requirement to allow for both the scholar and the SF to ensure that each was a mutually good fit—the scholar might evaluate the work location and environment, focus topics for the day-to-day work or research, facility mission, etc. while the facility might evaluate the scholar in terms of how well they may fit into the organization.

The site visits continue to present day and the objectives of the visits have held steady since their inception. The IDA team learned via interviews with stakeholders that SFs put a considerable amount of time into planning the site visits. Although the immediate goal is to ensure a good fit for the scholar and SF, the long-term goal is to ensure that the scholar remains on staff at the SF well beyond the service payback component of the SMART award. As such, the SF plans the site visits with both short- and long-terms goals in mind. Additionally, the Component Liaison will occasionally visit the SFs to get a sense of the working and living environment in order to better match scholars with SFs. It should be noted that due to the COVID-19 pandemic, the SFs had to quickly adapt to travel restrictions and safety protocols by developing a plan for remote/virtual site visits for the 2020 cohort. Due to the ongoing pandemic, the SFs are planning for virtual/remote site visits for the 2021 cohort as well but with ample time to plan, hope to be able to provide as close to an in-person experience as possible for the scholars.

As part of the site visit requirement, the scholars and SFs each complete a site visit report within 5 days of the visit for submission to the SPO. One component of the site visit report focuses on a reaffirmation of commitment by both the scholar (i.e., continued participation in the SMART Program) and the SF (i.e., to provide the requisite internship and service commitment experience as well as the subsequent hiring of the scholar for Phase 3 of the program). As noted by Balakrishnan et al. (2018), this section of the site visit report is seen as a positive for both the scholar and the SF as it allows for the identification of scholars who may withdraw or be dismissed early due to unhappiness with the program due to work area, workload, geographic area, work environment, etc. Although it might be ideal for all scholars who are selected to accept the award and assignment, allowing scholars to opt out or the SF to rescind an offer opens up a slot for a scholar who is a better fit. Likewise, understanding why a scholar may opt out of the program after the site visit allows the SPO to identify and address potential issues at the SF.

The IDA team requested a sampling of site visit reports (from both scholar and SF) from the 2017–2019 entering cohorts and another batch from the 2020 cohort. The reports were from a mix of undergraduate and graduate scholars from across all the facilities, branches of the military, and Fourth Estate. We received 10 each from 2017, 2018, and 2019, and 30 from 2020 and analyzed the responses from the 58 scholar (two of the 2020 files were corrupted and excluded) and 60 SF reports. The responses from the years of in-person visits (2017–2019) were also compared to the responses from the virtual visits from 2020.

a. Site Visit Report: Sponsoring Facility

The SF site visit report contains four questions:

1. In what ways do the SSPP (SMART Scholarship Program Participant) award specifications meet personnel needs? (Note, this question was updated for the

2020 site visit report to read: "How does the selection of this awardee align with the mission and objectives of your component or facility?")

2. Describe the established communication plan for future interactions including internship coordination and hiring procedure.
3. How is the participant a valuable asset to your facility and the mission?
4. Moving forward, are there any concerns with the participant's fit within the SF?

Although the number of SF site reports we reviewed were limited, we are able to make some observations regarding the responses to these questions. First, we should note that it was not clear from the responses that there were any significant differences between the in-person versus virtual site visits. That is not to suggest that differences in the site visits did not exist, only that the responses on the site visit reports were not sufficiently different between the 2017–2019 samples and the 2020 sample.

As written for the 2017–2019 cohort, the first question seems to be seeking information regarding how the SMART Program meets the SFs' personnel needs. In approximately one-half of the reports, the SF mentioned using the SMART Program for hiring, particularly in regards to filling workforce expertise gaps due to staff attrition through retirement. On occasion, the responses referenced relying on the program for recruitment of critical talent and for retention while it is possible that many of the responses combined recruitment and hiring functions into one.

For the 2020 cohort, the first question changed to focus more on the scholar's alignment to the SFs mission and objective. The responses generally identified a scholar's interest, skills, and qualifications/degree, as factors that were relevant to meeting the SF's mission. Some respondents provided details regarding specifics of what the scholar may do during their internship and subsequent commitment period. Yet, other responses described how the SMART Program allows for the SF to expand their workforce to address a growing research need; strengthens the division's expertise which allows the facility to expand on its capabilities; brings in high caliber scholars from excellent academic institutions who want to support national defense through innovation; and allows facilities to influence and guide the scholar's education at no cost to the facility such that by the end of the internships and service commitments, the scholar becomes an invaluable asset to the facility requiring little training upon hiring. Due to the revised wording of the question, many SFs responded similarly to Question 1 and Question 3, as described below.

In terms of Question 2 regarding the communication plan, a large majority of SFs reported that they planned to remain in touch with the scholar via email throughout their academic studies, thus outlining an informal plan. A few reports provided a more detailed or formal communication plan such as working with the scholar and his/her academic advisor to develop a research project that aligns with the SF's mission area or provided a

clear plan to support the scholar throughout Phases 1 and 2 (e.g., support for academic life, connection to mentor, study plan for research, preparation and planning for the internship) in order to ensure that the scholar felt like he/she was part of the team from the beginning of their interactions. Although some responses provided a very detailed communication plan, upon closer inspection, the communication plan was actually a detailed description of the SMART Program's communication guidelines/organization (e.g., who assists with personnel matters at the facility, the role of the SF lead coordinator, role of the HR representative).

The IDA team examined the responses to Question 3 regarding how the scholar is (or will be) a valuable asset to the SF's mission. We noted as in the summary of Question 1 above that a vast majority of the responses focused on the scholars' educational background and associated experience in mission critical STEM fields as ways in which the scholar would be an asset to the facility. For example, several reports mentioned how the scholar had technical skills that address a current competency gap which will bring new ideas, perspectives, and talents (i.e., diversity) to the SF and help improve the group's methods and thinking going forward. Second, it was clear that a number of SF respondents spent a considerable amount of time getting to know the scholar on a professional and personal level. One report noted that they had discussed what influenced the scholar to pursue their degree, the scholar's hobbies, etc., while another noted that the scholar had a gifted analytical mind and the scholar's technical acumen, maturity, and professionalism was beyond their years. Others reported that the scholar was very ambitious, intelligent, bright, motivated, responsible, and enthusiastic about the mission space, all of which were considered characteristics that made the scholar invaluable to the SF. Although combined with Question 1, the responses highlighted the different qualities/characteristics of the scholars or their knowledge, experience, and expertise that made them a valuable asset to the facility, a few responses were less complementary. For example, one report noted that bringing in scholars would allow the facility to free up higher skilled personnel to perform priority tasks or were concerned about the potential for scholars to opt to either complete the service commitment or apply for a permanent position with another facility, which would "waste" the time invested by the SF. Again, it is noteworthy that the responses to the reports were similar across all cohorts such that it was not evident that the 2020 visits took place virtually.

Finally, none of the SFs reported having any concerns regarding the scholar's fit. Instead, many praised the scholar or the SMART Program (in terms of the success the facility has had with prior scholars). One report even detailed how they typically rotate scholars to different teams within the SF to ensure that the scholar finds the right fit.

b. Site Visit Report: Scholar

The scholar site visit reports contained eight questions:

1. In what ways was your SF prepared for your site visit?
2. What did you accomplish during the site visit?
3. Summarize who you were able to meet at your SF. Was a communication plan established?
4. In what ways can your skills or knowledge from your field of study be utilized at your SF?
5. If you are a graduate student, how will you be able to align your research with your SF's mission?
6. How sufficient was the funding provided in supporting your ability to attend the site visit?
7. Did the SF provide you with a clear understanding of the mission?
8. Do you believe you are a good fit with your SF and the mission?

Unlike the SF reports, the difference between in-person and virtual site visits was quite pronounced on the scholar reports. For scholars who visited their SF virtually, questions 1 and 6 were not as applicable to the visit, so scholars struggled to answer those questions. Even without those two, the difference between virtual and in-person visits was apparent in their answers to other questions. SMART scholars who participated in virtual visits almost all reported either meeting a relatively large (8+) number of site staff on their visit, or a relatively small number (≤ 4). By comparison, most in-person visits reported meeting between 4 and 8 people on their visit. Not all scholars were specific about how many people they met and the interpretation of 'met' may vary between scholars so the difference in responses may not be meaningful. However, it also may suggest that the quality of visits became much more divergent in virtual form. In addition, scholars who visited virtually were much less likely to report forming a formal communication plan with their SF versus an informal exchange of email addresses. This may simply be a reporting artifact, but it could also be an indication of the importance of face-to-face meetings in developing lines of communication.

The first question asks scholars to comment on the logistics of their visit. Nearly all of the scholars gave very similar answers: that the SF had identified a facility staff for them to meet and discuss questions with, that they were able to get to the SF with little trouble, and that they were able to tour the SF and other associated facilities as part of their visit. Reports from virtual visits were similarly consistent, with nearly every scholar reporting that the SF had organized a set of virtual interviews with site staff as well as a short presentation on the facility and its history and mission. Some scholars also reported a form of a virtual tour.

The second question was similar to question one in asking about the substance of the visit, and that was reflected in the answers. Many of the answers to the second question were similar to those from the preceding question, and was frequently mashed up with the scholar's answer to question 3 regarding who they met with during their visit. Very few scholars included information in the answer to question 2 that was not included in their answers to questions 1 or 3. Those that did seemed to dilute some of the key information from the other two questions and include it here, such as how many people they met with. Answers to this question did not seem to vary substantially in virtual visits.

Question 3 continued the thread of visit-specific questions. Quality of responses to this question varied substantially, as some scholars provided specific answers regarding with whom they met and the individuals' positions, while others were too vague to provide insights into the visit (e.g., met "a large number of people at the SF"). Additionally, many scholars specified with whom they met (project managers, other SMART scholars, base leadership, etc.) without clearly specifying how many people they had actually met. This lack of specificity made a quantitative analysis of the answers difficult, but a few conclusions were able to be drawn.

This question also asked the scholars whether a communication plan was created. Relatively few scholars (~25%) reported forming a formal communication plan with their SF, most instead reporting an informal exchange of emails and a vague promise to stay in touch. Interestingly, this reporting was not agnostic to the type of visit—scholars who visited their SF in person were significantly more likely to have reported making a communication plan than those who visited virtually (45% versus 7 %, respectively) with their sponsor.

The fourth question pivoted to focus less on the site visit itself and more on the scholar's general compatibility with the SF. In a parallel to Question 3 of the SF's report on the site visit, the scholar was asked how their skills and knowledge could benefit the SF. However, unlike the SF's reports, it seemed that many scholars were unclear on how to answer this question. Most responded that their particular knowledge and skills aligned well with the work of the SF. Some scholars also called out their competencies in specific software or analysis methods that would be relevant to the mission of the SF. It did not appear that many scholars had a strong understanding of the variety of ways the SMART scholars benefit the mission and objectives of the SF when compared to the SF responses to a similar question, as chronicled above.

The fifth question, directed to graduate students, asked how the student's research aligned with the SF mission. Since this was a question exclusively for graduate students, only about a third of the reports IDA analyzed addressed this question. Of those that answered, a few scholars reported that for various reasons (unique thesis requirements, security reasons, lack of graduate research, etc.), their graduate work could not be aligned with the mission of the SF. Those that could answer seemed to provide responses that were

similar to those provided for Question 4 due to the similarity in questions. To some degree, the same difficulties encountered in answering Question 3 persisted through Question 4. As such, most answers to this question were simply broad statements about how the scholar's research and skills fit the mission and needs of the SF.

The sixth question asked scholars whether the funding for their site visit was sufficient. Obviously, this question did not apply to scholars who visited virtually, but among those who did answer, nearly all of them (93%) agreed that the funding was sufficient for them to stay in a hotel, rent a car, fly to the SF, etc. The few scholars from the sample who felt that they did not receive sufficient funding were under fairly unique circumstances: one retention scholar wished they had been compensated for missing several days of work to visit, and another was too young to rent a car and had a parent fly to the SF with them to resolve that.

The seventh and eight questions asked the scholar whether they felt they understood the mission of the SF and whether they felt they were a good fit. Every scholar whose report was reviewed answered in the affirmative for both of these questions. This does make sense as every report reviewed for this analysis was from a scholar who accepted their award, and it would be hard to imagine a scholar accepting their award without feeling that they understood their SF and felt that there was a match.

c. Potential Revisions to the Site Visit Reports

In addition to analyzing the site visit report responses, the IDA team also made some general observations regarding the reports. In terms of the SFs, although it was evident that many of the respondents spent time getting to know the scholar and his/her background during the site visit, a number of responses were focused on the SF's workforce and mission needs with very little information provided on how the scholar, as an individual, met a critical need for the facility. In other words, these reports were largely devoid of evidence regarding how the particular scholar who just completed the site visit was a good fit for the SF and instead the focus of the "fit" was on how the scholar's scholarly and technical expertise will fill a current gap.

Another observation made by the IDA team was in regards to the level of responsiveness to the questions on the SF site visit reports. Some respondents provided thorough, thoughtful responses, while others provided incredibly brief responses (e.g., "candidate meets mission needs"), often times not actually answering the question. It was clear that some facilities approached the site visit reports as a mechanism through which to provide feedback or support to the SPO. On the other hand, other facilities treated the report requirement as a "check-the-box" exercise to note that they completed the site visit and report. The combination of overly general, brief responses, and the observation that many SFs simply copied and pasted their responses into the site visit reports leads us to question the utility of the responses from these facilities and to examine ways in which the

report might be adjusted to increase response efficiency and effectiveness. Table 13 provides some suggestions for how the SF site visit reports could be revised.

Table 13. Revised questions for SF site visit report.

1.	In what ways do the SSPP's (SMART Scholarship Program Participant) award specification meet personnel needs? □ Recruitment of needed talent/expertise □ Retention of needed talent/expertise □ Ability to address critical knowledge/expertise gaps
2.	In what ways did you prepare for the site visit? □ Planned travel/logistics □ Organized speakers □ Organized tour of SF □ Introduced SMART cohort members □ Introduced former/current SMART scholars □ Planned group lunch/dinner □ Introduced to mentors □ Other:_____ Summarize with whom the awardee was able to meet with during the site visit.
3.	Describe the communication plan going forward between the SF and this awardee. Who at the SF will maintain contact with the awardee/scholar and how (email/phone, schedule, etc.) will contact be maintained?
4.	How does the selection of this awardee align with the mission and objectives of your component or facility?
5.	Did the site visit allow you to identify additional ways in which you will be able to utilize the awardee's skills and knowledge (from their field of study) at the SF or allow you to better align the awardee's research/research goals with the SF's mission and objectives, how so or why not?
6.	Do you believe the scholar is a good fit for your facility/component, mission, and objectives, why or why not? What factors outside of the awardee's degree, expertise, skills, etc. make this awardee a good fit for your facility/component?

The scholars' responses to the site visits followed a similar pattern, with some scholars giving detailed answers to the questions with an attempt to be as thorough as possible while others only answered in short, non-descriptive answers. However, as noted above, many scholars struggled to answer some of the questions asked, even those that worked hard on their responses. It was clear that many scholars did not feel they had the knowledge they needed to answer questions such as 2 and 4, and many of their responses were vague and seemingly unlikely to provide the SMART Program useful insight because of it.

These general observations led the IDA team to consider how to increase the efficiency and effectiveness of the site visit reports for the SMART Program. During interviews conducted in support of the current process evaluation, SMART Program stakeholders who operate and manage the program relayed to the IDA team that each scholar site visit report is compared to the parallel SF site visit report to ensure that both parties report similar experiences and that both agree that the overall assessment of a good fit for the SF and the mission is reciprocated. However, based on a comparison of questions on each report, there seems to be only one question that is similar—the question regarding

fit. In other words, the remainder of the questions do not allow for an apples-to-apples comparison of responses between the scholar and the SF. There is, however, a slight disconnect between what has been reported to the IDA team regarding the SMART Program stakeholders' focus in ensuring that the program (including the SF) is a good fit for the scholar. Although the program engages the scholar in a number of ways to ensure that both the scholar and the SMART Program (through the SF) are successful, the site visit report questions on both the scholar and SF versions focus only on the scholar being a good fit for the SF and does not address if the SF is a good fit for the scholar. If a critical feature of the site visit reports is to not only confirm that the scholar is a good fit for the SF but to also identify any potential issues that might arise at the SF, it might be helpful to revise the scholar site visit report to include a question that addresses the scholar's perspectives regarding fit (see Table 14).

Table 14. Revised Questions for Scholar Site Visit Report

1	I received sufficient funding to support travel for the site visit. □ Agree □ Disagree (explain): _____ □ N/A
2	How was the SF prepared for your site visit (select all that apply)? □ Planned travel/logistics □ Organized speakers □ Organized tour of SF □ Introduced to SMART cohort members □ Introduced to former/current SMART scholars □ Planned group lunch/dinner □ Introduced to mentors □ Other:_____
3	Summarize with whom you were able to meet with at the SF.
4	Describe the communication plan going forward between you and the SF. How (email/phone, schedule, etc.) and with whom will you remain in contact with at the SF?
5	What were you hoping to accomplish during the site visit? Were you able to meet your goals for the site visit, how so or why not?
6	Did your SF provide you with a clear understanding of the mission?
7	Did the site visit allow you to identify ways in which you will be able to utilize your skills and knowledge (from your field of study) at the SF, how so or why not? If you are a graduate student, did the site visit allow you to better align your research with the SF's mission, how so or why not?
8	Do you believe the SF and its mission are a good fit for you, why or why not?

When it comes to the site visit reports, a central focus for the SPO might be to identify the capacity in which they would like to use the information provided in the report. If the primary uses of the report are to 1) confirm that the site visit occurred and 2) to confirm that the scholar and SF are a mutually good fit for each other, then the report can be reduced to just two questions. The first question could simply be a confirmation of the date of the site visit and the second question could focus on fit. If the SPO utilizes the responses on the site visit reports, updates to these questions may help to focus the responses in order to avoid some of the aforementioned concerns (e.g., reports focused on the scholar's

discipline/expertise only, redundant responses by the SF for each scholar, increased level of responsiveness to the questions).

In terms of the efficiency of completing the surveys and improving the utility of the information gathered, some of the scholar site visit response report questions could be updated to include a mix of check boxes and questions requiring longer responses. Additionally, the order of the questions could be revised so that similar question topics are clustered together.

Our review of the site visit reports highlighted the variability in responsiveness from both the scholars and SFs. It is possible that some of this variability may be due to the wording of the questions. Going forward, it might be worthwhile for the SPO to identify the goals for the site visit report requirement—if the goal is to ensure that the site visit took place and the scholar/SF feels that each is a good fit for one another, then the questions might be revised to address just these two areas. If the goal is to collect more thoughtful insights regarding how the SF planned for the site visit and the degree to which the SF staff has gotten to know the scholar (and not just their degree/expertise) as an individual who will be contributing to the SF's mission and objectives and the scholar has been able to self-reflect on how well they feel like they are a fit for the work, research, mission, and objectives of the SF, then perhaps revisions to the site visit report questions are in order.

C. Phase 1 – Degree Pursuit

The primary activities during the degree pursuit stage include the scholar attending and completing the school/degree requirements as well as participating in summer internships at the SFs, as shown in Figure 13. Also, at the beginning of this stage, SFs should process the scholar's security clearance so that the scholar will be cleared by the time the internship occurs the next summer. It is during this stage that scholars gain knowledge and skill from the university, but also gain valuable work experience and an understanding of their SF during the internship or through communication with their SF mentors.

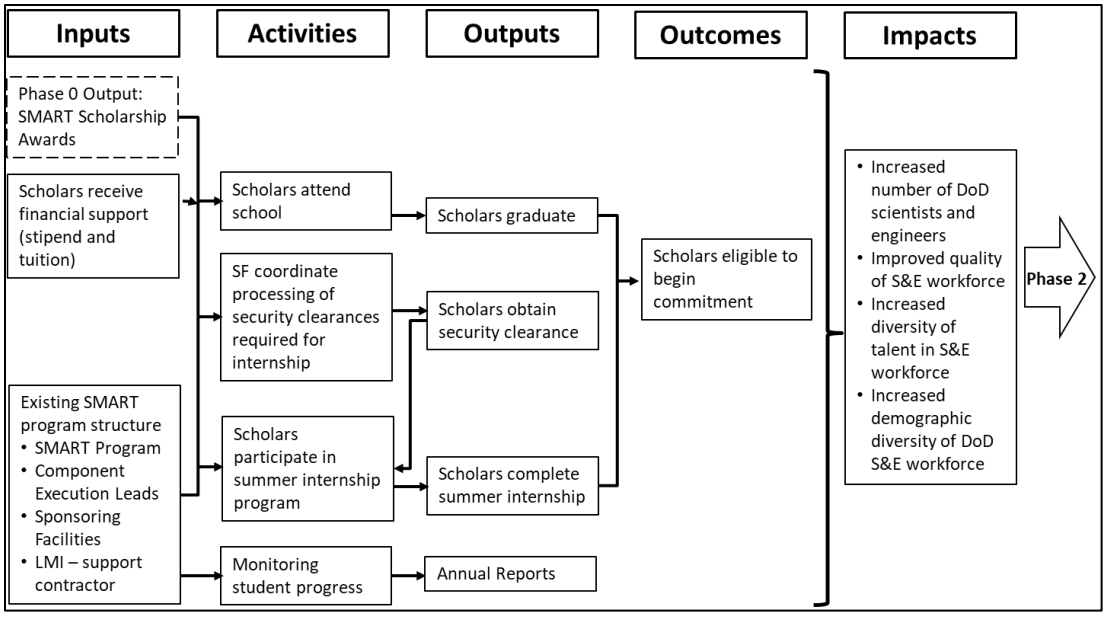

Figure 13. Logic Model: Degree Pursuit

During the degree pursuit stage, called Phase 1 by the SMART Program, there are multiple reports that the scholars must complete that enable the SMART Program to monitor their continued progress towards completing their degree. These reports include the annual reports that are completed in May that indicate how the scholar is progressing towards his or her degree requirements, which is an opportunity for a scholar to inform the SPO on progress as well as any notable achievements during the year. There are also Internship reports that the scholars generate after they complete a summer session at their SF, which allow for feedback on how well the internship went. The Internship report also provides an opportunity for the scholar to indicate that there is an issue that they would like to discuss with a Scholar Coordinator.

1. Scholarship

a. SMART Degree Levels and Disciplines

As previously described, scholars are drawn from 21 STEM disciplines and a range of degree levels from Bachelors to Doctorates. The four most common scholar degree disciplines are represented by computer sciences and engineering, electrical engineering, mechanical engineering, and aerospace engineering. A view of these awards across the last three application years (2018–2020) in Figure 14 below reveals that these top four disciplines have remained consistent. However, computer science and engineering scholars continue to outpace the other disciplines reflecting a growing need across the SFs for such expertise. Another point drawn from Figure 14 is that some disciplines have a more balanced mix of degree levels while others incline towards a particular degree level. For

example, PhD-level scholars dominate the awards in physics, oceanography, and nuclear engineering, while mechanical engineering and electrical engineering see a majority of BS-level scholars.

