Army Educational Outreach Program

Research & Engineering Apprenticeship Program

2014 Annual Evaluation Report

ARMY EDUCATIONAL OUTREACH PROGRAM

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Executive Summary

REAP is a paid, summer internship program that focuses on developing STEM competencies among high school students from groups historically underrepresented and underserved in STEM. For more than 30 years, REAP has placed talented high school students in research apprenticeships at colleges and universities throughout the nation. Each REAP student (herein referred to as apprentice) are provided a minimum of 200 hours (over a 5 to 8 week period) of research experience under the direct supervision of a university scientist or engineer on a hands-on research project. REAP apprentices are exposed to the real world of research, gain valuable mentorship, and learn about education and career opportunities in STEM through a challenging STEM experience that is not readily available in high schools.

In 2014, REAP provided apprenticeships to 117 students at 38 sites at 36 different colleges and universities.[1] This number represents a 16% increase in enrollment from 101 apprentices in 2013.

This report documents the evaluation of the FY14 REAP program. The evaluation addressed questions related to program strengths and challenges, benefits to participants, and overall effectiveness in meeting AEOP and program objectives. The assessment strategy for REAP included questionnaires for apprentices and mentors, 1 focus group and 3 interviews with apprentices, 1 focus group with mentors, and an annual program report compiled by the Academy of Applied Science (AAS).

2014 REAP Fast Facts	
Description	STEM Apprenticeship Program – Summer, at colleges/university laboratories, targeting students from groups historically underserved and under-represented in STEM, college/university S&E mentors
Participant Population	9th-12th grade students from groups historically underserved and under-represented in STEM
No. of Applicants	426
No. of Students (Apprentices)	117
Placement Rate	27%
No. of Adults (Mentors)	74
No. of College/University S&Es	74
No. of K-12 Schools	117
No. of K-12 Schools – Title I	97
No. of College/Universities	36
No. of HBCU/MSIs	18
Total Cost	$347,392

[1] Some of the colleges and universities had multiple laboratories participate in REAP.

Stipend Cost (Apprentices & Mentors)	$254,709
Administrative Cost to AAS	$92,683
Cost Per Student Participant	$2,969

Summary of Findings

The FY14 evaluation of REAP collected data about participants, their perceptions of program processes, resources, and activities, and indicators of achievement related to AEOP's and REAP's objectives and intended outcomes. A summary of findings is provided in the following table.

2014 REAP Evaluation Findings	
Participant Profiles	
REAP continues to have success in serving historically underrepresented and underserved populations.	• REAP was successful in attracting participation of female students (50%)—a population that is historically underrepresented in engineering fields.
	• REAP had 100% success meeting the program requirement of providing outreach to students from historically underrepresented and underserved groups as defined in admission requirements (students must self-identify as meeting at least two of the following requirements: qualifies for free or reduced-price lunch; is a minority historically underrepresented in STEM (Alaskan Native, Native American, Black or African American, Hispanic, Native Hawaiian, or other Pacific Islander); is a female pursuing research in physical science, computer science, mathematics, or engineering; receives special education services; has a disability; speaks English as a second language; or is a potential first-generation college student). Enrollment data from program applications indicate that 42% of apprentices identify as Black or African American, 23% as Hispanic or Latino, and 49% as female. Additionally, 91% of the participating apprentices attend Title I schools (students from Title I schools typically come from underrepresented and underserved populations).
	• REAP served apprentices across a range of school contexts. Most apprentice questionnaire respondents attended public schools (91%) and schools in urban settings (64%), which tend to have higher numbers or proportions of underrepresented and underserved groups.
	• REAP was successful in implementing a bridge with UNITE, another AEOP STEM education initiative that serves students from underrepresented and underserved groups. In 2014, 18 alumni of UNITE participated in REAP apprenticeships.
REAP's mentor diversity did not mirror the diversity of apprentices.	• In 2013, mentors identified as predominantly male (75%) and White (67%). In 2014, there was more diversity among the mentors, as fewer identified as male (64%) or White (49%).
	• A comparison of apprentice and mentor demographics suggested that many apprentices of underserved or underrepresented populations are not likely to have mentors sharing the same gender or race/ethnicity. Having a mentor who shares