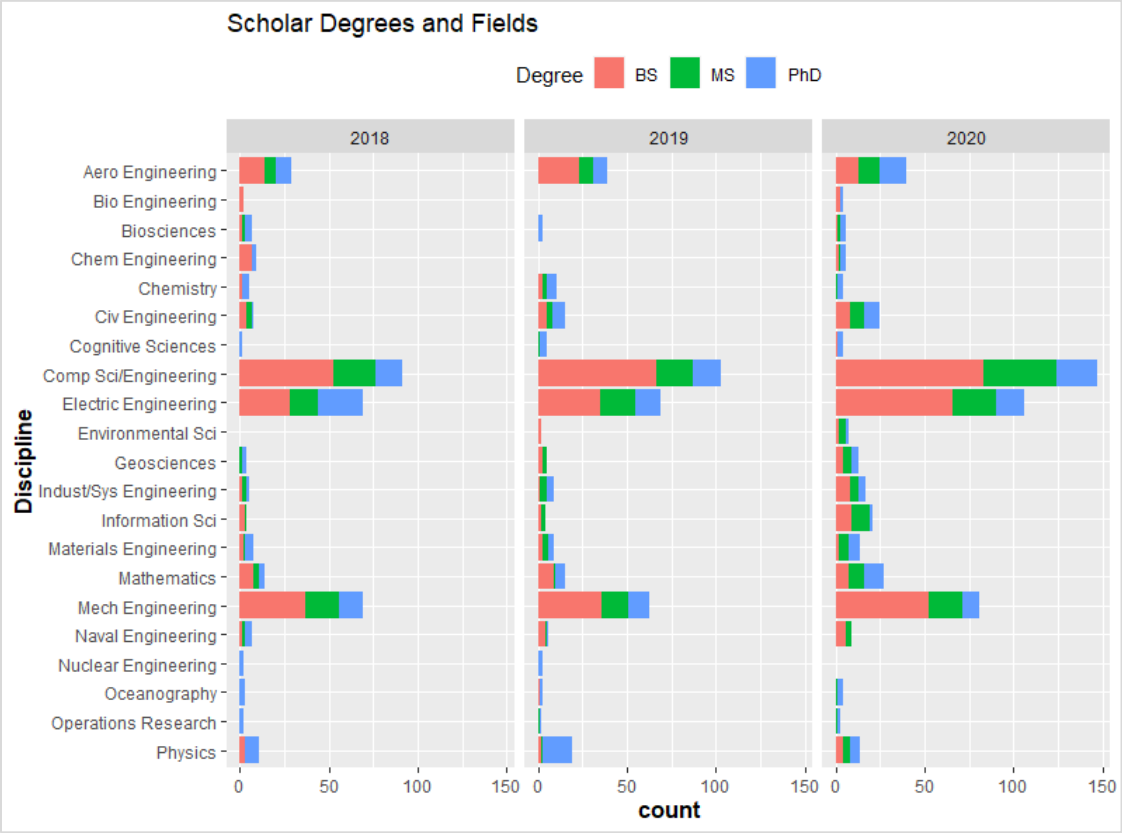

Figure 14. Degrees Across Disciplines for 2018–2020

b. Comparison to NDSEG Disciplines

The SMART Program is one of several tools for the DoD to promote education in particular disciplines or that may motivate recent STEM graduates to come work for the DoD. Section 251 of the National Defense Authorization Act for Fiscal Year 2021 (FY21 NDAA) directs the DoD to establish or designate an office to coordinate scholarship and employment programs across the DoD. While this NDAA direction is not focused on STEM, it would definitely include programs like the SMART Program. A compendium of other programs that share some features with SMART is provided in Appendix A. One particular way to compare the SMART Program with other programs is by the graduates in particular disciplines that the programs facilitate the student to attain. In this subsection, we provide a comparison of students in particular disciplines across the SMART and DoD National Defense Science and Engineering Graduate Fellowship (NDSEG) Programs as an example of how such comparisons may facilitate potential collaborations to most efficiently address particular workforce needs.

The NDSEG is a scholarship awarded to U.S. citizens, U.S. nationals, and U.S. dual citizens who intend to pursue a PhD. degree aligned to the DoD services Broad Agency Announcements (BAAs) in research and development at a U.S. institution of their choice. The NDSEG Fellowship lasts 3 years and covers full tuition, a monthly stipend, and additional costs with no service requirement. So, the two main differences are that the NDSEG awardees are not required to work as a federal civilian for the DoD, and it is only for those pursuing PhDs with an expectation that they will continue to do research after graduation. Figure 15 below portrays the distribution of awards as a percentage of those across the relevant disciplines for a representative sample of 337 NDSEG fellows between 2000 and 2009 (Belanich et al. 2019), compared to the SMART Program.

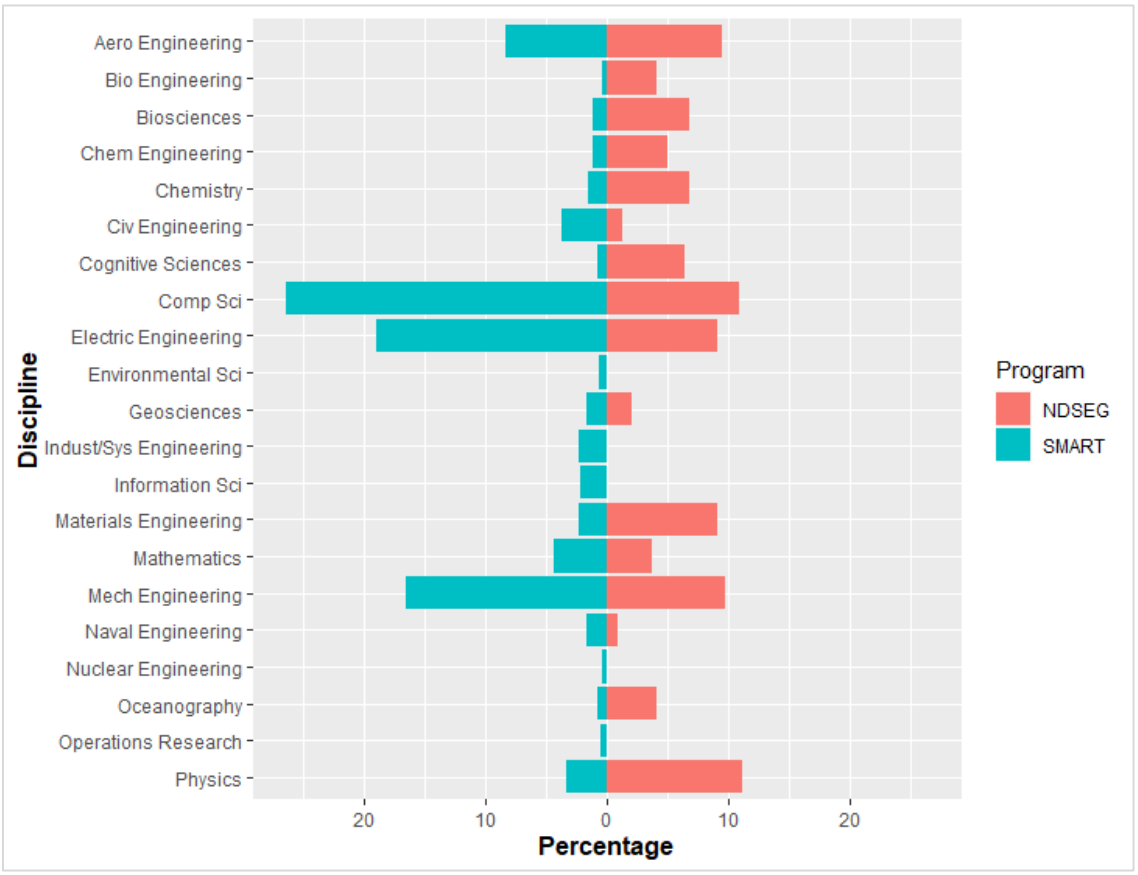

Figure 15. Distribution of Awards for NDSEG versus SMART

Differences in program disciplines are clear. NDSEG includes a smaller range of STEM fields, with the noted absence of operations research, environmental sciences, information sciences, industrial and systems engineering, nuclear engineering, and biomedical engineering. Some of these differences may be due to the collapsing of certain disciplines into broader disciplines (e.g., various types of engineering are folded into an "engineering" discipline) for the purposes of NDSEG. As such, information sciences may

be folded into computer sciences, accounting for its absence. Another obvious difference manifests in the more even distribution of awards for NDSEG compared to SMART. For example, for some disciplines where the SMART Program has a relatively low fraction of scholars, such as physics, biosciences, biomedical engineering, cognitive sciences, chemistry, and chemical engineering, NDSEG sees a sizable portion of fellows. The emphasis of these areas makes sense, given their relevance to the DoD Office of Basic Research. Considering the disparities in how different fields are emphasized for the SMART Program, a pertinent question arises regarding whether the blanket-use of the 21 STEM disciplines is optimal. Also, this type of program comparison may be useful for coordinating across scholarship and employment programs as directed in Section 251 of the FY21 NDAA.

A review of Appendix A that lists several programs that share some characteristics with the SMART Program indicates that there are other programs where it may be useful for coordination. For example, there are two programs that focus on cyber and computer science capabilities, which is the SMART Program's most common discipline sought by SFs. If some SFs leveraged these other cyber-focused programs for their computer science needs it may enable the program to shift some of their resources to other disciplines. The two programs are CyberCorp, a federal-wide scholarship for service program, and the DoD CySP, a scholarship for service program for students at universities designated as National Center of Academic Excellence in Cybersecurity. Both cyber-focused programs are open to Bachelors, Masters, and Doctorates.

2. Monitoring of Degree Pursuit

a. Phase 1 Annual Reports

As components of their annual requirements for the SMART Program, scholars are required to complete annual reports for each award year. (Phase 3 reports are requested for up to 10 years into Phase 3.) IDA requested a random sampling of annual reports from the 2014, 2016, and 2018 cohorts for each degree level and awardee type (retention versus recruitment) (see Table 15). The 76 reports received by IDA represented scholars from across all the sponsoring facilities, military branches, and Fourth Estate. Because the 2018 scholar cohort had not started Phase 3 at the time of writing of the present report, these reports were not included in the current analysis.

Table 15. Number of Annual Reports Reviewed by IDA by Phase and Degree

	2014			2016			2018		
	BS	MS	PhD	BS	MS	PhD	BS	MS	PhD
Phase 1	3	3	4	4	4	1	4	4	2
Phase 2	3	3	4	4	4	1	4	4	2
Phase 3	4	1	4	4	4	1	N/A	N/A	N/A

1) Phase 1 Annual (Degree Pursuit) Reports

The SPO requires that scholars submit all Phase 1 reports no later than June 1 for each award year. For example, a scholar awarded the SMART Scholarship for 3 years will complete three Phase 1 reports. The Phase 1 report tracks and projects completion of degree requirements (using similar questions to those on the SMART Educational Work Plan [DD3067-2]) over the course of the previous academic year (to include fall and winter semesters). This information is used by the SMART Program to project the number (and start dates) for SMART-required internships and each scholar's Phase 2 planned start dates. The report also requires the scholars to disclose any outside funding or employment, health insurance coverage, study abroad activities, and notable achievements during the award period.

Of the 29 Phase 1 reports received by IDA to conduct the current process evaluation, all were completed during the final year of the award (i.e., before the scholar commenced Phase 2). Additionally, 17% (5 of 29) of Phase 1 reports were completed by retention scholars (see Table 15 for a breakdown of the Phase 1 reports by degree). A vast majority of the reports (69% or 20 of 29) were completed by scholars pursuing a degree in engineering (mechanical, electrical, aerospace, chemical, civil, industrial and systems, nuclear, biological systems, or computer) and the remainder of the reports were completed by scholars pursuing degrees in computer science, mathematics, operations research, robotics, or geosciences. Outside funding or employment was obtained by 55% (16 of 29) of Phase 1 scholars and some scholars received both outside funding and outside employment. Given the caliber of SMART scholars accepted into the program, it is not surprising that many received additional scholarships or employment as interns for organizations focused on the scholar's discipline such as teaching assistant positions at the scholar's university, and other discipline-related employment. Likewise, many Phase 1 scholars reported notable achievements during their final year of university matriculation. Specifically, 38% (11 of 29) of scholars reported receiving at least one academic award or accolade (e.g., valedictorian for the discipline's graduating class, Dean's list, graduation with distinction) and 31% (9 of 29) of scholars reported having at least one peer-reviewed journal publication or academic conference presentation during the reporting year.

Finally, a number of scholars provided additional commentary in regards to their work experiences in the SMART Program. Most scholars responded that they were appreciative of the educational and occupational opportunities afforded to them because of the SMART Program. A few scholars noted that their positive experiences during the internships solidified their excitement in returning to the SF for Phase 2 of the program. The SPO and SFs are particularly interested in the long-term retention of SMART scholars. Although the Phase 1 reports do not include information regarding the scholar's long-term career goals, a few scholars noted potential plans after completing Phase 3. For example, these scholars reported that the SMART Program experience may open up opportunities for university tenure (teaching) or in the private sector, if the scholars choose to follow those paths. Information like this could be used to understand the context around scholars leaving their SF position.

2) Potential Revisions to Phase 1 Annual Reports

IDA discussed the purpose and review process for the annual reports with a number of stakeholders. The SFs relayed to the IDA team that they do not see the annual reports. However, many would appreciate being able to review them to help make changes to how the program is run, if needed, or to see what is working well. The SMART Contract Support Office explained that the purpose of the annual reports is to track the scholar's progress (Phase 1), identify any potential issues with the program (SF, scholar fit, or any other issue), and to highlight successes (e.g., awards, publications). During the stakeholder interviews, the IDA team learned that it is rare that an issue is reported on the annual reports as most issues receive immediate attention from a number of different stakeholders throughout the process. For example, the SF point of contact often has regular contact with the scholars. Thus, they are often the first to be alerted to an issue, either by the manager at the SF or the scholar. Many of the SF points of contact that the IDA team spoke with referred to themselves as "den mothers" regarding their close relationships with the scholars. If the issue cannot be resolved at the SF level, the Component Liaison or Scholar Coordinator[23] may also work to address the problem. For example, if a scholar would like to change SFs, the Component Liaison will discuss possible options with the scholar. Likewise, if the scholar feels like their skills are being underutilized at the SF, the Component Liaison will reach out to the SF POC to address the issue. If, for some reason, it seems that it is a truly systemic issue where the SF is not using the SMART Program as they should, the Component Liaison will reach out to the Component Execution Lead and the SPO.

[23] Each scholar has a designated Scholar Coordinator (SC) within the SMART Program. SCs are the first POC for scholars and are part of the SMART Support Contractor Team.

It is clear from reviewing the Phase 1 report that the first portion (Section 2) tracks the scholar's Educational Work Plan. The Phase 1 reports also allow the SMART Contract Support staff to ensure that the scholar is on track to begin an internship or graduate from their degree program and move onto Phase 2 (service commitment). This information is critical as the preparation of hiring documents by the SFs are time sensitive. Additionally, the SF is counting on each scholar to join and contribute to the SF's workforce and mission—delays in hiring and on-boarding scholars can result in delays to critical projects or tasks, which could be problematic. The Phase 1 report allows for the SMART Program to avoid such situations.

The purpose of some other sections of the Phase 1 report is unclear. For example, stakeholders revealed that in addition to the Phase 1 reports, scholars are required to complete an internship report (DD3076-4) within 14 days of completing an internship. These internship reports inquire about how the scholar's field of study applies to the work that they performed at the SF. However, the Phase 1 report already includes a similar inquiry. Specifically, Section 7 of the Phase 1 report asks the scholar to provide a one-line synopsis of his/her academic interests and to summarize his/her desire to pursue a degree in the academic topic/discipline. This information can be (and should have been) obtained from the scholar's application, interview, or site visit. Requesting this information on a yearly basis seems unnecessary. Alternatively, a question on the internship report might inquire how the work and experience gained during the internship has shaped the scholar's interest in their academic pursuits or professional goals. Adjusting the reports (i.e., removing the section from the Phase 1 report and adding a question to the internship report) will allow the SMART Program to better understand how the SF is fostering the scholar's interest in the SF's mission, which may aid in long-term retention. Likewise, Section 8 of the Phase 1 report inquires about two questions: 1) how the scholar's academic and professional goals relate to the mission of the SF, and 2) how the program is helping the scholar achieve his/her professional goals. Given that during Phase 1, the scholar's main interaction with the SF is during the internship, the first question is better suited for the internship report instead of at the end of the academic year. Although the second question regarding the SMART Program's role in the scholar achieving his/her professional goals is fair, our review of the responses shows that scholars focus on what is already known about the program: the program provides the scholar with funding for their degree (and reduces the stress/burden for the scholar to obtain funding), provides valuable on-the-job experience through the internship, and provides employment. Our review of the Phase 1 reports shows that the second question provides no additional insights for the SPO.

b. Internship and Internship Reports

Summer internships are required for all recruitment scholars who receive a scholarship that spans a summer. Scholars receive internship support payments[24] during the time that they work at the SF, becoming familiar with the facility where they will work after graduation. The internship is described as providing scholars with "valuable employment experience and, therefore, are waived only in very rare circumstances."[25] In contrast, retention scholars do not participate in formal internships, but are expected to return to work during breaks in their schooling.

Historically, the SMART Program has provided scholars with awards that span 1–5 academic years. However, beginning with the 2019 cohort, the minimum award length was changed to 1.5 academic years for recruitment scholars.[26] This change was implemented in order to allow eligible scholars the opportunity to complete an internship with their SF prior to the start of the service commitment and hiring as a civilian employee (Phase 2).[27]

The 8–12 week (56–84 days as calculated from start to end date and including weekends)[28] internship allows the scholar to contribute to the SF's mission, establish work relationships, and become familiar with the culture of the SF. Most scholars receiving more than 1 year of academic support embark on an internship during the summer after each year until they matriculate from their degree program. Although seen by many stakeholders as an important facet of the SMART Program experience, SMART Program policy does not identify the completion of an internship as a requirement for the program or for transition into Phase 2 employment. In fact, the SPO has provided internship waivers during Phase 1 such that scholars can be hired directly into civilian employment without ever having completed an internship. For those SFs that offer internships to scholars, the SPO asks that they "provide valuable summer internship(s)" to SMART scholars, thus the SFs identify scholar supervisors or mentors and tasks/projects for the scholar to work on during the internship period. During interviews with the IDA team, some SFs highlighted the importance of the internships to supporting their long-term workforce needs. Specifically,

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[24] Only those scholars who reside more than 50 miles from their SF are eligible to receive internship support payments.

[25] Quote from SMART scholarship FAQ (https://www.smartscholarship.org)

[26] Retention scholars do not complete internships. Because they are already employed by their DoD facility, in many cases, retention scholars return to their SFs for full-time employment during longer breaks between academic terms. However, returning to the SF where they are employed is not a requirement and as such, some retention scholars remain actively enrolled for all academic terms in a given calendar year.

[27] The SPO issued a Memorandum for Record on March 18, 2021, that changes the minimum SMART award length back to 1 year. This change will go into effect beginning with the SMART 2022 cohort.

[28] Note that the actual number of days on the internship is 40–60 days, which is reflective of the work week during the 8–12-week internship period.

they note that the internships allow the scholars to build relationships at the SF and allows the mentors to become invested in the scholars from the start of the program through and beyond Phase 3.

Due to the COVID-19 pandemic, the SPO waived the internship requirement for those scholars scheduled to intern at their SFs over the summer of 2020. In response to this, stakeholders at SFs reported to IDA that they reached out to their scholars to inquire about the possibility of attending an in-person internship at the SF or participating in the internship virtually. Because the internships were waived, internship support payments were not provided. Nevertheless, SFs reported that that some scholars local to the SFs' area were able to complete the internship either in-person or virtually using their personal computers. Due to the number of unknown factors related to returning to the workplace, many SFs held virtual internships for the summer of 2021.

Scholars who complete internships are required to complete and submit reports to the SPO after each internship. IDA requested a random sampling of five reports from each Component (Army, Navy, Air Force) and the Fourth Estate from the 2018, 2019, and 2020 cohorts. In total, IDA received 59 internship reports.[29] The report template contains five sections requesting a variety of information (see Table 16 for a summary of the template) with Section 1 requesting basic information regarding the scholar and SF (e.g., name, phone, email, sponsoring service, SF name, supervisor name/email, mentor name/email, internship start/end dates). The following sections provide an analysis of the internship report responses on the aforementioned sampling from scholars. The first eight questions are open-ended text responses where a scholar can write free-text, and the last question is a Yes/No checkbox item. We note that no scholar requested a meeting/discussion with their Cohort Administrator, which is also known as the Scholar Coordinator (Question 9), thus our analysis omits the responses to this question.

Table 16. Internship Report Template Questions

1	In what ways was your SF prepared for your internship?
2	Summarize the general work you performed on your own and with your mentor/supervisor during the internship.
3	When you begin working for your SF, how will your duties be different from your internship duties?
4	What skills or knowledge from your field of study were utilized during your internship?
5	In what ways were your professional skills expanded during your internship?
6	How sufficient were the internship support payments in supporting your ability to attend the internship?

[29] We received 20 reports for internships completed in 2018 and 2019 (5 reports from each service and the Fourth Estate) and 19 reports for the internships completed in 2020 (5 reports from the Army, Navy, and Fourth Estate and 4 reports from the Air Force).

7	Describe one aspect of your internship you would change.
8	Describe your favorite moment or aspect of your internship.
9	Would you like your Cohort Administrator (CA) to contact you about any issues/comments/concerns regarding your internship?

1) Analysis of Reports

Despite requesting only a small sample of internship reports, we are able to make a number of observations regarding the report template and responses to the questions on the template. First, the 2018 and 2019 internships took place in-person at the SF. Second, as noted above, due to the COVID-19 pandemic, the SPO waived the internship requirement for those scholars scheduled to intern at their SFs over the summer of 2020. Of the 2020 internship reports we reviewed, nine scholars completed internships virtually, nine scholars completed them in-person, and one internship was a mix of virtual and in-person work. Depending on the number of years a scholar participated in the SMART Program, it is possible that the COVID-19 pandemic affected the scheduled internships for scholars from all three cohorts reviewed in this section. Based on the reporting, nine scholars who participated in the 2020 internships had also completed one to two in-person internships during the prior years, while for nine scholars the 2020 internship period was the first experience working at or with their SF.

Across all three internship years, scholars reported that the SF assigned them both a supervisor and a mentor (who were the same individual on some occasions). In fact, all scholars identified a direct supervisor and 55 identified a mentor (4 did not name a mentor) on the internship reports. The scholars also indicated the length of their internships (see Table 17 for details). We found that although the average internship lengths were within the window of the required length, the actual lengths of individual internships are variable. For example, the longest internship in 2018 was 123 days, while the shortest was 11 days (i.e., 2 workweeks) in 2019.