	an apprentice's gender or race/ethnicity is a potential motivator for reducing stereotypes and increasing students' performance and persistence in STEM.
REAP provides outreach to the Nation's future STEM workforce.	• 98% of the 50 apprentice respondents indicated their intent to pursue a career in a STEM-related field. More respondents intended to pursue careers in Engineering (36%) than any other field, with Medicine/Health (28%), Biological Science (12%), and Environmental Science (6%) being the next most frequently reported fields.
Actionable Program Evaluation	
REAP marketing and recruitment was largely a site-based endeavor.	• 47% of mentors reported actively recruiting apprentices through connections with local school teachers, 37% through communications generated by a university or faculty, and 26% through communications generated by local high schools or teachers. Applications solicited by the AAS and general AEOP marketing were also used to recruit apprentices (45%).
	• Apprentices most frequently learned about REAP from teachers and professors (56%), school newsletters, emails, or websites (20%) or from a REAP mentor (15%).
	• 26% of mentors learned about REAP from a colleague and 21% from a superior, such as a Department Chair, Center Director, or Dean.
REAP is strongly marketed to students from historically underrepresented and underserved groups.	• The RFP specified to university directors/mentors that the targeted participants were underrepresented and underserved high school students. In addition, the REAP administrator worked with all of the directors and mentors to ensure that the students being considered for the apprenticeships identified as coming from an underrepresented and underserved groups.
REAP apprentices participate to clarify and advance their STEM pathways.	• Many apprentices received encouragement to participate from others, including friends, family members, and school staff, often who have current or past connections to the REAP program. Additionally, apprentices participated to clarify and advance their STEM and research knowledge. A small number were motivated by their own previous positive experiences in REAP or other AEOPs.
REAP engages apprentices in meaningful STEM learning through team-based and hands-on activities.	• Most apprentices (74-87%) report learning about STEM topics, interacting with STEM professionals, applying STEM knowledge to real-life situations, and learning about cutting-edge STEM research on most days or every day of their REAP experience.
	• Most apprentices had opportunities to engage in a variety of STEM practices during their REAP experience. For example, 89% participating in hands-on activities, 82% working as part of a team, 77% analyzing or interpreting data or information, and 68% drawing conclusions from an investigation on most days or every day.
	• Apprentices reported greater opportunities to learn about STEM and greater engagement in STEM practices in their REAP experience than they typically have in school.
	• Large proportions of mentors report using strategies to help make learning activities to students relevant, support the needs of diverse learners, develop

	students' collaboration and interpersonal skills, and engage students in "authentic" STEM activities.
REAP promotes STEM research and careers but can improve mentors' awareness of and resources for promoting AEOP opportunities and DoD STEM careers.	• Most mentors had limited awareness of or past participation in an AEOP initiative beyond REAP. Nineteen percent of responding mentors had past experience with SMART, an undergraduate scholarship program, and 15% with URAP, an undergraduate research program, but mentors' participation in all other AEOP programs was 10% or less. In addition, although most apprentices reported an increase in awareness of other AEOPs, 68% reported that their mentors never recommended any AEOP programs. However, the majority of the apprentices reported having interest in the SMART and URAP programs, indicating that the mentors did make an impact.
	• Many mentors educated apprentices about STEM majors and careers (68% of apprentices reported learning about three or more STEM careers), but few of those were DoD STEM careers. Some mentors stated that they were unaware of DoD STEM careers, and 63% of apprentices reported that their mentors never discussed STEM career opportunities with the DoD.
The REAP experience is greatly valued by apprentices and mentors.	• All responding apprentices indicated being satisfied with their REAP research experience overall. Open-ended responses about the overall experience highlighted apprentices' opportunity to do hands-on research and learn about STEM content and research. Apprentices also commented on how REAP provided opportunities they do not get in school and would not otherwise have.
	• The vast majority of responding mentors indicated having a positive experience. Further, many commented on the benefits the program provides apprentices, including hands-on research experience and increases in STEM content knowledge.
Outcomes Evaluation	
REAP had positive impacts on apprentices' STEM knowledge and competencies.	• A majority of apprentices reported large or extreme gains on their knowledge of how professionals work on real problems in STEM, what everyday research work is like in STEM, a STEM topic or field in depth, the research processes, ethics, and rules for conduct in STEM, and research conducted in a STEM topic or field. These impacts were identified across all apprentice groups.
	• Many apprentices also reported impacts on their abilities to do STEM, including such things as reading technical or scientific texts to learn about the natural or designed worlds, designing and carrying out procedures for investigations, asking questions to understand data, and deciding what kind of data to collect to answer a question.
REAP had positive impacts on apprentices' 21st Century Skills	• A large majority of apprentices reported large or extreme gains on their patience for the slow pace of research, making changes when things do not go as planned, and sticking with a task until it is complete.
REAP positively impacted apprentices' confidence and identity in STEM, as well as	• Many apprentices reported a large or extreme gain on their confidence to do well in future STEM courses (78%), their ability to contribute to STEM (76%), preparedness for more challenging STEM activities (74%), and building academic or professional STEM credentials (73%). In addition, 72% reported an increase in