Table 17. Reported Length of Internships

Internship Year	Shortest Internship (days)	Longest Internship (days)	Average Internship (days)
2018	51	123	73
2019	11	81	63
2020 (in-person)	20	95	65
2020 (virtual)	59	94	73

Another observation focused on the starting date for the internships. Although a vast majority of internships (51 of 59) were in the summer months (May 1–August 1), a few (5 of 59) scholars started their internships over the winter months (December 1–February 28)

and a few (2 of 59) began their internships in the fall (September 1–November 30). Although the average length of the internships seems to vary with the time of year (or academic semester) that the scholar started his or her internship, this is likely due to the unique circumstances that led to approval of a non-summer start. For example, for the 2018–2020 period, the average length of the internships was 48 days (winter start) and 70 days for both fall and summer starts; however, much of this difference was due to two very short winter internships, which is the exception, not the norm. As previously noted, internships are set by the SPO to take place over the summer academic term for a duration of 8–12 weeks (56–84 days). The scholars work directly with personnel at their SF to determine the actual length of the internship and any related logistics. Scholars are able to request amendments to the duration or timing of the internships by submitting a Service Agreement Amendment Request to the SPO. When asked about desired changes to the internships (Question 7), it should be noted that a number of scholars stated that they would change the length of the internship (and associated support payments) so that those scholars wanting to extend their internships are able to do so. These scholars noted their desires to complete critical tasks and take part in team presentations/exercises.

Scholars reported on how the SF prepared for the start of the internship (Question 1). Many scholars noted that the SF took a number of steps to prepare for rapid onboarding such as requesting that the scholar complete the facility access (e.g., Common Access Card [CAC]) paperwork prior to the start of the internship. Additionally, a large number of scholars were appreciative of their communications with their supervisors prior to the start of the internship. The scholars reported that these communication efforts were integral to identifying and setting up projects that utilized or built upon the scholars' knowledge base. Scholars also reported that many SFs identified teams such as those involved in on-boarding and project teams/colleagues to make the internship start seamless. From a day-to-day standpoint, scholars noted that the SFs provided workstations on the first day, however, access to IT systems was not always a smooth process. One repeatedly described issue was the reactivation process for CACs, which after each internship are deactivated (Question 7). Scholars found the repeated completion of the paperwork tedious. In some cases, reactivation of CACs took several days to weeks, affecting access to both the SF and materials needed to complete work. We noted several issues that may have been specific to the reporting scholar's situation (i.e., these difficulties were not reported by more than one to two scholars). Such challenges included how a scholar's designation (contractor versus civilian) impeded access to the SF/IT systems, need for better communication with the scholar regarding location of internship, desire for increased interaction between other scholars and SF colleagues, and clarity regarding the role of the internship tasks relative to the work of the SF.

Scholars provided descriptions of the work they performed during the internship in response to Question 2. Many scholars noted working independently on projects while

meeting regularly with supervisors or mentors while others reported working with teams on a common task or problem set. Furthermore, all scholars reported utilizing a number of skills and existing knowledge from their fields of study (Question 4). In terms of professional skill development (Question 5), many scholars appreciated the expansion of their technical, communication (writing, digital), presentation and public speaking, management (project and financial), networking, leadership, and team working skills that the internship afforded them. Scholars also reported developing a better understanding of government organization and research (particularly working with active duty service members) and developing in-depth knowledge regarding the work of the SF during the internships. Regarding changes that the scholars would make to the work they performed during the internship (Question 7), some scholars noted a desire for greater assigned responsibilities during this time. For example, some requested that the work be more technical, related to their field of study, and wished for additional time in the laboratory versus simply providing oversight or program management. Likewise, some scholars, particularly those who completed the internship virtually, relayed their desire for tasks based on real data or SF needs instead of analyzing "dummy" or test data. Finally, a few scholars described their desire for increased mobility between teams at the SF to develop a better understanding of the different research and development areas of the SF.

The SMART Program provides all approved scholars with internship support payments (ISPs) at a rate of $1,000/week to cover costs associated with the change in duty station. Overall, scholars noted that the ISPs were sufficient for the internship period (Question 6).[30] Of note, because the SPO waived internships for all scholars in 2020, they did not issue ISPs during this time. Still, scholars were able to request an in-person internship in 2020 if the SF was able to accommodate the request and the scholar was located within 50 miles of the SF. Alternatively, scholars were able to request virtual internships if the SF was able to accommodate this request. Again, ISPs were not issued for any internship during 2020. A handful of scholars reported that the support was insufficient to cover their costs during the internship. From our observation, these scholars generally interned in areas with high costs of living, thus the standard ISP amount may have been insufficient.

Scholars reported on the most memorable aspect of their internships in question 7. A number of scholars shared similar sentiments regarding the most memorable or enjoyable part of the internship:

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[30] The U.S. General Services Administration sets the Federal Travel Regulations (FTR) that covers the travel and relocation policy for all federal civilian employees and others authorized to travel at the government's expense. The FTR policy explains that relocation and travel/commuting expenses are not paid if a new official station (in this case, the SF) is less than 50 miles from the old official station (i.e., scholar's residence/university). In other words, scholars who reside 50 miles or less from their SF reported not receiving ISPs as they did not meet the FTR policy.

- Collaboration with team and colleagues at SF (to include collaborative atmosphere at SF and camaraderie with fellow scholars and staff)—SF "is a great place to work!"
- Improved technical understanding of how discipline is applied to DoD problem sets
- Ability to work on difficult problem sets and complete critical tasks
- Quality of end deliverables (technology, briefings, papers)
- Exposure to SF practices and policies before becoming a full-time civilian employee

Overall, the scholars report that the SFs have provided them with valuable internship experiences.

Finally, we would like to return to the question regarding how the scholar's duties during Phase 2 will be different from their internship duties (Question 3). In general, the scholars anticipate increased autonomy and responsibility, working on projects with greater/direct relevance to the SF's mission, more opportunities to lead projects, increased writing (grants, papers, instructions) and briefings, being able to work on longer-term projects, and increased travel for data collection or collaboration with other DoD teams. Additionally, other scholars reported that they are either unsure of how their duties will differ during Phase 2 or stated that they anticipate that their duties would remain the same as they were during the internship. It is unclear if their duties would indeed remain the same or if the scholars' responses are indicative of not knowing how their duties will change as civilian employees.

2) Potential Revisions to Internship Reports

IDA discussed the purpose and review process for the internship reports with a number of stakeholders. The SFs relayed to the IDA team that unlike the annual reports, the SFs do not see the internship reports. However, many SFs stated that they would appreciate being able to review them to improve their own internship processes, if needed. The SMART Support Contractor explained that the purpose of the internship report is to keep track of completed internships, to ensure that the experience was positive for the scholar, and follow up on any requests that a scholar may have to discuss concerns/comments/issues experienced during the internship with their Scholar Coordinator.

Although the scholars seemed to provide adequate responses to the internship report questions, the IDA team identified ways in which to increase the utility of the report for the SPO's program oversight responsibilities. The objective of these revisions is to allow the SPO to easily aggregate the data and for analyses pointing to trends or the identification

of significant departures from normative responses. For example, although text analytics on the free-text responses is possible, the data analysis is significantly easier if these free-text responses are converted to selection items. Additionally, Question 3 inquires how the scholar expects their duties to change during Phase 2, however, it is not clear if the SF has been given clear guidance that the scholar should have an understanding of how their duties will differ as an intern versus as a civilian employee. One would expect that the scholar's duties will change from internship to employee. However, the current internship report template does not provide any insights into the question. As such, a revision of the internship report might include the questions listed in the table in Appendix C. The selection items are based on the most commonly reported responses identified in the analyzed internship reports.

The responses to these revised questions could provide the SPO improved insight into the internship experiences for the scholars. These questions can also help to identify potential issues at the SF. Addressing issues that arise during internships may help to alleviate negative experiences for scholars if their feedback leads to actionable change as they will likely return to the SF for additional internships or to commence Phase 2. Responding to concerns raised by scholars may also improve their Phase 2 experiences and lead to longer workforce retention during Phase 3. Finally, providing scholars with a positive experience in Phases 1 and 2 can lead to increased recruitment of talented applicants in future years and potentially retention in the DoD.

3) Recommendations for Adjustments to the Internships

Although the IDA team reviewed a limited number of internship reports, we were able to identify a few areas where changes may improve a scholar's internship experience. First, as noted earlier, a number of scholars would have preferred a slightly longer internship in order to complete critical portions of their research or dissemination efforts. The increase in the length of the internships goes hand-in-hand with a parallel increase in ISPs. Although the SF determines the details of the internship, the SPO may want to consider a policy whereby scholars can request an extension of the internship and ISPs on a case-by-case basis. Given the number of approvals needed for such a request, a scholar would need to make the request no later than a specific point during the internship (e.g., at the midpoint). Considering such requests will allow the scholars to contribute to their knowledge base, discipline, and the SF, and leave a lasting positive internship for the scholar, which may improve long-term retention of the scholar into the DoD STEM workforce.

Relatedly, we reported above that some scholars noted that the ISPs were insufficient to cover their expenses during the internship period. Many of these scholars completed internships in areas with high costs of living. These scholars did not report how they were able to cover their expenses. However, from our review of annual reports, a number of

scholars reported receiving outside support through other scholarships/awards, loans, and employment. Currently, the SMART Program provides the same ISP amount ($1,000) per week per scholar, regardless of where the internship takes place. OPM sets the basic pay rate for federal employees under the General Schedule (GS). Additionally, the base rate of pay is adjusted for the cost of living in a geographic area for federal employees.[31] For example, the locality pay rate for a GS-5 position in Huntsville, Alabama, ranges from $36,541 to $47,389, while the same position in the Washington, DC area ranges from $39,684 to $51,592. Given that OPM has acknowledged the differential cost of living in different parts of the United States, it would seem that a similar system should be applied to SMART's ISPs given the differential cost of living at the SFs.

Although the scholars reported that the SFs had prepared for their arrival in a number of ways, one repeatedly mentioned issue by returning scholar interns was the length of time it took to reactivate their CACs in order to access the SF. Many scholars noted that they were required to complete the same paperwork for each internship in order for their CACs to be reactivated, leading to frustration on their end. Additionally, many reported waiting for more than 1–2 weeks for the processing of the reactivation request in order to access the SF or laboratory and begin meaningful work. A few scholars reported that their CAC issues stemmed from how they were designated in the system—during one internship, the SF had classified the scholar as a contractor while during the next internship, the scholar was classified as a civilian employee. This designation discrepancy caused delays as the SF's security office and human resources office worked out the correct position classification. Depending on the length of the internship, a scholar may spend anywhere from 8 to 25% of their internship waiting for access to the SF, which is a considerable amount of down time. It would benefit the scholar, the SF, and the SMART Program to identify a more efficient way to gain access to returning interns. On a related note, a number of scholars mentioned the slow process to gain computer access (one mentioned scholars not given access to computers for weeks). Given that the SFs have made strong efforts to be prepared for the scholar's arrival, it may be helpful for the SF to prioritize computer access.

Finally, one of the most memorable aspects of the internships for the scholars was their ability to work both with other established scientists in their disciplines and on topics of importance to the SF and the DoD. Scholars reported enjoying their collaboration experiences and getting to know their colleagues on a professional and personal level. One desire mentioned by a few scholars was clearer guidance or approval for travel. Some scholars were asked to present their work at SF-identified locations (e.g., professional meetings, other SF locations) but scholars were either unable to identify the process to

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[31] See https://www.opm.gov/faqs/QA.aspx?fid=de14aff4-4f77-4e17-afaa-fa109430fc7b&pid=6d2e8f23-3322-43c2-a9fd-f8ac7148fb62 for information regarding the federal pay system.

obtain travel funding and approval or were unable to travel due to a lack of funding from the SMART Program. These scholars noted that the experience of traveling with and presenting their work with their team would have contributed significantly to their internship experience. As such, we recommend that the SPO and SF identify ways in which scholars can apply for travel funding during their internships.

3. Security Clearances

The ability to obtain a security clearance is a requirement for the positions that SMART scholars will fill due to their award commitment. Each scholar must have an active clearance (either secret, top secret, or higher, per SF requirements) prior to the start of the internship. At the start of the SMART Program, the SPO managed the clearance process for secret clearances, however, this process was transitioned to the SFs. As noted in the previous section, many SFs collect the required documentation and fingerprints from the scholars during the site visit to ensure that the clearances can be processed during the academic year prior to the start of the internship.

The SMART 1.0 report (Balakrishnan, Buenconsejo, et al. 2018) identified some of the issues that had arisen from the transition of clearance processing from the SPO to the SFs, and through interviews with SF POCs and reviews of scholar internship reports, the IDA team learned that some of these issues persist to this day. One issue that a number of scholars reported was that as interns, they are not federal employees. Depending on the SF, the status of the intern's employment can vary. Some scholars were identified as contractors in SF's hiring system. This designation sometimes limited access to critical materials or information at the SF, ultimately restricting the type of work the scholar was able to do during the internship. The SF POCs noted similar frustrations with the clearance process. One SF POC relayed that their security office had been trying for months to obtain clearances for their scholars but did not have adequate guidance on how to do so, resulting in the SF completing only standard background checks for the internships (instead of the appropriate clearance level).

Another challenge to processing clearances at the SF is that there are 190+ SFs, each with security offices with one or more security managers. There is a high turnover rate of security managers at some SFs, therefore the organizational knowledge regarding the SMART Program, the employment status of the scholars as interns, and the procedures to process clearances for non-federal employees are often lost between security managers. Additionally, the non-federal employee status of the interns requires a great deal of documentation and justification in order for the scholar interns to obtain even interim clearances, which is quite onerous and subject to error; these issues are worsened by the high turnover rate. Although, the Component Liaison supports the SFs in a number of ways, including on the processing of clearances, the suggestion for the SPO to have human resource specialists with experience with the clearance process and the various hiring

authorities to assist SFs with clearance processing was a ubiquitous suggestion by the stakeholders interviewed by the IDA team.

Despite these concerns, a few SFs reported being able to process security clearances with ease due to the expertise of their in-house security. These SFs appeared to utilize a process that worked well for them. First, the SF POC sends the awardee the electronic Questionnaire for Security Processing (eQIP) information when scheduling the site visit and provides assistance in completing the documentation so that everything is ready for submission prior to the site visit. During the site visit, the POC asks that the security office and security manager provide security briefings to the awardees. These security officers also collect the awardee's fingerprints that are submitted with the eQIP documentation to begin the clearance process.

Given that the clearance process has been problematic for most of the SFs, the SPO may want to reach out to the SFs to identify best practices for processing scholar clearances. This information can be used to develop training for the SFs for working with their component or agency security offices. Additionally, the Support Contractor may want to bring in additional staff with expertise in the security clearance process and associated policies to serve as advisors during the site visit periods to assist SFs in processing the clearances.

D. Phase 2 – Service Commitment

In the Service Commitment stage, scholars are hired and begin to satisfy their service commitment. This stage, shown in Figure 16, is called Phase 2 by the SMART Program. It begins when scholars complete their academic and internship requirements, are hired, and begin government service as full-time employees at their SF. Phase 2 ends when the scholar completes their commitment to the SF (i.e., 1 year for each year of scholarship). If scholars leave before the commitment period is complete, then the Component Execution Leads determine the appropriate refund amount the scholar owes the federal government and begins to pursue debt collection.

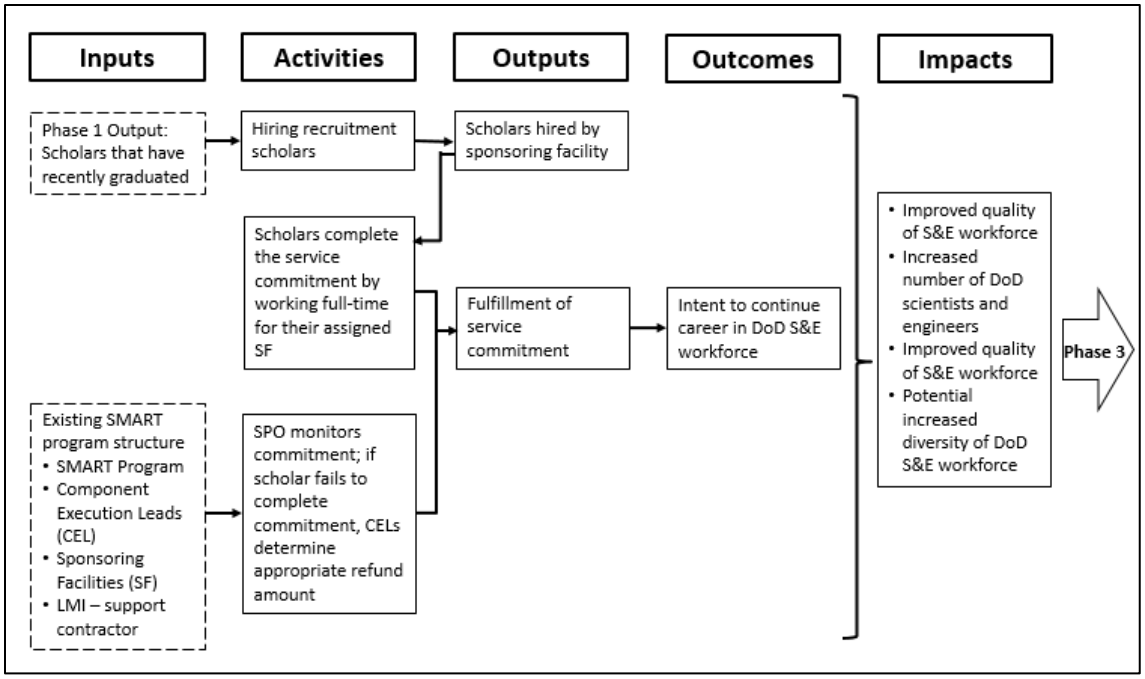

Figure 16. Logic Model: Phase 2 – Service Commitment

During this phase, the key process is for the SF to hire the scholar. An added objective is to employ the scholar as continuing STEM talent for careers beyond their commitment. There is a specific hiring authority for SFs to use for SMART scholars that allows for careers (Title 10, U.S. § Code, Section 2192a[32]). This hiring authority allows the DoD (i.e., the SF) to convert the scholar's position from an excepted service position to a career or career-conditional appointment without additional competition after 2 years of service. It is important to note that the authority indicates that the DoD "may hire" using the SMART hiring authority but its use is not a requirement for Phase 2. Thus, there are many instances where SFs use other hiring authorities, such as the Science and Technology Reinvention Laboratory (STRL) Personnel Demonstration (Demo) Projects.[33] While the use of other (non-SMART) hiring authorities might be easier for some SFs to employ scholars for Phase 2, tracking SMART scholars through their DoD career becomes difficult because alternative hiring authorities are not linked to their DoD personnel records.

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[32] 10 U.S. Code § 2192a—Science, Mathematics, and Research for Transformation (SMART) Defense Education Program—authorizes the DoD to appoint to an excepted service position a person that has successfully completed an academic program for which they received the SMART scholarship and are obligated to a service commitment based on the scholarship.

[33] DoD laboratories designated as STRLs under section 1105 of the NDAA for FY 2010, Public Law 111-84, as amended by section 1105 of the NDAA for FY 2015, Public Law 113-291, and section 1104 of the NDAA for FY 2018, Public Law 115-91 (10 U.S.C. 2358 note).

1. Conversion from Scholar to Employee (post-graduation)

The conversion of a Scholar to a federal civilian working at their SF is in one sense, a mark of success for the SPO as it represents the filling of a workforce need for the DoD. The process of converting a scholar to employee requires involvement from a number of stakeholders—from the Support Contract Office (and Component Liaison) through Hiring Managers at SFs. For recruitment scholars, after they graduate they are hired by their SFs as full-time federal civilians. The sponsoring facilities have their local hiring standards and procedures that drive this process, versus a singular process that is consistent for all scholars.

2. Hiring Process

The hiring process is initiated prior to a scholar's graduation from their degree program. For scholars graduating in May, the Scholar Coordinator will contact the scholar between the December and February preceding graduation to confirm their graduation date. The Scholar Coordinator works with the Component Execution Leads to generate the hiring paperwork for the SFs. If there is any change to the graduation date, the Component Execution Lead will submit a Service Agreement Amendment Request (SAAR) to the SMART Program Office. On the other hand, if the scholar graduates on time, the Scholar Coordinator will change the scholar's status in SIMS to indicate a transition to Phase 2 and will request that the scholar submit a copy of their final transcript with grade point average and degree conferral date.

As noted in SMART 1.0 (Balakrishnan, Buenconsejo, et al. 2018), three legislative actions in recent years directly affected the hiring of SMART scholars. First, in the FY10 NDAA, Congress authorized direct-hire authority for graduates of the SMART Program.[34] Then in the FY15 NDAA, Congress amended the SMART Program requirements such that a scholar could meet his or her service obligation through employment outside of the DoD if there was no suitable DoD position and the other position would provide benefit to the DoD. The service obligation employment in this case can be with a public or private entity or organization.[35] Finally, the FY16 NDAA opened SMART eligibility to citizens participating in the Technical Cooperation Program. This change allowed the SMART Program to accept up to five scholars from Australia, Canada, New Zealand, and the United Kingdom.[36]

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[34] National Defense Authorization Act for Fiscal Year 2010, Pub. L. No. 111-84, 123 Stat. 2484, Sec. 1102(a) (2009), https://www.gpo.gov/fdsys/pkg/PLAW-111publ84/pdf/PLAW-111publ84.pdf.

[35] National Defense Authorization Act for Fiscal Year 2015, Pub. L. No. 113-291, 128 Stat. 3327, Sec. 215 (2014), https://www.gpo.gov/fdsys/pkg/PLAW-113publ291/pdf/PLAW-113publ291.pdf.

[36] National Defense Authorization Act for Fiscal Year 2016, Pub. L. No. 114-92, 129 Stat. 726, Sec. 212 (2015), https://www.gpo.gov/fdsys/pkg/PLAW-114publ92/pdf/PLAW-114publ92.pdf.

The use of direct-hiring authorities has been evaluated by the DoD over the years. Section 809 of the FY16 National Defense Authorization Act[37] established an advisory panel on streamlining and improving the efficiency and effectiveness of the defense acquisition process and regulations. The focus of the advisory panel's report was on the acquisition workforce. Because a similar analysis has not been conducted regarding the hiring authorities for science, technology, and engineering positions for the DoD, the advisory panel's findings are the closest proxy we have to such workforce hiring.

The advisory panel reviewed DoD hiring processes and found that because of their slow pace and rigidity, the DoD's ability to successfully hire talented candidates was hindered. Part of the issue, they note, is that the hiring authorities are too complex to allow for hiring speed and flexibility. Broadly, the hiring authorities provide the rules that a federal agency must adhere to during the hiring process. These authorities allow agencies the flexibility to fill open positions without being bound to the traditional competitive examining processes for Executive Branch hiring. The two primary goals of these flexible hiring authorities are to allow the federal government to bring in specific expertise and to make hiring easier for certain positions, such as scientists or engineers at DoD laboratories. These authorities, however, vary in terms of the affordances they provide. For example, some allow for exemptions for some competitive hiring procedures while others provide agencies with hiring autonomy. The advisory panel found that the federal government used 105 different hiring authorities in FY14 (Section 809 Panel 2018). Currently, there are 27 different DoD technical talent hiring authorities.[38]

Per the advisory panel report, the DoD's annual time to hire using the competitive examining process was, on average, greater than 100 days between FY09 and FY14 and only exceeded 100 days on three occasions when direct-hiring authority was used during the same time period. Although the direct-hiring authorities decreased the average time to hire, the sheer number of direct-hiring authorities available created unnecessary complexity for human resources personnel and hiring offices regarding the appropriate hiring authority to use for specific job openings. Additionally, at times extensive legal guidance accompanying the hiring authority added to the confusion and tension in hiring. These issues have often led hiring managers to use competitive examining processes in lieu of direct-hiring authorities (Section 809 Panel 2018).

In order to increase use of direct-hiring authorities, the advisory panel recommended that the DoD adopt a streamlined list of primary hiring authorities for the acquisition workforce. These improve the speed and flexibility of the hiring process and rendered the

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[37] National Defense Authorization Act for Fiscal Year 2016, Pub. L. No. 114-92, 129 Stat. 726, Sec. 809 (2015), https://www.congress.gov/bill/114th-congress/senate-bill/1356/text.

[38] See https://www.techtalentfordefense.org/resources/list-of-dod-hiring-authorities-and-mechanisms for a list of the DoD technical talent hiring authorities.

other hiring authorities redundant or unnecessary. Specifically, they endorsed the use of a master list of primary hiring authorities to the greatest extent possible and only considered the use of other hiring authorities as a last resort. For the acquisition workforce, the advisory panel recommended a primary list of seven direct-hiring authorities to include the SMART hiring authority. In fact, the advisory panel noted the critical role the SMART Program has for recruiting STEM undergraduate and graduate students and recommended using it to fill critical STEM skill gaps for the acquisition workforce (Section 809 Panel 2018). The panel has been keeping track of if, when, and how their recommendations have been implemented.[39] They report that their recommendation for streamlined hiring authority for the acquisition workforce has been partially addressed by Section 1109 of the FY20 NDAA.[40] Specifically, the NDAA amended Section 9905 of Title 5 United States Code to allow the DoD to recruit and directly appoint qualified candidates to GS-15 and below positions (permanent, term, or temporary) while forgoing the competitive hiring procedures. This direct-hiring authority can be used for a variety of STEM positions such as those involved in the maintenance of weapon systems, hardware, equipment, software, infrastructure; cyber workforce; acquisition workforce involved in the aforementioned maintenance or critical STEM positions. The direct-hiring authority includes STEM within any Defense Science and Technology Reinvention Laboratory. The implementation of the new hiring authority consolidated and canceled 11 others.[41]

In terms of the SMART Program, many SFs utilize the SMART direct-hiring authority (see Title 10 U.S. Code § 2192a). These SFs reported that the combination of the support they receive from the Scholar Coordinators and Component Execution Leads and their ability to use the SMART hiring authority allows for a relatively efficient hiring process for scholars. Occasionally, they reported running into issues with the security clearance process for the scholars, which can be a huge impediment to the entire hiring process. Other SFs reported that they push to align hiring so that the scholars are on-board prior to the cut-off date for the end-of-year pay pool. Doing so allows scholars (as new hires) at the SF to receive salary increases at an accelerated rate. One major issue that was discussed with the stakeholders was how to reconcile hiring under the SMART hiring authority when the SF can only hire using term employment. Due to the complicated nature of the underlying legal authorities of flexible renewable term employment, the SFs relegated to using term employment for SMART scholar hiring have been debating on the best way forward (i.e., appointing scholars to flexible renewable terms or keeping scholars

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[39] See https://discover.dtic.mil/wp-content/uploads/809-Panel-2019/Promo-Outreach/ImplementationTracker.pdf.

[40] National Defense Authorization Act for Fiscal Year 2020 Pub. L. No. 116-92, 129 Stat. 1198, Sec. 1109 (2019), https://www.congress.gov/bill/116th-congress/senate-bill/1790/text.

[41] 5 USC § 9905.Direct hire authority for certain personnel of the Department of Defense.

on term hiring). The issue, of course, is that the term hiring, regardless of the renewable terms, is at odds with the SMART hiring requirement into a permanent position.

The process of hiring (i.e., transition from Phase 1 to Phase 2) may take several weeks, and there is considerable variation across scholars and facilities on how long after graduation it may take before a scholar starts at their SF. Figure 17 shows the length of time for all 2,045 scholars hired by the DoD from the start of the program in 2006 until April 2021. The plot shows how long in weeks it took for scholars to start their DoD job after graduation. At the top, the graph is a boxplot showing the distribution of the data, with a median hiring time of 8.3 weeks after graduation. There are a few scholars with hire dates before they graduate, and these are most likely retention scholars or there may be some issues with the data. The hiring time for most scholars seems to be within a reasonable timeframe, with 75% of scholars being hired within about 12 weeks of graduation. Almost all scholars (95%) are hired within 26 weeks. As a comparison, the median time to hire (hire 50%) for STEM position at the defense laboratories in FY17 was 88 days, or 12.5 weeks.[42] The time to employment can be longer than 3 months for a quarter of the scholars who complete the program. However, the SMART Program eases the delay by providing the scholar with a stipend until they are hired by the SF. While the process for hiring SMART scholars appears to be working well the concern is with the scholars who take extraordinarily long times to be hired, and this may warrant further analysis to identify particular issues where there have been difficulties. We note that the Component Liaisons have put together a Tiger Team to examine and share best practices across a number of SMART Program processes with SFs. For example, in June 2021, the Tiger Team presented a briefing on best practices on hiring scholars in a timely manner.

[42] Government Accountability Office. 2018. Report to the Committee on Armed Services, US Senate, DoD Personnel: Further Actions Needed to Strengthen Oversight and Coordination of Defense Laboratories' Hiring Efforts. (GAO-18-417).

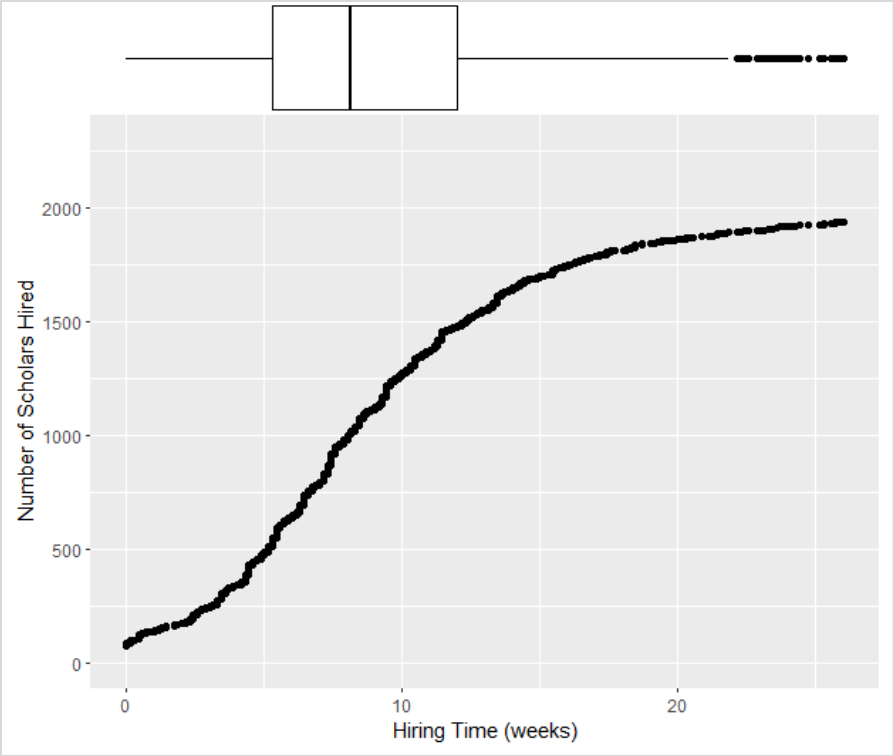

Figure 17. Plot of scholars and how many weeks between their graduation data and the start date for their job. The scholars are ordered by hiring time.

Over the years, it seems like hiring is taking longer. By splitting the awardees into three cohort bins (2006–2010, 2011–2015, and 2016–2020), hiring times can be compared, as shown in Table 18. Both the median hiring time (hiring 50%) and the time to hire 90% of scholars was shortest for the 2006–2010 cohort, then slightly longer for 2011–2015, and longest for 2016–2020. An ANOVA (analysis of variance) statistical test indicated there was a difference across cohorts ($F = 3.321$, $p = 0.0363$), with a statistically significant difference between the 2006 to 2011 and the 2016 to 2020 cohorts ($p = 0.0358$).

Table 18. Median and 90th percentile Hiring Times as Measured in Weeks from Graduation across Three Sets of Cohorts, 2006–2010, 2011–2015, and 2016–2020

Award Cohorts	Median Time to Hire	Time to Hire 90% of Scholars
2006–2010	7.3 weeks	18.3 weeks
2011–2015	8.3 weeks	19.7 weeks
2016–2020	9.4 weeks	20 weeks

An analysis across degree level indicated that there is a little difference between the hiring time for scholars who receive different levels of degrees, as shown in Table 19. While the MS degree graduates had the lowest median time to hire, it took longer for that cohort to have 90% of the scholars hired than for BS degree graduates. Conversely, the BS

degree graduates had the longest median time to hire. While an ANOVA statistical test indicated there was a difference across groups ($F = 7.462$, $p = 0.00059$), the only significant group difference was between BS and PhD (adjusted $p = 0.00048$). This is probably due to the outliers in each group, and that many more MS and PhD graduates were hired prior to graduation as compared to BS

Table 19. Hiring statistics of the scholars separated by degree level across BS, MS, and PhD degree recipients. The scholars that did not have data on their hiring time were omitted before calculating the statistics. The median and 90th percentile hire times in weeks from graduation.

Degree Level	Median Time to Hire	Time to Hire 90% of Scholars
Bachelor's	8.6 weeks	18.7 weeks
Master's	7.4 weeks	19 weeks
PhD	8.1 weeks	19 weeks

3. Service Commitment

While SMART scholars are completing their service commitment, they are full-time employees of the SFs. As such, the SFs compared to the SPO have far more interaction with and influence on the scholar. Therefore, the responsibility to retain Scholars through the service commitment lies more with the SF than the SPO. One effort that may help with retaining Scholars through the service commitment stage is the initiation of the SMART Scholar Symposium that began in 2015 at the Naval Air Systems Command's Patuxent River facility but has since expanded. Due to COVID-19, the symposium was canceled in 2020 and held virtually in 2021.

a. Phase 2 Service Commitment Reports

Just as with the Phase 1 reports, the SPO requires that scholars submit all Phase 2 reports no later than June 1 for each year. The Phase 2 report tracks any updates to the scholar's contact information, adds any notable achievements during the Phase 2 year, and includes an inquiry regarding any issues to bring to the attention of the SPO for follow up.

Of the 29 Phase 2 reports received by IDA to conduct the current process evaluation (see Table 15 on page 70 for the degree breakdown of the Phase 2 reports), many were incomplete in terms of scholar responses/input. As such, the analyses provided in this section reflect the reports where the information was provided. For example, 14% (4 of 29) of the reports did not include information on scholar type. Of the Phase 2 reports we analyzed, retention scholars (3 of 29) completed 10%. Additionally, of the scholars that provided the information, 65% (18 of 26) of the reports were completed by scholars whose work at the SF focused on engineering (mechanical, electrical, aerospace, chemical, civil, industrial and systems, nuclear, biological systems, or computer) and 23% (6 of 26) of

scholars worked on computer science-related topics. The remainder of the scholars worked in operations research (n = 2), oceanography (n = 1), or did not provide information regarding work area (n = 4). Of the scholars who responded to the question, 47% (9 of 19) reported receiving a pay raise or promotion while 53% (10 of 19) did not receive a pay raise or promotion (10 scholars did not respond). Many Phase 2 scholars reported notable achievements during the reporting period. Specifically, 55% (16 of 29) of scholars reported receiving at least one professional award or accolade, peer-reviewed journal publication, or conference presentation. A number of scholars reported more than one such achievement over the course of the year.

Finally, due to the number of incomplete Phase 2 reports, the analysis of these reports was difficult. For example, the IDA team could not always distinguish between reports where the scholar may not have had any notable achievements from those reports where the scholar opted not to provide a response. Still, scholars generally responded to the final question on the report template noting that they would not like the SPO to contact them about any potential issues or concerns regarding their Phase 2 employment. The IDA team learned during stakeholder interviews conducted during this process evaluation that scholars do not wait to alert the SF or SPO of issues via the Phase 2 report. Instead, due to the continued contact between the scholar and SF POC, any potential issues are discussed and addressed as they arise.

b. Revisions to Phase 2 Annual Reports

The purpose of the Phase 2 report seems straightforward. Again, stakeholders report that any potential issues are brought to the attention of the program through the appropriate channels before the annual Phase 2 reports are completed. Given the brevity of the Phase 2 reports, it seems that scholars should be able to provide the requested information with very little effort. However, many of the Phase 2 reports we reviewed were incomplete. Although Section 3 of the Phase 2 report inquires about the discipline or topic areas of the scholar's work, the SPO could obtain a better understanding of Phase 1 if the Phase 2 report asked how Phase 1 activities prepared the scholar appropriately for Phase 2. Specifically, this section of the report could instead ask the types of questions listed in Table 20.

Table 20. Example Questions for Phase 2 Annual Reports

1	I am able to apply my educational background/expertise in my work at the SF. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Additional comments:
2	I feel that my experiences (with the SMART Program or SF) during Phase 1 prepared me for Phase 2. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Additional comments:
3	What changes, if any, could the SMART Program implement to ensure that a Scholar's expertise is utilized to the fullest extent possible or better prepare them for Phase 2?
4	I have been able to take advantage of additional professional development opportunities at the SF. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Additional comments:
5	I feel overworked or pulled in multiple directions in my current position. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Additional comments:
6	I feel underutilized in my current position. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Additional comments:
7	I plan to remain employed with my SF (or within the DoD) beyond my service commitment. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Additional comments:
8	If this is not your first year in Phase 2, how has your previous service commitment experience shaped your professional goals?
9	What changes can be made to the program to ensure long-term retention of SMART scholars such as yourself?

Responses to questions about how one phase may have influenced another phase may provide actionable information that could strengthen the understanding of the influence of activities across phases. This information could be used by the SPO to address or potentially improve long-term retention of scholars in the DoD workforce.

E. Phase 3 – Post-Service Commitment

After scholars complete their service commitment, they may continue working for the DoD. The expectation is that SMART scholars will stay in government service, but they are not required to do so. Figure 18 depicts the segment of the logic model that pertains to this Post-Service Commitment stage that the SMART Program calls Phase 3. At this point, the Scholars have technically completed the SMART Program requirements. However, the SMART Program continues to monitor scholars through the submission of annual reports for 10 years. Additionally, Phase 3 scholars may act as mentors or become ambassadors for the program.

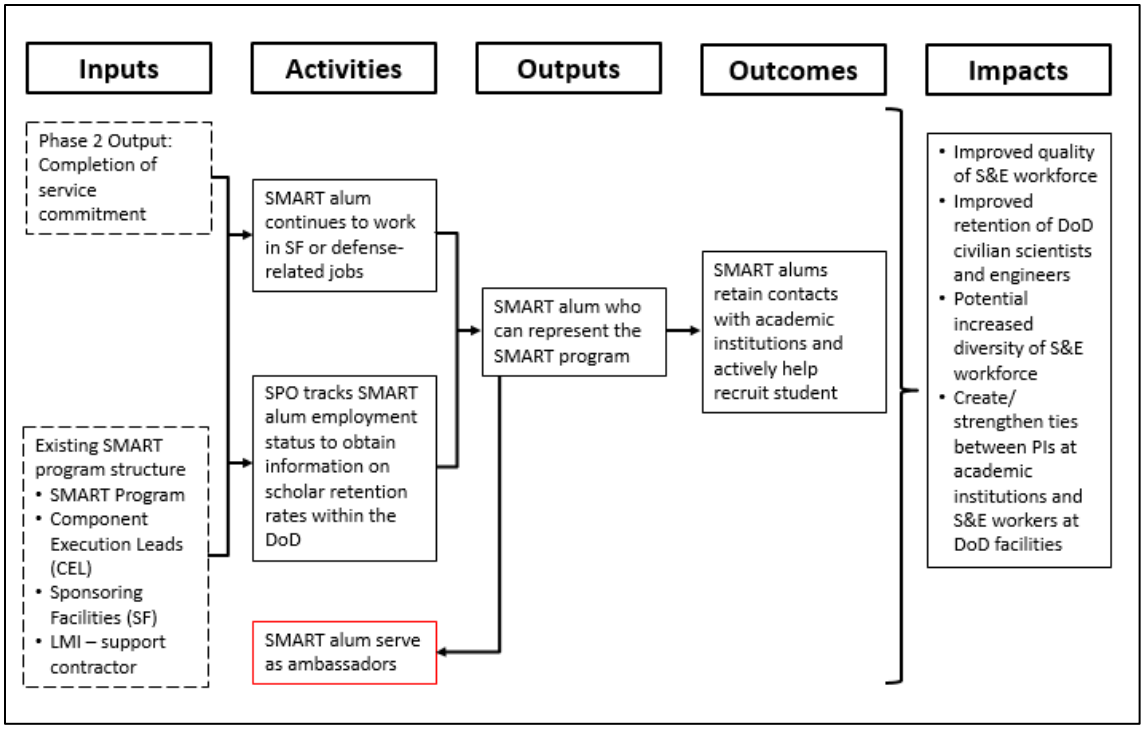

Figure 18. Logic Model: Phase 3 – Retention. Those with dashed borders are activities/outcomes from previous phases. The red border denotes a relatively new activity or output.

One of the more salient findings from the SMART 1.0 evaluation was that the program did not facilitate long-term retention of SMART scholars at DoD SFs post-service commitment (Balakrishnan, Acheson-Field, et al. 2018). The findings from the earlier evaluation showed that the SMART recruitment scholars were leaving DoD employment faster than their DoD S&E civilian comparison group. The following sections present factors that may influence retention in Phase 3 and some actions that the SPO has taken or could take to address the retention problems.

1. Phase 3 Post-Service Commitment Reports

Again, similar to the Phase 1 and 2 reports, the SPO requests that scholars submit all Phase 3 reports prior to June 1 each year during the 10-year survey period. Given that in Phase 3, the scholar has moved beyond the service commitment period, the report tracks updates to the scholar's contact and current employment information, any additional educational pursuits, and notable achievements during the Phase 3 years covered by the report. Finally, the Phase 3 report includes a section titled, "Value Statement," that focuses on how the SMART Program is helping the scholar achieve his/her goals, what the scholar would change about the program, what the scholar would highlight during their time in the program, and if they would recommend the program to others.

a. Results from Sample of Phase 3 Annual Reports

Of the 18 Phase 3 reports received by IDA to conduct the current process evaluation (refer to Table 15 on page 71 for a breakdown of Phase 3 reports by degree), many were incomplete in terms of scholar responses/input. The analyses in this section only are for reports where the information was provided. Recruitment scholars completed 83% (15 of 18) of the Phase 3 reports while 1 report was completed by a retention scholar, 1 by a scholar who left the program, and 1 report did not include information on scholar type. Additionally, 53% (9 of 17) of the reports were completed by scholars whose work at the SF focused on engineering (mechanical, electrical, aerospace, chemical, civil, industrial and systems, nuclear, biological systems, or computer) and 29% (5 of 17) of scholars worked on computer science-related topics. The remainder of the scholars worked in mathematics (n = 1) and metal sciences (n = 1). The majority of scholars (61% or 11 of 18) reported still being employed by their original SF during Phase 3. Some scholars reported working for a contractor or in the private sector (17% or 3 of 18) or for another DoD office (1 of 18), attending school (2 of 18), or having left the SF/DoD (1 of 18). Of the scholars who reported working at their original SF or the DoD during Phase 3, 75% (9 of 12) reported receiving a pay raise or promotion. Many Phase 3 scholars reported notable achievements during the reporting period and some more than one during a year. Specifically, 57% (8 of 29) of the reporting scholars received at least one professional award or accolade, peer-reviewed journal publication, or conference presentation.

Finally, a number of scholars provided details regarding their goals for the upcoming Phase 3 year. Some scholars noted their desire to continue to pursue professional leadership and development opportunities at their SF, obtain additional professional certifications, apply for additional patents, and submit manuscripts to peer-reviewed journals. There were a few scholars who noted that their goal was to leave the SF for another DoD office or move to another part of the country to be closer to family. Nevertheless, a number of scholars provided constructive feedback for improving the SMART Program and identified highlights to their time with the program. For example, scholars appreciated the diverse experiences the SMART Program afforded them though placement in SFs, allowed the scholar to achieve their long-term goal of supporting specific Components or offices within the DoD, and were grateful for the initial start given them to excel in their academic work and professional goals. Both scholars who remained in Phase 3 and those who left the SF/DoD shared these sentiments. On the other hand, some scholars noted problems experienced in Phase 3: that they felt overwhelmed with the number of projects assigned to them (in terms of attentional demands); suggested the need for improved communication between the SPO, SF, and scholar during transition between Phases; felt that their work during Phase 2 did not apply to non-DoD organizations (i.e., private sector); and would have enjoyed more interactions with SMART scholars from across the DoD and across cohort years.

b. Revisions to Phase 3 Annual Reports

The Phase 3 report is similar to the Phase 2 report in that the data collected provide updates to the scholar's address and employment, notable achievements (e.g., promotions/pay raises, peer-reviewed manuscripts, conference presentations), and changes to the aforementioned Value Statements. Although the Phase 3 report is only two-pages in length, many of the reports we reviewed were incomplete.

Some questions on the Phase 3 report provide program insights that the SPO can use to form a better picture regarding workforce retention. For example, Section 2 asks scholars to list their current professional goals for the upcoming year. If a scholar no longer is employed by the DoD, the question is whether their work during Phase 2 helped prepare him/her for their current position. Likewise, Section 6 (Value Statement) asks scholars to describe how the SMART Scholarship has helped them in achieving their goals, what they would change about the program, a highlight of their time in the program, and if they would recommend the program to others. However, the Phase 3 report could include a single question to directly address the scholar's longer-term plans/retention:

- I plan to remain employed with my SF (or within the DoD) for the next
  - 1–2 years
  - 3–4 years
  - 5–7 years
  - 8+ years
  - N/A (I have left or plan to leave within the year).

Additionally, given that the Phase 3 reports are requested for a 10-year survey period, it is unclear if there are any metrics derived from the reports that come from tracking scholar responses from year to year. Tracking trends may provide useful information or help identify potential predictors for when a change is about to happen with a person.

2. Processes to Improve Retention

We examined several recent reviews of the literature on factors or processes that determine employee turnover and retention (Allen, Bryant, and Vardaman 2010; Hom et al. 2017; Rubenstein et al. 2018). These reviews either directly suggest or imply at least six processes or interventions that could potentially increase the probability of SMART alumni staying on their jobs with their SF at the conclusion of their service commitments. These six processes are discussed in the following subsections: those that are currently employed to some degree in the SMART Program (promote just and fair compensation policies, encourage social interconnections, and provide realistic job previews) and those that could be implemented but at some costs (provide training and professional development opportunities, determine employee intentions, and use biodata to predict retention). Each

section below summarizes a process by describing the research finding on which it is based, the application the process has to the current SMART Program, and possible questions raised for the SMART 2.0 outcome evaluation.

a. Processes That Are Currently Employed in SMART

The following three processes are currently used in the SMART Program to enhance job retention. While these processes are part of the SMART Program, they could potentially be modified to provide a better benefit in the future.

1) Promote Just and Fair Compensation Policies

Multiple research studies confirm that employee retention is positively related to pay satisfaction, which is defined as the perception that employees are being fairly and equitably compensated for their work (e.g., Rubenstein et al. 2018).