their interest in future STEM engagement.	their sense of accomplishing something in STEM, 70% reported feeling like part of a STEM community, and 69% reported feeling responsible for a STEM project or activity.
	• Apprentices also reported on the likelihood that they would engage in additional STEM activities outside of school. A majority of apprentices indicated that as a result of REAP, they were more likely to work on a STEM project in a university or professional setting; participate in a STEM club, student organization, or professional organization; work on solving mathematical or scientific puzzles; or help with a community service project related to STEM.
REAP succeeded in raising apprentices' education aspirations, but did not change their career aspirations	• After participating in REAP, apprentices indicated being more likely to go further in their schooling than they would have before REAP, with the greatest change being in the proportion of apprentices who expected to continue their education beyond a Bachelor's degree (74% before REAP, 96% after).
	• Apprentices were asked to indicate what kind of work they expected to be doing at age 30, and the data were coded as STEM-related or non-STEM-related. The majority of the apprentices were interested in STEM-related careers before participating in REAP, and almost all were interested in STEM-related careers after participating in REAP; however, there was not a statistically significant difference from before REAP to after. This result is likely due to the requirement for apprentices to demonstrate interest in STEM in order to be selected for the program.
Although many REAP apprentices were largely unaware of other AEOP initiatives, a substantial portion expressed interest in future AEOP opportunities.	• At the end of their apprenticeship, many apprentices reported that they had never heard of any of the AEOPs except for REAP (43-68% of apprentices, depending on the program). However, after participating in REAP, a large proportion of apprentices were somewhat to very interested in participating in other AEOP initiatives in the future (38-72% of apprentices, depending on the program).
REAP raised apprentice awareness and appreciation of DoD STEM research and careers, as well as their interest in pursuing a STEM career with the DoD.	• A majority of apprentices reported that they had a greater appreciation (64%) and awareness (63%) of DoD STEM research and careers. In addition, 49% indicated that REAP raised their interest in pursuing a STEM career with the DoD. Apprentices cited their participation in REAP (53%), their REAP mentor (40%), and the AEOP instructional supplies (30%) as having the most impact on their awareness of DoD STEM careers.

Recommendations

1. The REAP program has the goal of broadening the talent pool in STEM fields, and, overall, the program has been successful at attracting students from groups historically underrepresented and underserved in these fields. The bridge between UNITE and REAP has shown early signs of efficacy in helping REAP attract students from underrepresented and underserved groups; 18 students from UNITE received REAP apprenticeships in 2014.