The SMART 1.0 evaluation showed that scholars beginning their service commitment (Phase 2) were paid significantly less than a comparable group of S&E workers who had not gone through the SMART Program (Balakrishnan, Acheson-Field, et al. 2018). The evaluation also showed that the SPO had made efforts to remedy the lower starting salaries of SMART scholars. However, interviews with stakeholders for the SMART 2.0 evaluation indicated that retention remains a problem for certain disciplines (e.g., computer science) where the private sector offers more lucrative compensation.

These particular issues raise the following questions, which could be addressed in the SMART 2.0 outcome evaluation:

- What remedies were adopted to address the pay inequities between SMART scholars and those S&E workers hired through other means?
  - Are the remedies having an effect on starting salaries?
  - Are the remedies having an effect on the retention of SMART scholars?
- Are there particular disciplines that experience greater retention problems due to inadequate compensation? Some preliminary findings on this issue are presented in the following section (1.A.3).

2) Encourage Social Interconnections, Both On- and Off-the-Job

"Job embeddedness" refers to the web of social connections that employees have to their work, family, and community. Research has shown that job embeddedness is a significant factor in determining why employees stay on the job (e.g., Mitchell et al. 2001).

Our interviews with SF representatives indicated that they explicitly recognized this social factor by paying attention to candidates who prefer their particular facility. The

following expresses the bias of a representative of a relatively remote SF located in the southwestern U.S. towards scholar candidates who live and are educated close by:

> In the early years we were kids in a candy store with all of the students from prestigious schools with high GPAs, cream of the crop, we didn't normally have that reach; some stayed on but when they left, they did because they wanted to move back to be closer to family, they wanted to move back to the east coast; this has caused a shift in what schools we focus on, not just choosing local schools but it is a factor.

Thus, it appears that the SFs are biased to select scholars who are more likely to form social connections at their home and work site. Research also suggests that initiatives to promote social connections off the job lead to increased employee commitment and retention. In a 2019 study by the Boston College Center for Corporate Citizenship, 80% of the participating companies[43] reported that community involvement by employees contributed to an improved ability to recruit new employees and reduced employee turnover. Further, 95% of companies that measure the relationship between employee volunteering and employee engagement scores found a positive correlation between scores suggesting they lead to improved employee job satisfaction. Likewise, in a 2010 survey, the Corporate Executive Board found that employees who reported being the most committed to their workplace were 87% less likely to resign (and tended to put in 57% more on-the-job effort) than employees who considered themselves to be disengaged from the organization.

Interestingly, the Boston College 2019 study also looked into focus topics of these workplace community engagement initiatives. They found that most North American companies ranked STEM education as the most prioritized initiative for community engagement. This finding is clearly relevant to the SMART Program. The program could leverage community initiatives to improve scholar retention during Phase 3 given that STEM education is considered a priority focus area leading to increased employee job satisfaction and therefore retention.

Overall, the connection of a scholar to the local community is an important ingredient of job satisfaction. Therefore, one recommendation is that the SMART Program should develop a formalized scholar-to-mentor program whereby local SMART Program alumni who are in Phase 3 serve as mentors for incoming scholars. This appears to happen informally at some SFs, but how frequently is not clear. Such a program would afford alumni the ability to give back to the community and to their workplace. As another community initiative, the SMART Program might consider formalizing a role for program alumni to participate in outreach. This type of engagement might be particularly useful for

[43] The survey was conducted in 2018 with 252 companies that were mostly U. S.-based medium- to large-sized companies.

attracting scholars for niche positions, from specific universities, or for certain demographics (e.g., to increase the diversity of an applicant pool for a discipline).

These retention issues lead to additional questions that could be addressed in the SMART 2.0 outcome evaluation:

- What factors and processes foster the interconnections of SMART scholars to the workplace and community? Does job embeddedness increase the probability that scholars remain on the job after they complete their service commitment?
- Are SMART scholars retained longer in Phase 3 if they either (1) are assigned to their preferred SF, or (2) receive their academic education at a local institution?
- Does involvement in local community activities increase the likelihood that SMART scholars remain on the job at their assigned SF?
- Would SMART scholars in Phase 3 be willing to serve as mentors, and would they be acceptable to incoming scholars in Phase 2?

3) Provide Realistic Job Previews (RJPs)

In some pioneering research, Joseph Weitz (1956) hypothesized that one cause of turnover was a mismatch of an applicant's expectations to his/her actual workplace experience once hired. He showed that applicants for a life insurance agent job, who were provided a booklet that described the agent's job in some detail, were more likely to stay on the job for 6 months after being hired. Since then, a number of studies have shown that when an organization provides applicants a realistic preview of their prospective job before they start work, they are more likely to stay on the job after they are hired (Earnest, Allen and Landis 2011). The medium of the preview may vary (oral, written, video, or some combination), but the most important characteristic is that previews be "realistic" and include negative as well as positive aspects of prospective jobs. Such RJPs are thought to increase positive feelings of "met expectations," which lead to greater job satisfaction and reduced turnover. In addition, these RJPs are thought to reduce turnover by increasing role clarity, enhancing ability to cope with job demands, and fostering the perception that the organization is being honest with its applicants.

The SMART Program currently conducts a robust program of job previewing, including site visits, orientation, and onboarding sessions in addition to summer internships, where SMART awardees work in their prospective environment. But perhaps the most important preview is the site visit that occurs in the summer after awardees sign the SMART Scholar Agreement but before they start receiving scholarship payments. If students decide that the work or environment at the facility do not fit their career expectations, they are able to back out of their commitment in that period. It is important that this preview provide a realistic depiction of the defense S&E jobs, both the good and

bad points, so that the scholar has appropriate expectations about the job when they enter it as a full-time employee in Phase 2.

At least two questions should be addressed concerning the relationship between RJPs and retention in Phase 3 in the SMART 2.0 outcome evaluation:

- To what extent can such SMART Program events be considered RJPs?
- Do these events influence decisions of the scholars to stay or leave their SF position in Phase 3?

b. Processes That Could be Employed by SMART

The following are three interventions that could potentially be employed by the SMART Program to reduce turnover in Phase 3. However, each potential intervention has some associated costs.

1) Provide Training and Professional Development Opportunities

A recent meta-analysis of the literature indicates that lack of rewards beyond pay (including benefits, career/growth opportunities, and training) are a factor that consistently predicts job turnover across a variety of contexts (Rubenstein et al. 2018). To that point, Allen, Bryant, and Vardaman (2010, 57) maintain that "offering training and development opportunities generally decreases the desire to leave; this may be particularly critical in certain jobs that require constant skills updating."

Results from the SMART 1.0 scholar survey (Balakrishnan, Acheson-Field, et al. 2018) indicated that "career growth" was most often given by SMART alumni who had left their S&E jobs as a reason for leaving. One of the reasons for reluctance to provide training and professional development opportunities is that employers think that these benefits make their employees more marketable and thus more likely to leave the organization. To reduce that possibility, Allen et al. (2010) suggested that employers should consider providing training opportunities that are specific to the employee's job and linking developmental activities to tenure. The extent to which such interventions can be employed within the DoD system is unknown.

These training and development issues lead to the following potential outcome evaluation questions:

- What opportunities do SFs currently provide scholars to attend and participate in professional meeting and training sessions?
- What barriers do SFs have to providing training and professional development opportunities?

2) Determine Intentions of Employees to Leave or Stay

Many models of job turnover identify quit intentions (i.e., thoughts about leaving or related withdrawal attitudes) as the single best predictors of whether an employee stays on the job or leaves (e.g., Rubenstein et al. 2018). Assessing the intentions of employees is valuable for at least two reasons: to determine (1) *whether* an employee intends to quit, and (2) *why* an employee intends to leave. The employer can use this information to prevent or reduce the probability of the individual's quitting, and perhaps changing working conditions to reduce employee turnover in general.

There are at least three points in the SMART Program where it would be useful to assess scholars' intentions or decisions to leave or stay:

1. As part of a formal exit interview. Many SFs may use an exit interview when staff leave their organization. If the SFs shared such information with the SMART Program, it could be helpful in identifying why scholars leave. At this point, the scholars or alumni would be committed to leaving, and would be most likely to provide accurate information on their reasons.
2. At the start of Phase 2. Because the scholars are committed to staying in their S&E job during this phase, the question would have to be modified to assess their intentions after completing Phase 2.
3. At the start of Phase 3. At this point, scholars are likely to be staying in their S&E career field either at their assigned SF or other DoD facilities. However, some may still be considering other career fields and other government and nongovernment employers.

These research findings suggest at least three questions to understand the circumstances and context surrounding why scholars leave DoD service:

- What are the most frequently provided reasons for leaving the SF after completing the service commitment, and do these vary by discipline?
- What types of jobs do scholars take, or intend to take, after leaving their DoD position?
- At what time during a SMART Program experience do scholars decide to leave? For example, do scholars leave because of plans made *prior* to their service commitment or their experiences *during* service commitment?

3) Use Biodata to Predict Retention

Biodata refers to data usually obtained from information potential hires provide on their application forms. A number of studies have demonstrated that biodata items can predict aspects of job performance or behavior, including the probability of quitting. For instance, Barrick and Zimmerman (2005) showed that turnover was related to three biodata

items in application forms of two different organizations: whether an applicant was referred by a current employee, whether the applicant has friends or family working at the firm, and the applicant's tenure at his/her previous job.

Presumably, if certain biodata factors obtained from SMART applicants were shown to be predictive of retention in Phase 3, those factors could be used in selecting SMART awardees who would be most likely to stay on the job after completing Phase 2. Although the logic would appear to be straightforward, there are at least three impediments to implementing such an intervention in the SMART Program:

- Data acquisition and model building. Application forms would need to be developed or modified to capture biodata items that are likely to predict retention. Then, in order to build the regression model, longitudinal data would need to be collected from the application stage (Pre-Phase 0) through post-service commitment (Phase 3).
- Workforce priorities may conflict with retention factors. For instance, assume that data indicate SMART scholars with computer science degrees have a greater propensity to quit their jobs in the post-commitment phase. Following this logic, being a computer scientist would count against a candidate because they are less likely to stay in their position. But we know that computer scientists are in demand by the SFs and actually more likely to be selected, and perhaps over-selected to correct for the expected turnover in that discipline.
- Selecting on certain background variables does not have an adverse impact on minority and underrepresented populations. Even if biodata items such as gender, race, disability, or sexual orientation were shown to be reliably predictive of turnover outcomes, they could not be used in a selection instrument to exclude or include protected populations.

3. Retention of SMART Scholars in Phase 3

Once scholars move into Phase 3, although they are no longer required to stay, the goal of SMART is for them to continue contributing to their SF's mission. In order to determine how well the program accomplishes this objective, IDA performed an analysis of Phase 3 scholars. This analysis looked into the retention status of SMART scholars from cohort years 2016 through 2018 who had moved into Phase 3 by February 2021. Almost all of these scholars had been in Phase 3 for less than a year, so this analysis gives insight into scholars who leave their SF shortly after their commitment ends. These data are summarized in Figure 19.

Over all disciplines, the 85% of SMART scholars (211 of 249) in the 2016–2018 cohort were still retained in February 2021. However, the retention rates differed considerably for the top three disciplines, which account for nearly 60% (149 of 249) of

the scholars in this data set. For computer and computational sciences and computer engineering, the percent retained was lowest at 73%. This finding is consistent with the anecdotal reports that computer scientists are more likely to leave government service for more lucrative positions in the private sector. The retention figure for mechanical engineering was about equal to the overall retention rate at 84%; but then electrical engineering showed higher than overall retention at 98%. It is not clear why the retention rate for electrical engineers is so high. Differences were also observed for the other disciplines, but the small sample sizes prevent drawing any other generalizations.

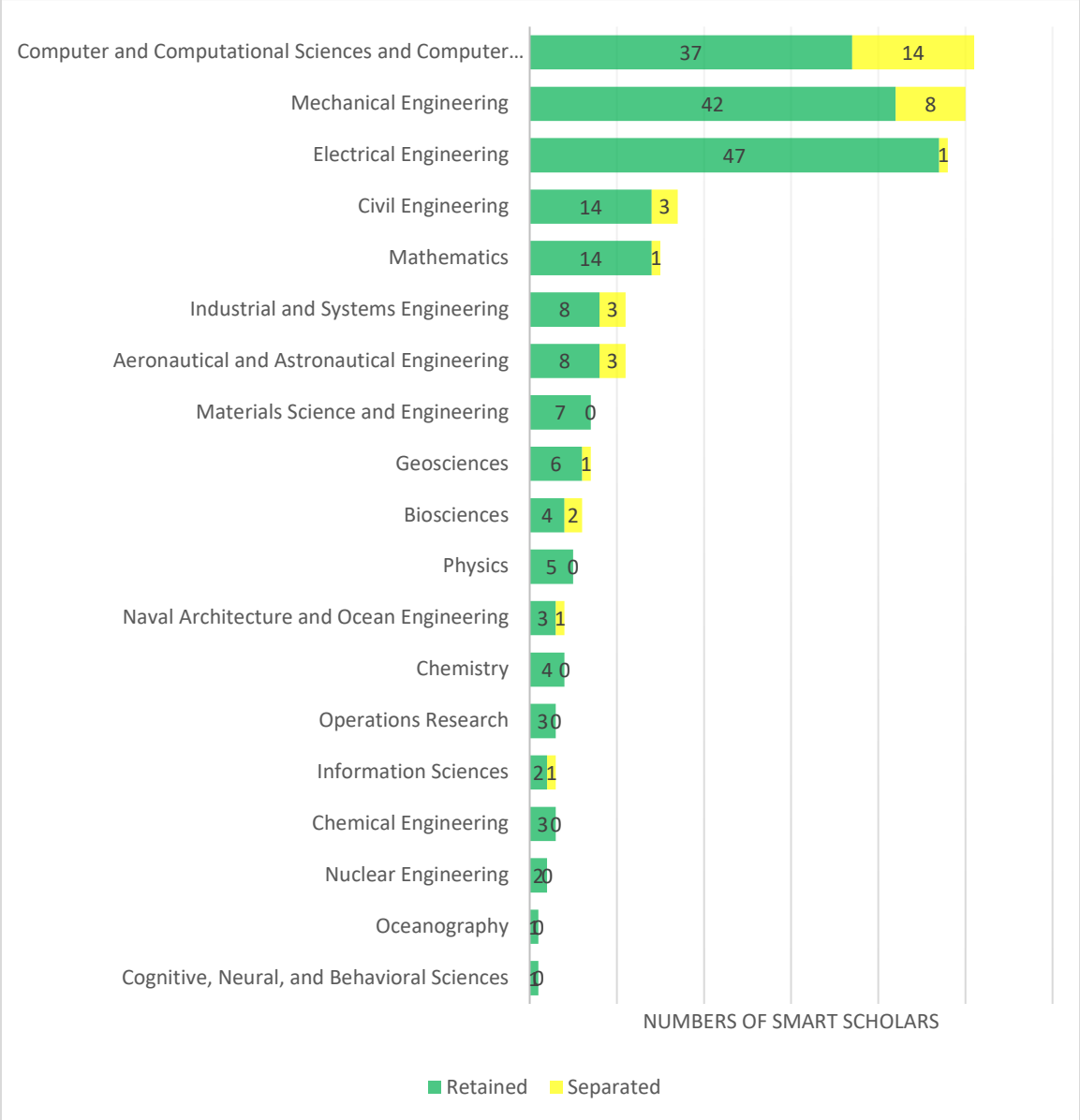

Figure 19. Status of 2016–2018 Cohort of SMART Scholars in Phase 3 as of February 2021

F. Ongoing (not phase specific)

The SMART Program is complex, with many processes that occur in series as has been described in the previous sections. However, it also includes some ongoing processes not aligned with the progression of cohorts through the program. Among those ongoing processes, there is general program oversight, records management, program adjustments, debt collection, and communicating with Congress and higher-level DoD personnel through the annual DoD Planning, Programming, Budget, and Execution (PPBE) process for resource allocation.

1. Stakeholder Perspectives

From the interviews with stakeholders, there were several comments on topics that weren't specific to a single activity or phase. In general, these comments were relatively positive regarding SMART Program processes and indicated positive trends that were appreciated across the program, to include:

- Automated processes and portal: good improvement, and looking forward to additional capabilities
- Dissemination of information has improved
- Sharing lessons learned (Tiger Team) seems to be initially positive
- Collaboration between SF/Component Liaison seems positive,
- Relationships across programs are important
- Mentoring is important (may have some room for improving)

These positive trends are indicative of program changes (e.g., portal, Tiger Teams) that were appreciated by stakeholders and should remain or potentially be expanded. Likewise, the comments about what was important (e.g., mentorship and relationships across programs) are indicative of aspects of the program that could be considered for improvement. By identifying them as important, stakeholders are signaling that positive changes would be impactful.

2. Oversight

There are several mechanisms through which the SPO can conduct oversight on the functioning of the SMART Program. These include information that is generated from individual scholars at particular points in the SMART processes (i.e., site visit reports, internship reports, annual reports), and from an SF-generated report or data (i.e., site visit reports, projections). Each of these data sources were discussed individually in prior sections with regards to what information they contain, but in this section, we will consider how they could be used as part of an oversight function to increase the program's knowledge about how well individual scholars or the whole program were functioning.

a. Scholar Reports

There are numerous reports that are generated by scholars. All of these are opportunities for oversight. The Component Liaisons seem to be the main set of eyes on those reports, to identify when there are issues that should be brought to the SPO's attention. Currently, it is not clear to what level the information from the scholar reports are aggregated by the Component Liaisons or across SFs or Components to inform the SPO of how the program is functioning, or potentially identifying outliers where there may be issues to address.

In our discussion of the individual reports generated at specific points in time as a scholar progresses through the program, we identified some potential modifications to the reports. These modifications are described in more detail in the separate sections above. Several suggested revisions would convert the information gathered into a format to facilitate aggregation for analysis of trends over time, group modes and outliers, and commonalities or differences across SFs.

b. SF-Generated Information

The SFs generate information that could be used for oversight, including the reports on individual scholars after the site visits. This information could be compared to reports from scholars to check how well the SF and the scholar share or do not share a common perspective. There is potential for additional SF reports that that could provide a similar SF to scholar comparison (e.g., internships during Phase 1 and annual reports during Phase 2) to help clarify what is happening.

As part of the SMART Program's workforce needs analysis, the SFs produce projections of what personnel they need up to 5 years in advance. These projections are clearly used as part of the review and selection of applicants, as described in the "Applicants to Awards" section earlier in this report. It is possible that the projection data could also be used for additional functions, like shaping outreach efforts, identifying workforce trends over time, and coordinating with other workforce recruitment programs or scholarships for service programs that may address some workforce needs.

3. SIMS Database and Records Management

The SMART Support Contractor maintains the SMART Information Management System (SIMS). Information from SIMS was very informative to this process evaluation and will be critical to the outcome evaluation. Additionally, the SMART Support Contractor generates both annual summary reports and other reports based on ad hoc information requests from the SPO. SIMS provides a strong oversight capability to the SMART Program.

There is a considerable amount of information stored in SIMS. However, the extent of the data currently in SIMS is unclear without a data dictionary to describe all of the fields including their format, structure of the database, the relationship between its elements, and how many years the data include. Such details would facilitate an understanding of how SIMS could be used and what information may be derived (i.e., new data computed from multiple pre-existing data elements) that may be informative. For example, from SIMS it may be possible to group scholars by the SFs that selected them, and use retention information on each of the scholars to calculate an SF's retention metrics.

The SMART Support Contractor answers requests for data as needed. SIMS data include personally identifiable information (PII) that needs to be safe-guarded; the Support Contractor limits access to that information or de-identifies the data, which are appropriate measures for handling PII. The development of a data dictionary as described above may help requestors of information (e.g., SPO, IDA, SFs) make more well-informed requests. There is also a use for storing some information external to SIMS by the SPO or in some archived version so that it could be referenced as needed.

To minimize the need to request information from SIMS, there is the potential for regularly (e.g., annually or at particular points in the calendar year) extracting data from SIMS and storing that within the SPO. This information can be summary data so there are no PII issues with long-term storage. These summary data could be an aggregated analysis of groups or subgroups of data versus the individual records of individuals. Aggregated data would be helpful for long-term storage because it does not have an expiration date unlike individual data that usually does (currently about 3 years),

Archiving data can be useful for programs to identify long-term trends, but also to identify and document accumulated accomplishments over time. Issues with a lack of historical data were identified in SMART 1.0 where application records prior to 2014 were unavailable so longitudinal analyses were limited and the impact of program changes could not be readily assessed over time. In recent years, the SPO has collected more data on applicants. The office needs to continue to ensure robust data collection and aggregation of application data.

4. Debt Collection

The debt collection process and authorities are outlined in DoDI 1025.09 (last updated in October 2018). This Instruction identifies what constitutes default to the SMART Program contract that scholars enter into upon acceptance of the award. A default leads to a scholar having to pay a debt for not completing the terms of their service agreement. The DoDI also identifies who is responsible in the government for determining the value of the debt and how to collect it.

For the scholars, the SMART Scholar Handbook describes the scholar default conditions and the debt collection process. Additionally, the SMART Service Agreement that the scholar signs to accept the award has two different sections (2. Refund Obligation Acknowledgement and 7. Service Obligation) that clearly indicate that a refund of the government's expense will occur if the scholar does not complete their service commitment.

A scholar is in default of the SSPP service agreement if they: a) voluntarily fail to complete the educational program identified in their agreement; b) fail to maintain satisfactory academic progress; or c) voluntarily terminate employment with the DoD or are removed from employment on the basis of misconduct before their service obligation period is complete.

Another policy, the Department of Defense Financial Management Regulation (DoD FMR) 7000.14-R, describes how debt collection can proceed by establishing agreements with the Defense Finance and Accounting Service and applicable debt collection policies and procedures of the DoD Component that identified a scholar in default of their service agreement. The Component Execution Lead will determine the appropriate amount to be refunded, or may waive (in whole or partially) the required refund amount in the particular case that debt collection would counter equity and good conscience or would be contrary to U.S. interests.

The expectation that scholars who withdrew from the program or left the DoD prior to satisfying their service commitment would repay the government has been in place since the beginning of the program. However, there were problems with how to execute the process and who was responsible. In 2016, DoDI 1025.09 defined the responsibilities regarding debt determination and debt collection, shifting the primary responsibility to the Component that selected the scholar.

5. Congressional Oversight and Communication

The SPO identified Congress as a stakeholder in that they provide legislative oversight and funding for the program. The ongoing mechanisms for the SMART Program to engage Congress is through the annual budgeting process whereby SMART and the DoD describe what they have done in the recent past and plans for the near term. Congress in turn may direct the SMART Program through the National Defense Authorization Act and determine the SMART Program funding through the appropriations process.

The DoD's annual PPBE process is described in DoD Directive 7045.14. This process provides an opportunity for the SMART Program to describe what it has accomplished (executed) with the funds allocated to the program along with justification for future plans if the program receives the expected budget. This process is conducted by the SPO through the OSD chain of command, which provides a mechanism for informing DoD leadership

about the SMART Program. The DoD collects information, determines budget estimates, and presents their annual budget request justifications in a series of volumes. For SMART, this information is provided within the *Justification Book for Research, Development, Test & Evaluation, Defense-Wide* volume. This volume provides tables indicating budget tables across many programs but also includes individual program information in what are called "R-2s." R2s include both budget details across recent past years and some future estimates along with narrative text to describe program accomplishments and goals.

An analysis of the SMART Program's R2 statements shows that the priorities of the program shifted through three different phases. The first phase from the inception of the program in 2006 through 2012 focused on growing the program and conducting reviews to define the program. The second, from 2013 through 2018, pivoted to increasing diversity through HBCU and MI outreach, improving the program, and implementing oversight per DTM 13-007. The most recent phase, started in 2019, has keyed in on regular growth to meet the needs of the Department, has focused recruiting in the DoD priority areas, and has created the SMART Symposium to provide inter-program networking between scholars.

An analysis across years provides some insight into how budget fluctuations can have a disruptive impact on the SMART Program. The annual funds received by the program enable it to award new scholarships each year but also to fund existing scholarship obligations for scholars already in the program. Figure 20 summarizes the yearly funding for the SMART Program: the projected funding request from the previous year (grey), the funding requested by the SMART Program (orange), and the funding appropriated by Congress (blue) indicated for each fiscal year on the graph. Additionally, the green bars depict the number of new scholarships awarded each year.

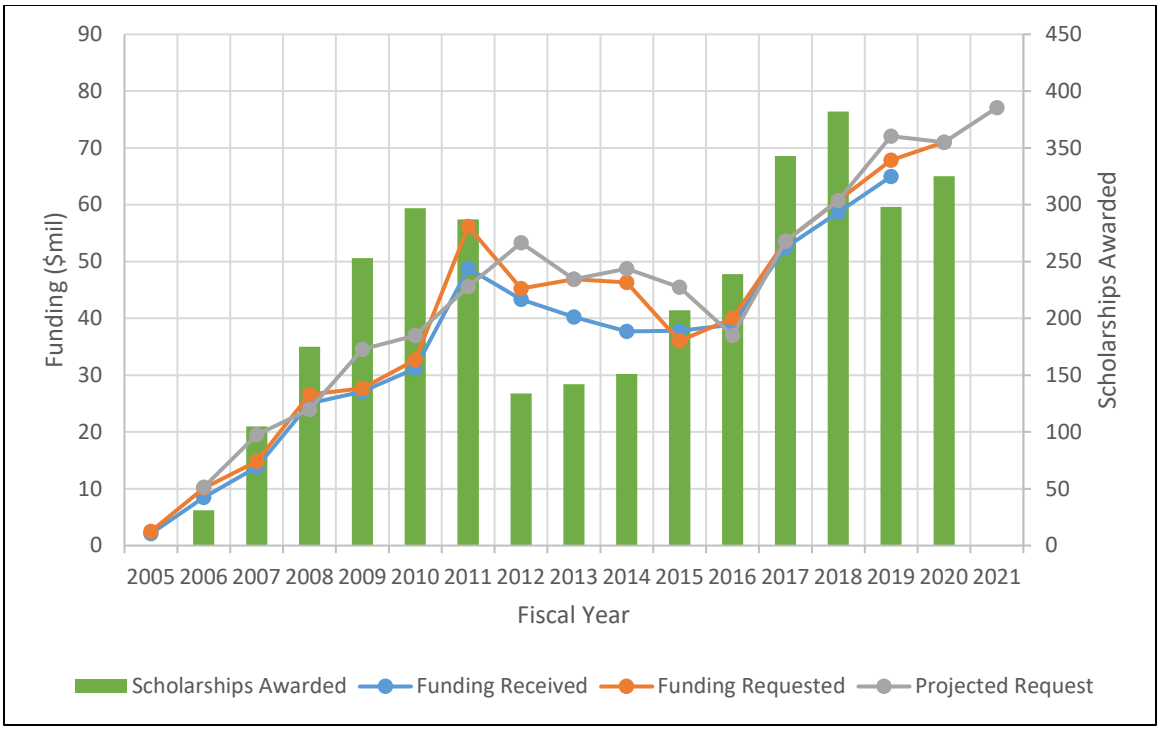

Figure 20. SMART Funding and Scholarships Awarded

As can be seen in Figure 20, the program suffered two major setbacks in its growth. The first was in 2012, when the effects of budget sequestration cut heavily into the appropriations for the SMART Program. The second was in 2019 when the program was underfunded by nearly $3 million relative to its request, the largest such gap outside the sequestration years. Each of these disruptions were responsible for a substantial decrease in the awarding of new scholarships. This effect was amplified by the need for the SMART Program to fund its existing awards. Therefore, any gap in funding can only be covered by the reduction of new awards. The net result in only two reductions in year-over-year award growth was a relatively larger percent decrease in new scholarships versus the decrease in funding. This highlights how disruptions in funding can have a magnified effect on the award of new scholarships in a given year.

6. Summary and Conclusions

This process evaluation of the SMART Program was a follow-up to one conducted in 2015–2018 (Balakrishnan, Buenconsejo, et al. 2018) called SMART 1.0. For the current program evaluation, the SPO asked IDA to evaluate how the program has evolved since SMART 1.0. IDA found the process changes indicative of an ongoing effort to improve the program over time. These changes include: site visits by scholars to their SF prior to formally accepting the scholarship; the continuing development of SIMS; the creation of the SMART Advisory Council; the development of the SMART Scholar Symposium; and continued improvement to the SMART Portal to record and share information.

For this process evaluation, the IDA research team examined program documentation (i.e., relevant policies, scholar handbooks, program and planning documents, and scholar- and SF-generated reports), conducted interviews with SMART Program stakeholders, and analyzed SMART Program data. To provide evaluative context, the IDA team also reviewed national and DoD-wide data, as well as reviewing other programs that share some characteristics with the SMART Program.

The SMART Program is inherently complex, with processes that involve cross-stakeholder interaction and, at any one time during a calendar year, concurrent processes that involve different scholar cohorts. For this evaluation, we grouped the processes into six stages and provide summaries of our findings and recommendations for each stage: a) planning and preparing, b) applications to awards, c) degree pursuit, d) service commitment, e) retention beyond service commitment, and f) ongoing processes that cross stages.

A. Planning and Preparing

The Planning and Preparing stage involves workforce planning activities and outreach to the applicants who may become the next cohort of SMART scholars. The SFs identify their workforce needs through a projection spreadsheet and communicate them through the Component Liaisons, and those needs are then aggregated by the SMART Support Contractor. These workforce projections are used during the selection process and subsequently inform outreach during the following year. The SFs that use the SMART Program regard it as integral to building their overall S&E workforce, but it is only one of several mechanisms they have for addressing workforce needs. In general, the SMART Program planning process is aligned with the standard OPM workforce planning model in

that it includes operational planning (e.g., addressing current talent needs) and strategic planning (e.g., forecast future needs) based on the facilities' objectives.

Workforce projections produced by SFs are organized by discipline (i.e., the 21 SMART Program disciplines of interest) and degree level (BS, MS, PhD). The workforce projections are based on academic disciplines, but the SFs are ultimately making decisions to hire scholars into occupations. For the majority of SMART scholars there is a clear match between their academic discipline and occupation, and this process seems to work fairly well. However, in some instances there are apparent mismatches that may be due to mild incongruities between recruitment of applicants by discipline and the workforce needs by occupation.

Outreach is an important process for the SMART Program, and is conducted by the SPO, the SMART Support Contractor, and by SFs. The SPO and SMART Support Contractor conduct outreach exclusively for the SMART Program and try to cover the entire country and all disciplines to find applicants that could potentially be placed at any SF. SFs, however, are focused on their own individual needs. As such, the SFs tend to provide outreach for the SMART Program in their own geographic region and discipline specialties, but are also recruiting for other potential hires that might come to the SF through means other than the SMART Program.

The analysis of the workforce needs indicates where outreach is sufficient and where it may need additional effort. Based on the projected need, there are an adequate supply of quality applicants for many disciplines, and this covers several of the high-need disciplines, like computer science, mechanical engineering, aeronautical/astronautical engineering, mathematics, and civil engineering. However, not all disciplines are adequately supported with quality applications (e.g., electrical engineering) and may need additional attention.

The emphasis on recruiting a diverse applicant pool seems to be working in that the applicant pool is more gender and racially diverse than the national population of those graduating with a STEM degree. However, the disciplines that are needed by SFs tend to be those that are less gender and racially diverse. Also, while the applicant pool appears to be relatively diverse that does not continue through selection for award by the SFs.

B. Application to Awards

Applications come from across the United States and there appears to be a geographical relationship with applications. Logically, states that have larger populations tend to provide relatively more applicants. However, there is also a link to DoD facilities that have used the SMART Program in the past. For example, states with facilities that have hosted SMART scholars previously tend to have more applicants than would be expected based on the population alone.

Overall, the applicant evaluation process has not changed much from the two-step process described in the SMART 1.0 Process Evaluation Report, with the exception of a greater utilization of the Application Portal. The first step is a review and ranking of all completed applications by a panel of subject matter experts (academics and DoD personnel) in the 21 STEM disciplines of interest to the SMART Program. This first review filters applications to identify well-qualified candidates who progress to the second phase of the review. In the second phase, SFs have 6 weeks to review applications in the portal, conduct interviews, and identify their top awardee selections. Stakeholder interviews suggest that a regular filter for the SFs is to see which of the qualified applicants has indicated the SF as a preferred site for their time (across all phases) with the SMART Program. In fact, our analyses show that two-thirds of awardees were selected by one of their preferred sites. In some cases, where the selecting SF was not in the applicant's top preferred sites, it seemed that there were other similarities between the SF and one of their preferences (e.g., similar or nearby state, same organization but different division) whereby the preferred site match was not too far off target.

After applicants are offered an award, awardees travel to the SF to participate in mandatory site visits to learn more about the SF, meet with staff, and determine if they would like to officially accept the award. Site visits are a significant new process that started in 2016 to ensure that the decision to accept the award and service commitment was made with full awareness of the SF's work and geographic area. In 2020, however, the COVID-19 pandemic caused the SMART Program to pivot to virtual site visits for the 2020 cohort.

C. Degree Pursuit

During the Degree Pursuit stage, scholars attend school and during the summers, complete internships at their SFs. With regards to scholars completing their degree, the SMART Program monitors their progress in meeting award requirements through annual reports which are due each May. For example, scholars indicate how they are progressing in school and may also report any academic awards or accomplishments (e.g., Dean's list, publishing in an academic journal) on these reports. The annual reports provide information as to how well the scholar is tracking their Educational Work Plan, which in turn helps the SMART Program prepare for the hiring process after graduation.

The summer internships seem to be considered by the scholars as valuable work experience where they have the opportunity to see what their work may be like after they graduate. The review of the internship reports indicates that the scholars are willing to provide program feedback on what went right and what could be improved regarding their internships. Due to the COVID-19 pandemic, the SPO waived the internship requirement over the summer of 2020. Still, some scholars were able to conduct their internship either in-person or remotely based on facility conditions and workplace constraints.

The security clearance process typically begins during the site visit, with the collection of information for the scholar's application. The SFs usually spend the academic year working to obtain a clearance for the scholars so that they can intern at the SF the following summer. The security clearance process was identified as a problem in SMART 1.0, and although the responsibility has changed from DoD SMART to SFs, it remains a problem according to most of the stakeholder interviews. However, there was one SF interviewee who indicated they had a good working relationship with their own security office and that made the process easier then when it was completed by the SPO.

D. Service Commitment

During the Service Commitment stage, scholars are hired by their SFs. Because the SFs are executing the hiring action, the individual SF rules and regulations apply and the SPO may have limited influence on how it is executed. The hiring process starts a few months prior to the scholar's graduation, when the Scholar Coordinator works with the Component Execution Leads to generate the hiring paperwork for the SFs. SFs reported that the combination of the support they receive from the Scholar Coordinators and Component Execution Leads and their ability to use the SMART hiring authority allows for a relatively efficient hiring process. Most of the SFs use the SMART direct-hiring authority, although some SFs use other direct-hiring authorities (e.g., Science and Technology Reinvention Laboratory (STRL) Personnel Demonstration (Demo) Projects) that they regularly use for non-SMART hiring actions

The process of hiring may take several weeks, and there is considerable variation across scholars and facilities on how long it may be between graduation and when a scholar starts at their SF. On average, across the history of the SMART Program, it takes 8.3 weeks after a scholar graduates for them to start working, which is shorter than the 12.5 weeks that was sited in a GAO report as the median time for the DoD to hire STEM positions. Also, over time there appears to be an increase in hiring time for the SMART Program in that it took 7.3 weeks to hire scholars in 2006–2010, 8.3 weeks to hire in 2011–2015, and 9.4 weeks in 2016–2020. A concern should be with hires that take extraordinarily long, and only 5 percent of scholars were hired after more than 26 weeks post-graduation. Long hiring times could be analyzed further to identify factors that could be improved upon. Although the time to employment can be 3 months or longer for a quarter of the scholars who complete the program, the SMART Program provides the scholar with a stipend until they are hired by the SF.

E. Post-Service Commitment

After scholars satisfy their commitment to the SF, they enter Phase 3 and may continue to work for the DoD but are no longer obligated to do so. While the scholar has technically completed the SMART Program, there is an expectation that they may continue

working and contributing to their SF. During Phase 3, the SPO requests that scholars continue submitting annual reports for the next 10 years. These annual reports provide updates to the scholar's contact and current employment information, additional educational pursuits, and notable achievements (e.g., awards, journal publications, and conference presentations). The Phase 3 annual reports also provide a means for scholars to inform the SMART Program about suggestions for programmatic improvements or to raise issues regarding some aspect of working at their SF.

IDA identified six processes that may be relevant to long-term retention of SMART scholars through a review of the academic literature. Three of those processes are currently incorporated by the SMART Program: a) promote just and fair compensation policies, b) encourage social interconnections, and c) provide realistic job previews. The other three processes that could potentially be instituted by the program, but there may be additional program costs, are: a) provide training and professional development opportunities, b) determine employee intentions, and c) use biodata to predict retention likelihood during the selection/award process.

There appears to be a considerable difference in the retention rates across the 21 SMART Program disciplines. The average retention rate across scholars from the 2016–2018 cohorts (249 scholars) that entered Phase 3 was 85%, but the retention rates for the three most common disciplines (accounting for 60% of scholars in this data set) differed considerably. For computer sciences and computer engineering, the percent retained was lowest at 73%, which is consistent with anecdotal reports that computer scientists are likely to leave government service for lucrative positions in the private sector. For mechanical engineering, the retention rate was 84%, about equal to the cohort average. For electrical engineering, however, the retention rate was an impressive 98%. Variation in retention rates was observed for the other disciplines, but the small sample sizes prevent drawing any other generalizations.

F. Ongoing Processes

The SMART Program includes some processes that are ongoing or not part of the standard sequence aligned with the progression of cohorts. Among those ongoing processes, there is general program oversight, records management, debt collection, and communicating with Congress and higher-level DoD personnel.

The SMART Program has worked to improve the program over the years. The improvements are evident from some of the stakeholder comments about changes that cross program phases that include: automated processes through the SMART Portal, dissemination of information across stakeholders, and the initiation of Tiger Teams to identify and share lessons learned.

The SMART Program collects considerable information through reports generated by scholars (e.g., site visit, internship, and annual reports) and the site visit reports from SFs. One of the main functions of these reports seems to be the identification of problematic issues that the Component Liaisons should bring to the SPO's attention. Modifications to some of these reports could potentially be made so that the information could be aggregated or analyzed and made more useful to the SMART Program.

G. Process Recommendations

In general, the SMART Program has appropriate processes in place to meet their objectives. As evident from the continued evolution of the program, the SPO has made changes based on directed requirements from Congress or DoD leadership, suggestions from stakeholders, and recommendations from the prior IDA evaluation. In general, these changes have had a positive impact on the procedures and activities of the program associated with accomplishing its primary goal to provide financial assistance for education in STEM skills and disciplines needed in the DoD workforce. Also, the SMART Program demonstrated flexibility in adjusting program processes to address challenges created by the COVID-19 pandemic.

While the SMART Program is functioning well, there are a few process recommendations that might refine how the program functions. These include:

- Consider modifications to reports to ease completion and obtain information that could be more useful to the SMART Program.
- Address diversity by assessing its current state within the SMART Program (applications and awards), identify most pressing needs to focus on, and analyze applicant supply metrics to determine how best to address those needs.
- Consider determining particular discipline needs (or limiting some) to influence how the SMART Program is used to address diversity or DoD modernization requirements. This would require a detailed understanding of discipline-by-discipline differences in applicant supply and employment metrics.
- Consider developing a formalized scholar to mentor program that facilitates program alumni to continue to be active members of the SMART community (e.g., as an additional stakeholder).

This process evaluation focused on the activities, procedures, and functions of the SMART Program. There will be a follow-up outcome evaluation that will focus on what the program produces and the impact the program has for the DoD and the participants.

Appendix A.
Programs that Share Characteristics

Air Force Civilian Service Palace Acquire Program (PAQ) – The PAQ is an Air Force-specific recruitment/development program intended to boost its civilian force (AF Civilian Service) for a variety of career fields and consists of a 2 to 4-year period with a formal training plan resulting in a permanent full-time position. The Science & Engineering PAQ is a 3-year paid internship culminating in a permanent position as a journeyman-level engineer or scientist. The Cyber & IT PAQ is open to recent graduates with specialties in computer science, electronic engineering, and information technology. The first and third years of the program involve work experience, while the second year is full-time, paid, graduate study. Participant incurs an obligation for continued employment, as they will be required to sign an agreement to continue in federal service for three times the length of the total academic training period. Depending on the financial and training incentive received, participants may be required to pay it back if the program is not completed.

Air Force Civilian Service Palace Acquire Program | afciviliancareers.com

Armed Forces Health Professions Scholarship Program (HPSP) – The HPSP offers 2-, 3-, and 4-year military scholarships (Army, Navy, and Air Force) for future and current medical or dental school students. This includes tuition coverage, monthly stipend, and potentially a signing bonus. After completion, participants repay the scholarship by working 1 year (Active Duty) as officers in the branch of service they were accepted into for each year of scholarship (minimum 3 years). Each Service has specific requirements to qualify for the program. For the Navy program, participants must apply for clerkships during each year of study.

Armed Forces Health Professions Scholarship Program | goarmy.com

Barry Goldwater Scholarship – The Goldwater scholarship is an award available to undergraduate students pursing a research career in science, mathematics, engineering, or medicine. This scholarship lasts for up to 2 years (that must terminate in graduation) and does not appear to carry a service requirement.

Barry Goldwater | Scholarship & Excellence in Education Foundation | scholarsapply.org

Charles B. Rangel Fellowship – The Rangel Fellowship is a fellowship for graduate students pursuing a career in the U.S. Foreign Service working on foreign policy. This could be a degree in public administration, public policy, international relations, business administration, economics, history, political science, communications, or foreign languages, but not law. The Rangel Fellowship lasts for 2 years and includes two summer internships, the first (the summer before study) working with members of Congress on international issues and the second (between the 2 years of study) overseas at an embassy or consulate. The Rangel Fellowship also includes a 5-year service requirement after graduation with the State Department Foreign Service. The program provides scholars with a position for the service requirement.

Rangel Graduate Fellowship Program | rangelprogram.org

Central Intelligence Agency (CIA) Stokes Graduate Scholar Program – The Stokes Graduate program is a scholarship program for graduate students pursuing a career relevant to the intelligence community. This does not appear to have a degree or field requirement. This program requires scholars to work during the summers at the CIA, and carries a post-graduation service requirement of 1.5 times the length of the scholarship. The program provides scholars with a position for the service requirement.

CIA Graduate Stokes Scholarship | cia.gov

CIA Stokes Undergraduate Scholar Program – The Stokes Undergraduate program is a scholarship program for undergraduate students pursuing a career relevant to the intelligence community. This does not appear to have a degree or field requirement. This program requires scholars to work during the summers at the CIA, and carries a post-graduation service requirement of 1.5 times the length of the scholarship. The program provides scholars with a position for the service requirement.

CIA Undergraduate Stokes Scholarship |cia.gov

CyberCorp: Scholarship for Service (SFS) – SFS is a unique program designed to recruit and train the next generation of information technology professionals, industrial control system security professionals, and security managers to meet the needs of the cybersecurity mission for federal, state, local, and tribal governments. This program provides scholarships ($25,000–$34,000) for up to 3 years of support for cybersecurity undergraduate and graduate (MS or PhD) education (e.g., computer science/engineering, security of emerging technologies, cyber law and privacy, policy). The scholarships are funded through grants awarded by the National Science Foundation. In return for their scholarships, recipients must agree to work after graduation for the U.S. Government

(contractor positions do not meet the service requirement), in a position related to cybersecurity, for a period equal to the length of the scholarship. Scholars are required to complete a summer internship and may choose to stay in the same location for post-graduation service placement. The program works with participating government agencies to hire scholars for their service commitments.

CyberCorps: Scholarship for Service | sfs.opm.gov

Defense Acquisition University Senior Service College Fellowship (SSCF) – The SSCF program is a 10-month educational/leadership development (post-bachelor's degree) opportunity sponsored by the Office of the Army Director, Acquisition Career Management (DACM). The purpose of the SSCF is to provide leadership and acquisition training to prepare senior-level civilians for leadership roles such as Product and Project Manager, Program Executive Officer, and other key acquisition leadership positions. The identification of position and placement for the service commitment is the responsibility of the Command, however, the Army DACM Talent Management Cell will assist in identifying potential post-fellowship opportunities.

Defense Acquisition University Fellowship Program | dau.edu

Defense Civilian Training Corps (DCTC) – The DCTC is a program that is in development by the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) and in partnership with the USD for Personnel and Readiness (P&R) and USD(R&E). Section 860 of the 2020 National Defense Authorization Act directed the Secretary of Defense to establish and maintain the DCTC to provide support to civilians pursuing undergraduate STEM degrees to prepare them for public service in DoD occupations relating to acquisition, science, engineering, or other civilian occupations determined by the Secretary of Defense, and to target critical skill gaps.

DoD Cyber Scholarship Program (CySP) – The CySP program is sponsored by the DoD Chief Information Office and administered by the National Security Agency (NSA) with the objective to promote higher education in all disciplines of cybersecurity, to enhance the DoD's ability to recruit and retain cyber and IT specialists, to increase the number of military and civilian personnel in the DoD with this expertise, and to enhance the nation's cyber posture. The program is open to students enrolled or applying to universities designated as a National Center of Academic Excellence in Cybersecurity. Following graduation, students are eligible for full-time employment with various Components and agencies across the DoD. Students are required to work for the DoD a minimum of 1 year for each year of scholarship support they receive. The program is also open to retention

scholars who pursue master's and doctoral degrees in cyber-related fields of study. For DoD civilian and military personnel, the service commitment following graduation is determined by their sponsoring component organization. Retention students also have an opportunity to pursue a 2-year community college degree or certificate

DoD Cyber Scholarship Program | CySP

DoD National Defense Science and Engineering Graduate Fellowship (NDSEG) – The NDSEG is a scholarship awarded to U.S. citizens, U.S. nationals, and U.S. dual citizens who intend to pursue a doctoral degree aligned to the DoD services Broad Agency Announcements (BAAs) in research and development at a U.S. institution of their choice. The NDSEG Fellowship lasts 3 years and covers full tuition, a monthly stipend, and additional costs. There is no service requirement with this award.