However, on the questionnaires, apprentices and mentors reported that they are largely unaware of UNITE, which indicates that more emphasis should be given to the UNITE-REAP pipeline so that it can be sustained, if not expanded, in the future. It will also be important for evaluation efforts to be focused on the UNITE-REAP bridge to determine if it has a lasting effect on participants' STEM persistence and to collect information about how the bridge program may be improved in subsequent years. Still, the program may want to consider doing more to increase the likelihood that the program has a long-term impact on the number of students who pursue STEM. Strategies that have been shown to be effective in this area include providing role models for students, exposing them to different education and career possibilities, providing guidance on how to pursue specific education and career paths (e.g., what courses they need to take in school, how to navigate the college application process), and providing coaching on the "soft skills" (e.g., time management, communication skills) needed to be successful in STEM careers. Although many mentors reported using a number of these strategies (e.g., highlighting the under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM), substantive proportions did not. The program should consider ways to ensure that these areas are addressed systematically. For example, the program may want to work with each site to see how these areas could be built into their schedules, or provide more guidance to mentors for how and when to address these issues. Additionally, the program should consider recruiting a more diverse pool of mentors that reflects the gender and race/ethnicity of the apprentices to serve as strong role models for the apprentices. The use of an RFP for to identify sites for the program resulted in 18 host sites that are identified as historically black colleges and universities (HBCUs) or minority serving institutions (MSIs). The program should continue these efforts to create more apprenticeships at HBCUs and MSIs.

2. As was found in 2013, REAP apprentices report having little previous experience with AEOP and limited knowledge of other AEOP programs, even after participating in REAP. Given the goal of having apprentices progress from REAP into other AEOP programs, the program may want to work with sites to increase apprentices' exposure to AEOP. Only 63% of mentors recommended other AEOPs to apprentices, typically SMART and URAP, both undergraduate initiatives. Further, although many apprentices expressed interest in participating in other AEOP programs, a substantial proportion indicated having little or no interest. Many of the apprentices reported learning about other AEOPs through their participation in REAP, their mentor, or the instructional resources provided to them; however, the program may want to work with each site to ensure that all apprentices have access to structured opportunities—such as invited speakers, presentations, and career events—that both describe the other AEOPs and provide information to apprentices on how they can apply to them. In addition, given the limited use of the program website, print materials, and social media, the program should consider how these materials could be adjusted to provide apprentices with more information and facilitate their enrollment in other AEOPs.

3. Similar to recommendation 2, efforts should be made to help mentors and apprentices become more aware of DoD STEM research and careers. Sixty-four percent of apprentices reported not learning about any DoD STEM

careers during their REAP experience. Comments from mentors in the focus group and open-ended questionnaire items suggest that they are not familiar with DoD STEM careers and did not spend very much time discussing DoD STEM careers with apprentices. Consistent with the recommendation from 2013, the program should continue to provide mentors and apprentices with new materials and resources (website links, articles, etc.) that describe current DoD STEM research and careers.

4. A number of apprentices suggested that the REAP program could be improved by extending the length of the experience. Many apprentices noted that 5-8 weeks was not enough time to learn about and get involved with a research project. Some of the mentors also said that the apprenticeship experience should be lengthened. Suggestions were made by both mentors and apprentices to extend the apprenticeship into the school year and/or to continue working with the same project for at least two summers.

5. Efforts should be undertaken to improve participation in evaluation activities, as the low response rates for both the apprentice and mentor questionnaires raise questions about the representativeness of the results. Improved communication with the individual program sites about expectations for the evaluation may help. In addition, the evaluation instruments may need to be streamlined as perceived response burden can affect participation. In particular, consideration should be given to whether the parallel nature of the apprentice and mentor questionnaires is necessary, with items being asked only of the most appropriate data source.

Introduction

The Army Educational Outreach Program (AEOP) vision is to offer a collaborative and cohesive portfolio of Army sponsored science, technology, engineering and mathematics (STEM) programs that effectively engage, inspire, and attract the next generation of STEM talent through K-college programs and expose them to Department of Defense (DoD) STEM careers. The consortium, formed by the Army Educational Outreach Program Cooperative Agreement (AEOP CA), supports the AEOP in this mission by engaging non-profit, industry, and academic partners with aligned interests, as well as a management structure that collectively markets the portfolio among members, leverages available resources, and provides expertise to ensure the programs provide the greatest return on investment in achieving the Army's STEM goals and objectives.

AEOP Goals

Goal 1: STEM Literate Citizenry.

- Broaden, deepen, and diversify the pool of STEM talent in support of our defense industry base.