DoD National Defense Science and Engineering Graduate Fellowship | ndseg.sysplus.com

Department of Energy (DOE) Computational Science Graduate Fellowship (DOE CSGF) – The DOE CSGF is awarded to students pursuing doctoral degrees in fields that use high-performance computing to solve complex S&E problems. The program consists of two tracks of study: a traditional track focused on a wide variety of STEM disciplines (e.g., physical, computer, mathematical, or life sciences) and a math/computer science track (focused on issues in high-performance computing as a broad enabling technology). The fellowship provides up to 4 years of support (full tuition plus stipend) but must be renewed each summer. There is no service requirement with this award, however, each scholar must complete a 12-week practicum at one of the DOE national laboratories or sites.

DOE Computational Science Graduate Fellowship | krellinst.org/csgf

DOE National Nuclear Security Administration Stewardship Science Graduate Fellowship (DOE NNSA SSGF) – The DOE NNSA SSGF is awarded to students pursuing doctoral degrees in fields of study that solve complex S&E problems critical to stewardship science. The program supports a broad spectrum of basic and applied research in S&E at the agency's national laboratories, at universities, and in industry (e.g., high-energy density physics, nuclear science, materials under extreme conditions, and hydrodynamics). The fellowship provides up to 4 years of support (full tuition plus stipend) but must be renewed each summer. There is no service requirement with this award, however, each scholar must complete a 12-week practicum at one of the following National Laboratories: Lawrence

Livermore, Los Alamos, or Sandia (there is an option to participate in a second practicum at a different National Laboratory).

DOE NNSA Stewardship Science Graduate Fellowship | krellinst.org/ssgf

Donald M. Payne Fellowship – The Payne Fellowship is a fellowship for graduate students pursuing a career with the U.S. Agency for International Development (USAID). This can be a degree in international development or in 'another area of relevance to … USAID' which appears to include any field of study. The Payne Fellowship lasts for 2 years and includes two summer internships, the first (the summer before starting study) working on international issues in DC and the second (between the 2 years of study) working overseas at a USAID mission site. The Payne fellowship also carries a 5-year service requirement as a USAID Foreign Service Officer after graduation.

Payne Program Fellowship | paynefellows.org

Harry S. Truman Scholarship – The Truman scholarship is an award available to undergraduate students to pursue professional or graduate school to prepare for careers in government or nonprofit/advocacy sectors (to include education to public health to the environment). This scholarship (up to $30,000) lasts for up to 3 years (that must terminate in graduation) and scholars are required to work in public service for 3 of the 7 years following completion of a Foundation-funded graduate degree program; however, the program does not provide the service commitment position. Immediately after graduation, scholars have the opportunity to participate in a Summer Institute where the program helps to arrange internships with government agencies and nonprofit organizations. Prior to starting graduate school, scholars may elect to participate in the Truman-Albright Fellows program that places the scholar in a public service job for 12-weeks.

Harry S. Truman Scholarship Foundation | truman.gov

National Health Services Corps (NHSC) Scholarship Program (SP) – The NHSC SP awards scholarships to students pursuing eligible primary care health professions training (physicians, dentists, nurse practitioners, nurse midwives, and physician assistants). In return, scholars commit to provide primary care health services in Health Professional Shortage Areas (HPSAs). For each year of full support, scholars commit to a minimum of 2-years of full-time service (not to exceed 4 years).

National Health Service Corps | nhsc.hrsa.gov

National Science Foundation Graduate Research Fellowship Program (NSF GRFP) – The NSF GRFP is awarded to graduate students in NSF-supported STEM disciplines (chemistry, computer and information sciences & engineering, engineering, geosciences, life sciences, materials research, mathematical sciences, physics and astronomy, psychology, social sciences, STEM education, and learning research) who are pursuing research-based master's and doctoral degrees at accredited U.S. institutions. The fellowship includes up to 3 years of financial support including an annual stipend and a partial tuition coverage. There is no service requirement with this award.

NSF Graduate Research Fellowship | nsfgrfp.org

National Security Agency (NSA) Stokes Educational Scholarship Program – The NSA Stokes Scholarship program is a scholarship program for undergraduate students pursuing a career with the NSA. This requires pursuing a degree in the fields of computer science, computer engineering, or electrical engineering. This program requires scholars to work with the NSA at Fort Meade each summer they participate in the scholarship, and carries a post-graduation service requirement of 1.5 times the length of the scholarship. The program provides scholars with a position for the service requirement.

NSA Stokes Scholarship | intelligencecareers.gov/nsa

National Security Education Program (NSEP), David L. Boren Scholarships and Fellowships – NSEP awards Boren Scholarships (undergraduate) and Fellowships (graduate) to students committed to long-term, overseas immersive language study and to public service. Boren Scholars and Fellows receive funding (up to $25,000 for Scholars and $25,000 for Fellows) to study the languages and cultures most critical to our nation's security. Additionally, undergraduates majoring in STEM subjects are eligible for summer-only awards. In exchange, they agree to utilize those skills within the government by seeking and securing federal employment for at least 1 year. The program does not provide positions for the federal service commitment, however Scholars are able to utilize the NSEPnet system to post resumes and search for federal jobs.

National Security Education Program | David L. Boren Scholarships and Fellowships | borenawards.org

Navy Sea Systems Command (NAVSEA) Scholarship – NAVSEA, in partnership with the Office of Naval Research Historically Black Colleges and Universities/Minority Institutions Program Office, developed the NAVSEA Scholarship to reach out to the next generation of scientists and engineers. The NAVSEA Scholars Program consists of two parts: 1) A one-time $10,000 scholarship awarded the freshman year of college for

pursuing a STEM degree at specific universities (see website), and 2) A student employment opportunity through the NAVSEA Student Employment Program, to provide valuable technical work experience and tuition assistance for the remainder of school. Scholarship recipients receive support for tuition and books and are given an opportunity to sign up for, and be hired into, the NAVSEA Student Employment Program. Work at a NAVSEA Field Command or Headquarters begins the summer following the freshman year. This program provides a scholarship, technical summer work experience, mentorship from a NAVSEA scientist or engineer, and a graduation employment agreement. Student employees receive up to $15,000 in tuition support and a competitive salary with benefits during their work experience. Students who successfully complete all academic and work requirements may be considered for conversion to a permanent full-time federal position after graduation. Students who commit to the NAVSEA Student Employment Program and are offered full-time employment after graduation will be required to complete a service agreement equivalent to 1 year of employment for every year they received tuition assistance while in school.

NAVSEA Scholarship | greatmindsinstem.org

Navy Voluntary Graduate Education Program (VGEP) – VGEP was created with the intent of accelerating the education of Midshipmen to receive a master's degree and Navy-approved subspecialty code early in their career. Midshipmen are selected for the VGEP program during their junior year and will begin graduate work at a university near the Naval Academy during the spring semester of their senior year. Up to 20 Midshipmen per class can pursue a graduate degree at a local university. The program usually takes approximately 1 year and will be completed by the December after they graduate. Additional service obligations: For Naval Officers, this commitment is served concurrently with their Naval Academy obligation. Naval Officer VGEP participants must serve on active duty for a period of 5 years commencing upon completion of or withdrawal from the approved education program. This obligation will be served concurrently with any other service obligation. Officers in Nuclear Power must serve in the Navy for 5 years upon completion of graduate education under VGEP. Marine Corps Officer VGEP participants must serve on active duty for a period of three times the length of VGEP education after commissioning. This obligation will be served concurrently with other obligated service. The crediting of service against any preexisting service obligation will be suspended during the time assigned to graduate education through VGEP.

Navy Voluntary Graduate Education Program | usna.edu/GraduateEducation

Navy/Morgan State University (MSU) Master of Engineering in Cyber Engineering (MECE) – The Navy/MSU MECE degree is a part of the Navy/MSU Employment and

Education program. The School of Engineering identifies and recruits candidates, typically newly baccalaureate graduates within the engineering and computer science programs, who meet both the U.S. Navy's employment requirements and the requirements for admission to MSU's School of Graduate Studies. Once the Navy employs these candidates, they matriculate at MSU to obtain an MECE degree. Service obligation is three times the duration of tuition coverage. Participants receive employment with the Navy; full salary while attending the 12-month, on-campus MSU MECE Program; paid tuition; and other associated costs. In addition, participates receive hands-on laboratory and workforce experience and a job promotion upon graduation from the program. The terminal MECE degree includes both the Internet Protocol (IP) and Network, as well as the embedded weapon control systems aspects of Cybersecurity/Engineering. The Navy has committed to 10 to 20 students per year for an annual investment of $300,000 to $600,000 in tuition and program costs.

Navy/Morgan State Master of Engineering Program | morgan.edu

Nurse Corps Scholarship Program (SP) – The purpose of the Nurse Corps SP is to provide scholarships to nursing students in exchange for a full-time service commitment (or part-time equivalent), at an eligible health care facility with a critical shortage of nurses. For each year of full support, scholars commit to a minimum of 2-years of full-time service (not to exceed 4 years). The program must approve the site where scholars wish to complete their service prior to acceptance of the employment.

Nurse Corps | bhw.hrsa.gov

Robert Noyce Teacher Scholarship Program – The National Science Foundation's Robert Noyce Teacher Scholarship Program supports STEM majors and professionals to become K-12 mathematics and science (including engineering and computer science) teachers in high-need local educational agencies. This award is given to institutions to recruit and prepare STEM teachers such that the institutions administer undergraduate scholarships (at least $10,000) and, separately, stipends (at least $10,000) to professionals to become certified STEM teachers. An individual awarded a scholarship or a stipend is expected to serve as a STEM teacher in a high-need local educational agency for 2 years, for each full-year of a scholarship received.

Robert Noyce Teaching Scholarships | nsf.gov

Robert Noyce Teaching and Master's Fellowship Programs – The National Science Foundation's Robert Noyce Teacher Fellowship Program award is given to institutions to administer fellowships and programmatic support to STEM professionals. The Teaching

Fellows (TF) may receive 1-year of support while enrolled in a master's degree program leading to teacher certification or licensing to teach a STEM discipline in an elementary or secondary school. In addition, TFs may receive up to 4 years of at least a $10,000 salary supplement/year. TFs are expected to serve as a STEM teacher in a high-need local educational agency for 4 years where they also take on a leadership role within the school or high-need local educational agency in addition to regular classroom activities. The NSF Master Teaching Fellowships Track (MTF) offers awards to institutions to administer fellowships and programmatic support to experienced and exemplary K-12 STEM teachers, who are certified/licensed teachers, who possess a master's or bachelor's degree in their field, and who participate in a program for developing master teachers and teacher leaders. While participating in the program and teaching in an elementary or secondary school served by a high-need local educational agency, a MTF will receive a salary supplement of at least $10,000 per year for the 5 years of the teaching service commitment. In the case of individuals with a bachelor's degree, MTF Fellows may receive a maximum of 1-year fellowship support (salary supplement) while enrolled in a master's degree program and up to 4 years of salary supplements while continuing to teach in a high-need local educational agency once they have received their master's degree.

Robert Noyce Teaching Fellowship | nsf.gov

Sandia National Laboratory Critical Skills Recruiting Master's Program (CSMP) – The CSMP is a special, entry-level hiring program that provides new or recent technical bachelor's degree candidates the opportunity to pursue a fully funded masters of science degree. The CSMP is designed to attract talent pursuing key disciplines aligned with Sandia's national security mission, including computer science, cybersecurity, computer engineering, electrical engineering, and mechanical engineering niche areas. After spending at least 2 months at Sandia acclimating to the national-laboratory environment, CSMP participants will enter graduate school to pursue their technical master's degrees full-time. Sandia will pay for eligible tuition and tuition-associated costs. While in graduate school, fellows will remain on roll as Sandia employees and will receive an annual stipend and employee benefits. After receiving their master's degrees, CSMP participants are placed in appropriate technical staff positions at Sandia. Although there is a service commitment with this award, the length of the commitment is not specified on the program's website.

Sandia Critical Skills Master's Program| sandia.gov/careers

The Corella & Bertram F. Bonner Foundation – The founding mission for the Bonner Program is to provide diverse low-income, under-represented, and first-generation students with the opportunity to attend college, while engaging their talents and educations in

building and supporting communities. The program has grown to become the largest privately funded, service-based college scholarship program in the country. The program provides scholarships (up to 100% of demonstrated financial need) to students in exchange for weekly commitments (10 hours a week of community service (referred to as an internship by the program) during the school year [140 hours per semester] and 280 hours in the summer) to service with a local community organization over the 4 years the scholar pursues their undergraduate degree. The program assists the scholars with placement in the internship/service location.

Corella & Bertram F. Bonner Foundation | bonner.org

The Hertz Fellowship – The Hertz Fellowship is an award available to graduate students pursuing a PhD in the applied physical and biological sciences, mathematics, or engineering where scholars direct their work towards understanding and solving major, near-term problems facing society. This fellowship lasts for 5 years (valued up to $250,000) and scholars are required to make a nonbinding moral commitment to making their expertise available to the United States in times of national emergency; however, the program neither defines what constitutes a national emergency nor provides the service commitment position. As described, there is no defined service commitment length.

The Hertz Fellowship | hertzfoundation.org

The Indian Health Service (HIS) Scholarship – The IHS administers the Health Professions Scholarship, which provides financial aid to qualified American Indian and Alaska Native undergraduate- and graduate-level students. Recipients must be members of federally recognized Tribes and enrolled in an eligible health profession degree program (undergraduate [nursing] through graduate). In exchange for financial aid, scholarship recipients agree to fulfill a service commitment (minimum of 2-years or 1-year/year of support) in full-time clinical practice at an Indian health facility upon completion of their academic or post-graduate clinical training. Physicians, social workers, clinical psychologists, and dietitians are required to complete post-graduate training and licensure before they can begin their service commitment. Pharmacists, optometrists, nurses, and dentists can elect to complete a 1-year training program. The scholar is responsible for identifying the appropriate service commitment position, however, the program does provide some assistance to facilitate placement.

Indian Health Service Scholarship Program | Health Professions Scholarship | ihs.gov

The Jewish Community Center (JCC) North American Graduate Scholarship – The scholarship supports graduate students who are involved with the JCC North America

Movement. The scholarship is awarded each year to full-time students, covering up to $10,000 towards graduate study tuition. The scholarship may be awarded for a 1- or 2-year period. As a requirement of the scholarship, all recipients must complete an internship at a local JCC chapter during their studies. Recipients also agree to commit to a full-time paid position within the JCC Movement for 2 years following graduation. The JCC Movement can assist recipients in finding a job within the organization upon graduation.

JCC North American Graduate Scholarship | jcca.org

Thomas R. Pickering Fellowship – The Pickering Fellowship is a fellowship for graduate students pursuing a career relevant to the U.S. Foreign Service. This includes the fields of public policy, international affairs, public administration, business, economics, political science, sociology, and foreign languages, but not law. The Pickering Fellowship lasts for 2 years and includes two summer internships, the first (between the 2 years of study) working at the State Department headquarters in DC and the second (after graduation) overseas at an embassy or consulate. The Pickering Fellowship also carries a 5-year service requirement after graduation in the State Department Foreign Service.

Pickering Fellowship | pickeringfellowship.org

U.S. Air Force Reserve Officer Training Corps (ROTC) – ROTC is a training program of the United States armed forces present on college campuses to recruit and educate commissioned officers. It is designed as a college elective, and studies focus on leadership development, problem solving, strategic planning, and professional ethics. After completing all Air Force ROTC and academic degree (many of which are STEM-focused) requirements, cadets accept a commission as second lieutenants in the Air Force, appointed by the President of the United States. The length of their initial service commitment depends on their career. Most officers have a 4-year active-duty service commitment. Pilots have a 10-year active-duty service commitment, and both Combat System Officers and Air Battle Managers have a 6-year service commitment upon completion of their respective trainings. Nursing graduates accept a commission in the Air Force Nurse Corps and serve 4 years on active duty after completing their licensing examination. Students can apply for scholarships that pay for college tuition, book stipends, and living expenses. There are several types of scholarships that offer differing levels of these financial incentives.

Air Force ROTC | afrotc.com

U.S. Army ROTC – The Army ROTC program is a college program for students interested in pursuing a career in the Army. This program is open to students of any major (many of which are STEM-focused), including nursing. The ROTC program runs parallel to a

standard 4-year college career or can be completed in just the last 2 years of a college career, and includes supplementary classes on military education as well as summer training programs. After graduation, the ROTC program carries a service requirement of 4 years for participants in a full ROTC program and 3 years for participants who only completed the 2-year program.

Army Reserve Officers Training Corps | goarmy.com

U.S. Naval ROTC (NROTC) – NROTC is a college program for students interested in pursuing a career in the Navy. This program primarily requires students to pursue a degree in nursing, engineering, math, or science, but some students pursue other degrees with specific language, cultural, or regional skills. The NROTC program runs parallel to a standard 4-year college career, and includes supplementary classes on naval education as well as summer training programs. After graduation, the ROTC program carries a service requirement: 5 years for NROTC graduates serving in the Navy, but only 4 years for graduates in the Marines or the Navy Nursing Corps.

Naval Reserve Officers Training Corps | navy.mil

Appendix B.
Matching Disciplines and Occupations

These two tables show the top three matches between disciplines and occupations for the 2,291 SMART scholars hired from 2006 up until April of 2021. The first table shows the top 3 jobs for each of the 21-degree disciplines, and the second table shows the top 3 disciplines for the 30 different job title categories that SMART scholars were hired into.

Table of Top 3 Jobs for Each Discipline

For each of the disciplines (first column), the top three jobs are listed in the second column. The "Scholars" column indicates the number of scholars with that discipline to job pairing. The "Total Scholars" column represents the total number of scholars in the corresponding discipline, and the "Percent Scholars" is the percent of the scholars from each discipline that went into the corresponding job. The "No Data" job category has been filtered from the results.

Discipline	Job	Scholars	Total Scholars	Percent Scholars
Aeronautical and Astronautical Engineering	Aerospace Engineer	102	179	57.0
	General Engineer	24		13.4
	Mechanical Engineer	11		6.1
Biomedical Engineering	Bio Engineer	1	1	100.0
Biosciences	Biologist	23	61	37.7
	Bio Engineer	9		14.8
	Health Field	5		8.2
Chemical Engineering	Chemical Engineer	14	34	41.2
	General Engineer	5		14.7
	Environmental	3		8.8
Chemistry	Chemist	35	49	71.4
	General Scientist	4		8.2
	Physical Scientist	2		4.1
Civil Engineering	Civil Engineer	101	142	71.1
	Environmental Engineer	8		5.6
	General Engineer	6		4.2
	Psychologist	17	47	36.2

Discipline	Job	Scholars	Total Scholars	Percent Scholars
Cognitive, Neural, and Behavioral Sciences	Operations Researcher	5		10.6
	Health Field	4		8.5
Computer and Computational Sciences and Computer Engineering	Computer Scientist/Engineer	160	351	45.6
	General Scientist	36		10.3
	Electronics/Electrical Engineer	20		5.7
Electrical Engineering	Electronics/Electrical Engineer	281	513	54.8
	General Engineer	101		19.7
	Computer Scientist/Engineer	16		3.1
Geosciences	Physical Scientist	11	44	25.0
	Environmental	10		22.7
	Geologist	6		13.6
Industrial and Systems Engineering	General Engineer	28	74	37.8
	Industrial/Structural/System Engineer	14		18.9
	Operations Researcher	12		16.2
Information Sciences	IT	8	23	34.8
	Computer Scientist/Engineer	4		17.4
	Operations Researcher	3		13.0
Materials Science and Engineering	Materials Engineer	27	65	41.5
	General Engineer	18		27.7
	Mechanical Engineer	2		3.1
Mathematics	Operations Researcher	42	105	40.0
	General Scientist	24		22.9
	Mathematician	12		11.4
Mechanical Engineering	Mechanical Engineer	217	415	52.3
	General Engineer	97		23.4
	Aerospace Engineer	20		4.8
Naval Architecture and Ocean Engineering	General Engineer	30	46	65.2
	Naval Architect	9		19.6
	Mechanical Engineer	1		2.2
Nuclear Engineering	General Engineer	8	13	61.5
	Nuclear Engineer	3		23.1
Oceanography	Physical Scientist	4	17	23.5
	General Scientist	3		17.6
	Geographical, Geospatial, Geodetic Scientist	2		11.8

Discipline	Job	Scholars	Total Scholars	Percent Scholars
Operations Research	Operations Researcher	23	32	71.9
	Intern/Trainee	1		3.1
	Manager	1		3.1
Physics	Physicist	33	80	41.2
	General Scientist	16		20.0
	Physical Scientist	7		8.8

Table of Top Three Disciplines for each Job

For each of the 30 job categories that SMART scholars were hired into (second column), the top three degree disciplines are listed in the first column. The "Scholars" column indicates the number of scholars with that discipline to job pairing. The "Total Scholars" column represents the total number of scholars in the corresponding Job, and the "Percent Scholars" is the percent of the scholars from each Job that came from the corresponding discipline.

Discipline	Job	Scholars	Total Scholars	Percent Scholars
Aeronautical and Astronautical Engineering	Aerospace Engineer	102	123	82.9
Mechanical Engineering		20		16.3
Chemical Engineering		1		0.8
Biosciences	Bio Engineer	9	13	69.2
Computer and Computational Sciences and Computer Engineering		1		7.7
Electrical Engineering		1		7.7
Biosciences	Biologist	23	27	85.2
Cognitive, Neural, and Behavioral Sciences		4		14.8
Chemical Engineering	Chemical Engineer	14	17	82.4
Computer and Computational Sciences and Computer Engineering		1		5.9
Materials Science and Engineering		1		5.9
Chemistry	Chemist	35	36	97.2
Biosciences		1		2.8
Civil Engineering	Civil Engineer	101	103	98.1

Discipline	Job	Scholars	Total Scholars	Percent Scholars
Mechanical Engineering		2		1.9
Computer and Computational Sciences and Computer Engineering	Computer Scientist/Engineer	160	192	83.3
Electrical Engineering		16		8.3
Mathematics		6		3.1
Electrical Engineering	Electronics/Electrical Engineer	281	324	86.7
Computer and Computational Sciences and Computer Engineering		20		6.2
Mechanical Engineering		8		2.5
Geosciences	Environmental	10	24	41.7
Civil Engineering		8		33.3
Chemical Engineering		3		12.5
Electrical Engineering	General Engineer	101	342	29.5
Mechanical Engineering		97		28.4
Naval Architecture and Ocean Engineering		30		8.8
Computer and Computational Sciences and Computer Engineering	General Scientist	36	99	36.4
Mathematics		24		24.2
Physics		16		16.2
Geosciences	Geoscience	6	14	42.9
Mathematics		3		21.4
Oceanography		2		14.3
Geosciences	Geologist	6	6	100.0
Biosciences	Health Field	5	9	55.6
Cognitive, Neural, and Behavioral Sciences		4		44.4
Geosciences	Imagery	2	4	50.0
Civil Engineering		1		25.0
Physics		1		25.0
Industrial and Systems Engineering	Industrial/Structural/System Engineer	14	23	60.9
Civil Engineering		4		17.4
Mechanical Engineering		2		8.7

Discipline	Job	Scholars	Total Scholars	Percent Scholars
Computer and Computational Sciences and Computer Engineering	Intelligence Specialist	3	5	60.0
Aeronautical and Astronautical Engineering		1		20.0
Operations Research		1		20.0
Computer and Computational Sciences and Computer Engineering	Intern/Trainee	3	8	37.5
Oceanography		1		12.5
Operations Research		1		12.5
Computer and Computational Sciences and Computer Engineering	IT	19	28	67.9
Information Sciences		8		28.6
Mathematics		1		3.6
Biosciences	Manager	2	10	20.0
Electrical Engineering		2		20.0
Operations Research		1		10.0
Materials Science and Engineering	Materials Engineer	27	30	90.0
Cognitive, Neural, and Behavioral Sciences		1		3.3
Mechanical Engineering		1		3.3
Mathematics	Mathematician	12	15	80.0
Computer and Computational Sciences and Computer Engineering		2		13.3
Industrial and Systems Engineering		1		6.7
Mechanical Engineering	Mechanical Engineer	217	238	91.2
Aeronautical and Astronautical Engineering		11		4.6
Electrical Engineering		3		1.3
Naval Architecture and Ocean Engineering	Naval Architect	9	10	90.0
Civil Engineering		1		10.0
Electrical Engineering	No Data	95	384	24.7
Computer and Computational Sciences and Computer Engineering		66		17.2

Discipline	Job	Scholars	Total Scholars	Percent Scholars
Mechanical Engineering		60		15.6
Nuclear Engineering	Nuclear Engineer	3	4	75.0
Mechanical Engineering		1		25.0
Mathematics	Operations Researcher	42	113	37.2
Operations Research		23		20.4
Computer and Computational Sciences and Computer Engineering		16		14.2
Geosciences	Physical Scientist	11	36	30.6
Physics		7		19.4
Oceanography		4		11.1
Physics	Physicist	33	37	89.2
Electrical Engineering		1		2.7
Mathematics		1		2.7
Cognitive, Neural, and Behavioral Sciences	Psychologist	17	17	100.0

Appendix C.
Internship Report

Table 21. Revised Questions for Internship Report

1	How did your SF prepare for your internship? **Prior to the start of the internship (select all that apply):** □ Paperwork (badging) completed □ Supervisor identified/contacted □ Mentor identified/contacted □ Project(s)/team identified **During first week of internship (select all that apply):** □ Badging (access) completed □ IT systems activated □ Workspace provided □ Tasks/projects assigned □ Met with supervisor, mentor, colleagues □ Onboarding completed Other:
2	Summarize the general work you performed on your own and with your mentor/supervisor during the internship. What were your main responsibilities/tasks?
3	This internship allowed me to apply my educational background/expertise to tasks/projects. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Please explain how the internship could have made better use of your background:
4	Describe a challenging aspect of your internship. How did you (or could the SF/SPO) mitigate this challenge?
5	Describe your favorite moment or aspect of your internship. Why was this event/aspect memorable?
6	I feel that my experiences during this internship have prepared me for Phase 2. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Please explain:
7	I have a solid understanding of what my work, role, or responsibilities (and how they will differ from the internship) will be during Phase 2. □ Strongly Agree □ Agree □ Neither Agree/Disagree □ Disagree □ Strongly Disagree Please explain:
8	The internship allowed me to expand on the following professional skills during the internship (check all that apply): □ Communication (written/digital) □ Presentation/public speaking □ Technical □ Collaboration □ Project management □ Time management □ Problem solving □ Networking □ Other (explain below) □ I did not develop additional professional skills Other professional skills:
9	The internship support payments sufficiently supported my ability to attend the internship. □ Agree □ Neither Agree/Disagree □ Disagree If insufficient, please explain why/how:

10 Would you like your Cohort Administrator (CA) to contact you about any issues/comments/concerns regarding your internship?

References

Allen, David G., Phillip C. Bryant, and James M. Vardaman. 2010. "Retaining Talent: Replacing Misconceptions with Evidence-Based Strategies." *Academy of Management Perspectives* 24 (2): 48–64.

Austin, P. C. (2017). "A Tutorial on Multilevel Survival Analysis: Methods, Models and Applications." *International Statistical Review, 85*(2), 185–203. doi: 10.1111/insr.12214

Balakrishnan, Asha, Hannah Acheson-Field, Reina S. Buenconsejo, Justin C. Mary, Claire A. Summers, Sol M. Vitkin, Vanessa Peña, Daniel A. Bernstein, Stephanie T. Lane, and James Belanich. 2018. *Science, Mathematics & Research for Transformation (SMART) Outcome Evaluation Report.* IDA Document D-9262. Alexandria, Virginia: Institute for Defense Analyses.

Balakrishnan, Asha, Reina S. Buenconsejo, Hannah Acheson-Field, Justin C. Mary, Vanessa Peña, and James Belanich. 2018. *Process Evaluation Report for the Science, Mathematics & Research for Transformation (SMART) Scholarship for Service Program.* IDA Document D-8946. Alexandria, VA: Institute for Defense Analyses.

Barrick, Murray R., and Ryan D. Zimmerman. 2005. "Reducing Voluntary, Avoidable Turnover through Selection." *Journal of Applied Psychology* 90 (1): 159–166. doi:10.1037/0021-9010.90.1.159.

Belanich, James, William A. DeMaio, Katherine I. Fisher, and Melissa A. Cummings. 2019. *Review of National Defense Science and Engineering Graduate Fellowship.* IDA Document D-10458. Alexandria, VA: Institute for Defense Analyses.

Boston College Center for Corporate Citizenship. 2018. *The Corporate Community Involvement Study.* Boston: Carooll School of Management.

Corporate Executive Board. 2010. "The Role of Employee Engagement in the Return to Growth." *Bloomberg Businessweek*, August 2010.

Earnest, David R., David G. Allen, and Ronald S. Landis. 2011. "Mechanisms Linking Realistic Job Previews with Turnover: A Meta-Analytic Path Analysis." *Personnel Psychology* 64: 865–897.

Hom, Peter W., Thomas W. Lee, Jason D. Shaw, and John P. Hausknecht. 2017. "One Hundred Years of Employee Turnover Theory and Research." *Journal of Applied Psychology* 102 (3): 530–545. doi:10.1037/apl0000103.

LMI. 2020. *Annual Outreach Data Report - 2019 Cycle.* Arlington, VA: LMI.

LMI. 2021. *Annual Outreach Data Report - 2020 Cycle.* Arlington, VA: LMI.

Mitchell, Terence R., Brooks C. Holtom, Thomas W. Lee, Chris J. Sablynski, and Miriam Erez. 2001. "Why People Stay: Using Job Embeddedness to Predict Voluntary Turnover." *Academy of Management* 44 (6): 1102–1121.

Modification of Science, Mathematics, and Research for Transformation (SMART) Defense Education Program. (2021). *National Defense Authorization Act for FY 2021, H.R. 6395, § 242*.

NCES. 2019. *2019 Digest of Education Statistics.* Accessed June 21, 2021. https://nces.ed.gov/programs/digest/d19/tables/dt19_318.45.asp.

Neal, Jeff. 2019. "Is It Time to Kill USAJobs?" *Federal News Network*, June 5. https://federalnewsnetwork.com/commentary/2019/06/is-it-time-to-kill-usajobs/.

Peña, Vanessa, Ashley M. A. Fehr, and Elizabeth W. Garbee. 2016. *A Comparision of Federal Scholarship-for-Service Programs.* IDA Document D-8276. Alexandria, VA: Institute for Defense Analyses.

Rubenstein, Alex L., Marion B. Eberly, Thomas W. Lee, and Terence R. Mitchell. 2018. "Surveying the Forest: A Meta-Analysis, Moderator Investigation, and Future-Oriented Discussion of the Antecedents of Voluntary Employee Turnover." *Personnel Psychology* 71 (1): 23–65. doi:10.1111/peps.12226.

Science, Mathematics, and Research for Transformation (SMART) Defense Education Program. (2010). *10 U.S.C. § 2192a*.

Section 809 Panel. 2018. *Report of the Advisory Panel on Streamlining and Codifying Acquisition Regulations.* Arlington, VA: Defense Acquisition University.

SMART Program Office. 2020. "SMART Evaluation 2.0: SPO Strategic Goals & Stakeholders." August 26, 2020.

SMART Program Office. 2021. "2021 SMART Strategic Initiatives." Presented at STEM Advisory Committee Meeting, February 17, 2021.

U.S. Census Bureau. 2019. *US Population QuickFacts.* July 1. Accessed June 21, 2021. https://www.census.gov/quickfacts/fact/table/US/PST045219.

Weitz, Joseph. 1956. "Job Expectancy and Survival." *Journal of Applied Psychology* 40 (4): 245-247. doi:10.1037/h0048082.

Wholey, J. S., H. P. Hatry, and K. E. Newcomer. 2010. *Handbook of Practical Program Evaluation*. John Wiley & Sons.

Woodruff, T., R. Kelly, and D. R. Segal. 2006. "Propensity to Serve and Motivation to Enlist among American Combat Soldiers." *Armed Forces & Society* 32 (3): 353–366. doi: 10.1177/0095327X05283040.

Glossary

Term	Definition
academic address	An academic address is the current address of record for the scholar while enrolled at the academic institution. The academic address is usually a temporary address located near the academic institution. In some cases, the academic address may be the same as the permanent address or the summer address. [SMART Scholar Handbook 2020]
academic term	An academic term is a division of the academic year. Depending on how the academic institution structures its classes, an academic term may consist of a quarter or a semester. [SMART Scholar Handbook 2020]
academic year	An academic year in the SMART Program consists of the fall through spring academic terms and is generally 9 months in length. An academic year does not include the summer term or condensed winter term. [SMART Scholar Handbook 2020]
Advisory Council	An advisory group, comprising representatives who are Military Service members or full-time or permanent part-time federal government employees from the Office of the USD(R&E), the SSP lead service, and the other DoD Components participating in SSP that provides recommendations regarding procedures, program improvements, and policies to the USD(R&E), SSP lead service head, and the other DoD Component heads. [DoDI 1025.09]
award	An award in the SMART Program is an offer of scholarship for the completion and conferral of a specific degree in accordance with the SSA in exchange for a period of obligated service. Also referred to as the SMART award. [SMART Scholar Handbook 2020]
award funding	Award funding refers to the amount of funds expended under the scholar's SMART award including all stipend, tuition, approved related educational expenses, travel expenses, health insurance funds, miscellaneous supplies allowance, and all other funds expended by the federal government under the scholar's award. Award funding begins August 1 of the first award year. [SMART Scholar Handbook 2020]
award year	An award year refers to a SMART Program funding year which generally begins August 1 and ends July 31. [SMART Scholar Handbook 2020]

Term	Definition
cohort	A cohort refers to the group of scholars who received a SMART award in a particular year. [SMART Scholar Handbook 2020]
cohort year	A cohort year refers to the year the scholar begins their SMART award. [SMART Scholar Handbook 2020]
component liaison	Member of the SMART Support Contractor, who is the main POC between the SMART Program, sponsoring component, and SFs. [SMART Scholar Handbook 2021]
component execution lead	Designated office in each Service or Fourth Estate agency that oversees the use of the SMART Program within the particular Component (Service or Fourth Estate agency). [SMART Scholar Handbook 2021]
debt repayment	The procedure for recovering funds determined due the federal government under a SMART award based on scholar withdrawal or dismissal from the SMART Program prior to completion of the service commitment. [SMART Scholar Handbook 2020]
degree completion	The date on which an individual completes all requirements to complete a degree, including thesis/dissertation writing, edits, defense, etc. This date generally occurs prior to degree conferral and is not set forth on official transcripts. The degree completion date may be the same as the degree conferral date. [SMART Scholar Handbook 2020]
degree conferral	The date on which a degree is bestowed upon an individual. This date is set forth on the official transcript reflecting the degree earned. The degree conferral date may be the same as the degree completion date. [SMART Scholar Handbook 2020]
dismissal	The process to remove a scholar from the SMART Program based on failure to comply with SMART Program policy, procedure, or SSA. [SMART Scholar Handbook 2020]
DoD component	Organizational entities in the DoD. There are four DoD component designations in the SMART Program: the Department of the Army, Department of the Navy, Department of the Air Force, and other DoD Agencies. [SMART Scholar Handbook 2020]
eligible person	An individual who meets the requirements of Section 2192a of Title 10, U.S.C. [DoDI 1025.09]
financial assistance	Financial aid provided under a scholarship or fellowship awarded to a person. [DoDI 1025.09]
full-time employment	Employment that includes regularly scheduled work hours and days required by the administrative work-week for a particular group or class. [SMART Scholar Handbook 2020]
incomplete coursework	Receiving a grade of incomplete for a registered course and does not constitute adequate progress toward degree completion as

Term	Definition
	reflected in the Educational Work Plan. [SMART Scholar Handbook 2020]
internship support payment (ISP)	Funds intended to support travel, lodging, meals, transportation, and incidental expenses for eligible scholars attending an internship. [SMART Scholar Handbook 2020]
mentor	An experienced individual who assists and guides another person's professional development. SMART Program mentors may coordinate internship logistics and assist scholars in educational and professional growth. A mentor may be a facility supervisor or the SMART facility POC. [SMART Scholar Handbook 2020]
Minority Institutions (MI)	Accredited institution of higher education for which the population of racial or ethnic minorities at the school exceeds 50% of the school's total enrollment (20 USC § 1067k(3)). This could be either of a single minority or in aggregate, and is determined using the Higher Education General Information Surveys published each year (20 USC § 1067k(3)). Because of this, the list of MIs is regenerated every year by the Department of Education, and there are a number of schools with minority populations very close to 50% whose status can change from year to year with the small random fluctuations in student demographics.
minority serving institutions	Accredited institution that exceeds a certain percentage of undergraduate enrollment for a particular minority or institutions that qualify as a Historically Black College or University (HBCU) or a Tribal College or University (20 USC § 1067q). The benchmark for qualification for each individual minority group was defined in the Higher Education Act of 1965 or one of its several amendments. The specific minimum percentage of enrollment to qualify for MSI status for each minority group (20 USC §1059d-g, 1067q, 1101a) is as follows: Black/African American 40% Hispanic 25% Alaskan Native 20% Asian American 10% Native American 10% Native Hawaiian 10% Native Pacific Islander 10%
obligated service	The period of service for an SSPP [SMART Scholarship Program Participant] in exchange for financial assistance. The period of service required may not be less than the total period of pursuit of a degree that is covered by financial assistance. This period is specified in the SSPP service agreement. [DoDI 1025.09]

Term	Definition
other DoD Agencies	Individual DoD Agencies that do not belong to the Army, Navy, or Air Force. [SMART Scholar Handbook 2020]
permanent address	The legal permanent residence of the scholar. In some cases, the permanent address may be the same as the academic or summer address. [SMART Scholar Handbook 2020]
personally identifiable information (PII)	Information used to distinguish or trace an individual's identity, such as name, social security number, date and place of birth, mother's maiden name, biometric records, home phone numbers, other demographic, personnel, medical, and financial information. PII includes any information that is linked or linkable to a specified individual, alone, or when combined with other personal or identifying information. For purposes of this issuance, the term PII also includes personal information and information in identifiable form. [DoDI 1025.09]
phase 0 – Award	Begins at the time an awardee accepts a SMART award by signing the SSA and ends July 31 of the award year. A phase 0 awardee does not receive award funding. Any time spent attending a site visit, completing orientation, or completing an onboarding session does not count towards completion of the service commitment. Prior to funding an award, the phase 0 awardee must comply with acceptance deadlines, complete orientation, and provide all funding prerequisite documentation. [SMART Scholar Handbook 2020]
phase 1 – degree pursuit	Begins August 1 of the award year in accordance with the SSA and ends upon verified completion of all phase 1 requirements. During phase 1, scholars complete approved degree requirements and internships. As scholars near completion of phase 1, they work with the SF, SMART Program, SC, and Component Liaison to prepare for the start of the service commitment. [SMART Scholar Handbook 2020]
phase 2 – service commitment	This phase begins the service commitment as defined by the work start date. The work start date is defined as the first day of full-time employment with the SF after verified degree completion. Once phase 1 is verified completed, the SMART Program provides written confirmation of official entry into phase 2, including service commitment start and end dates. During phase 2, scholars complete the service commitment by working full-time for their SF. [SMART Scholar Handbook 2020]
phase 3 – post-service commitment	Is an employment status monitoring period that begins upon completion of the service commitment. During phase 3, the SMART Program tracks scholar employment status to obtain information on scholar retention rates within the DoD. [SMART Scholar Handbook 2020]

Term	Definition
program phases	Scholars complete four SMART Program phases: phase 0 (award), phase 1 (degree pursuit), phase 2 (service commitment), and phase 3 (post-service commitment). [SMART Scholar Handbook 2020]
recruitment scholar	A scholar who is not employed in a permanent civilian position by the SF at the time of and throughout the award. Scholars who are employed by the SF in temporary or internship positions at the time of award are recruitment scholars. [SMART Scholar Handbook 2020]
retention	The result of a DoD civilian S&E employee being retained as a either a government or contractor defense employee. [IDA SMART 1.0 Outcome Evaluation Report]
retention scholar	A retention scholar is a scholar who is employed in a permanent civilian position by the SF at the time of and throughout the award. This does not include term or temporary employees or interns, e.g. Pathways. [SMART Scholar Handbook 2020]
S&E managers	Managers of sponsoring S&E facilities who directly oversee work of SMART scholars. [IDA SMART 1.0 Outcome Evaluation Report]
satisfactory academic progress	Maintenance of a 3.0 grade point average (GPA) on a 4.0 scale within the criteria defined in the SSA and maintaining adequate progress toward degree completion. [SMART Scholar Handbook 2020] Maintenance of a 3.0 GPA on a 4.0 scale within the criteria defined in the SSPP service agreement. [DoDI 1025.09]
scholar	A scholar is an individual who has received and accepted a SMART award. An individual remains a scholar throughout all three program phases. [SMART Scholar Handbook 2020]
scholarship or fellowship	A financial award for full-time study leading to a STEM degree. [DoDI 1025.09] [SMART Scholar Handbook 2020]
scholarship-for-service	Refers to programs that provide scholarship funding in exchange for an agreement to complete a period of employment after degree completion or conferral. [SMART Scholar Handbook 2020]
scholar coordinator (SC)	Each scholar has a designated SC within the SMART Program. SCs are the first point of contact for scholars. This role is sometimes referred to as a cohort administrator.
science, technology, engineering, and mathematics (STEM) disciplines	aeronautical and astronautical engineering; biomedical engineering; biosciences; chemical engineering; chemistry; civil engineering; cognitive, neural, and behavioral sciences; computer and computational sciences and computer engineering; electrical engineering; environmental sciences; geosciences; industrial and systems engineering; information sciences; materials science and engineering; mathematics; mechanical engineering; naval

Term	Definition
	architecture and ocean engineering; nuclear engineering; oceanography; operations research; physics [SMART Public Website]
security clearance	An authorization issued by the federal government permitting an individual access to sensitive and classified information. [SMART Scholar Handbook 2020]
service commitment	The period of service for a scholar determined by the DoD as being appropriate to obtain adequate service in exchange for financial assistance. [SMART Scholar Handbook 2020]
SMART component	Representatives of Military Services or Agencies who provide management and oversight to the SMART Program. [IDA SMART 1.0 Outcome Evaluation Report]
SMART Program Office	Element of the Office of the USD(R&E) tasked with implementing and administering the SMART Program. [SMART Scholar Handbook 2021]
SMART Program Support	Contractors supporting the SMART Program Office who conduct program administration work. [IDA SMART 1.0 Outcome Evaluation Report]
SMART Public Website	The SMART Public Website provides updated information regarding other program events. The SMART Public Website is located at: http://smartscholarship.org. [SMART Scholar Handbook 2020]
SMART Scholar Portal	The SMART Scholar Portal contains scholar submittal documents, posts policies and procedures, and is where scholars update their contact information during all phases. The SMART Scholar Portal is located at: http://smartscholarship.org/scholar. [SMART Scholar Handbook 2020]
SMART Scholarship Program	The SMART Scholarship Program is the DoD Science, Mathematics, and Research for Transformation Scholarship for Service Program. [SMART Scholar Handbook 2020]
SMART Scholarship Program lead service	A DoD Component, designated by the USD(R&E) in accordance with Paragraph 2.2.f., that provides day-to-day administrative support for the SSP. [DoDI 1025.09]
SMART Service Agreement	A signed written agreement whereby the DoD funds the academic pursuit of a scholar in exchange for a period of obligated service to the DoD. The SMART Service Agreement is signed by the scholar and the awarding DoD Component. [SMART Scholar Handbook 2020] A written agreement between the SSPP and the awarding DoD Component that includes the terms and conditions of the financial

Term	Definition
	assistance award, including those pertaining to obligated service. [DoDI 1025.09]
sponsoring facility	A particular laboratory or agency within the DoD Component that participates in the SMART Program. [SMART Scholar Handbook 2020]
summer address	Where the scholar is located prior to traveling to their summer activities, example internship. In most cases, this will be either the academic address or permanent address. [SMART Scholar Handbook 2020]
United States citizen	An individual who was born or naturalized within the United States and is subject to the jurisdiction of the United States. [SMART Scholar Handbook 2020]
work start date	The first day of full-time employment with SF after verified degree completion. [SMART Scholar Handbook 2020]

REPORT DOCUMENTATION PAGE

Form Approved
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PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED *(From–To)*
November 2021	FINAL	

4. TITLE AND SUBTITLE

Evaluation of SMART Program 2.0: Process Evaluation

5a. CONTRACT NUMBER
HQ0034-19-D-0001

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

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Bhatt, Sujeeta B.
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5d. PROJECT NUMBER
AI-2-4833

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Institute for Defense Analyses
Systems and Analyses Center
730 East Glebe Road
Alexandria, VA 22305-3086

8. PERFORMING ORGANIZATION REPORT NUMBER

IDA Document D-32883

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Defense Laboratories and Personnel Office/STEM
OUSD(R&E)
4800 Mark Center Drive
Alexandria, VA 22350-3086

10. SPONSOR/MONITOR'S ACRONYM(S)

OUSD(R&E)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited (12 April 2022).

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The Science, Mathematics and Research for Transformation (SMART) Scholarship for Service Program was established in 2006 as a scholarship for service program to enhance the Department of Defense's (DoD) workforce in science, technology, engineering, and mathematics skills and disciplines that are needed by DoD. This process evaluation is a follow-up to one conducted in 2015–2018, and will be followed by an outcome evaluation. The SMART Program is inherently complex, with many stakeholders looking to address a broad set of workforce needs, and distributed across many facilities of the three Service Components as well as the Fourth Estate agencies. Due to continual effort to improve the program, new directed requirements, suggestions from stakeholders, and/or recommendations from the prior IDA evaluation, the SMART program processes have evolved over time. In general, these changes had a positive influence on the procedures and activities. Additionally, despite the complexity of the program, each stakeholder demonstrated flexibility in adjusting the program processes to address challenges created by the COVID pandemic.

15. SUBJECT TERMS

Scholarship for Service; science, technology, engineering, and math (STEM); Workforce Development

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Lopez, Louie R.
Uncl.	Uncl.	Uncl.	SAR	154	19b. TELEPHONE NUMBER *(include area code)* 571-372-6715

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18