Goal 2: STEM Savvy Educators.

- Support and empower educators with unique Army research and technology resources.

Goal 3: Sustainable Infrastructure.

- Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army.

This report documents the evaluation study of one of the AEOP elements, the Research and Engineering Apprenticeship Program (REAP). REAP is managed by the Academy of Applied Science (AAS). The evaluation was performed by Virginia Tech, the Lead Organization (LO) in the AEOP CA consortium. Data analyses and reports were prepared in collaboration with Horizon Research, Inc.

Program Overview

REAP is a paid, summer internship program that focuses on developing STEM competencies among high school students from groups historically underrepresented and underserved in STEM. For more than 30 years, REAP has placed talented high school students in research apprenticeships at colleges and universities throughout the nation. Each REAP student (herein referred to as apprentice) works a minimum of 200 hours (over a 5 to 8 week period) under the direct supervision of a university scientist or engineer on a hands-on research project. REAP apprentices are exposed to the real world of research, gain valuable mentorship, and learn about education and career opportunities in STEM through a challenging STEM experience that is not readily available in high schools.

REAP is guided by the following objectives:

1. Provide high school students from groups historically underrepresented and underserved in STEM, including alumni of AEOP's UNITE program, with an authentic science and engineering research experience;

2. Introduce students to the Army's interest in science and engineering research and the associated opportunities offered through the AEOP;
3. Provide participants with mentorship from a scientist or engineer for professional and academic development purposes; and,
4. Develop participants' skills to prepare them for competitive entry into science and engineering undergraduate programs.

A total of 426 students applied for the REAP program in 2014. REAP provided funding for 117 apprenticeships under the supervision of 74 university faculty at 36 colleges and universities in 24 states and US territories (shown in Table 1). Of the 36 colleges and universities involved in REAP, 18 institutions identified as historically black colleges and universities (HBCUs) or minority serving institutions (MSIs). As part of a pipeline pilot program, REAP funded 18 apprenticeships for UNITE alumni at 5 universities. UNITE is an AEOP-sponsored pre-collegiate summer program for talented high school students from historically underrepresented and underserved groups. The 117 apprenticeships in 2014 represent a 16% increase from the 101 apprenticeships in 2013.

According to the Annual Program Report (APR) prepared by AAS, a few issues with the online application process may have impacted the number of applications received for REAP apprenticeships. First, the apprentice application did not actually go live on the AEOP website until April (the target date was January). Also impacting the number of applications was the complexity of the application process itself. If students did not complete every item on the application, the application was marked as "incomplete." An attempt was made to have students complete the application, but the system did not allow them to re-access their application in order to supply additional information. The application system for all of the AEOPs has been revised for 2015.

Table 1. 2014 REAP Site Applicant and Enrollment Numbers

2014 REAP Site	No. of Applicants	No. of Enrolled Participants
Alabama State University *(REAP/UNITE)*	14	8
Arizona State University	4	2
Ball State University	6	2
Clark Atlanta	19	2
Colorado State University	5	2
Delaware State University	13	2
Georgia State University	12	2
Jackson State University *(REAP/UNITE)*	8	4
Loyola University	50	4
Miami Dade University *(REAP/UNITE)*	8	6
Michigan Technical University	11	2
Montana State University	4	2

New Jersey Institute of Technology *(REAP/UNITE)*	4	2
New Mexico State University	5	2
North Carolina A&T State University	9	3
North Carolina Central University	6	1
Oakland University	8	2
South Dakota School of Mines and Technology	15	4
Texas Southern University *(REAP/UNITE)*	30	6
Texas Tech University	5	4
University of Alabama Huntsville	18	2
University of Arkansas at Pine Bluff	9	2
University of California-Berkeley	4	2
University of Central Florida	16	6
University of Colorado Boulder	5	2
University of Houston	18	4
University of Maryland–Baltimore	22	2
University of Massachusetts Lowell	6	2
University of Missouri	14	3
University of New Hampshire	4	2
University of Puerto Rico	9	3
University of Puerto Rico at Humacao	4	4
University of South Florida	26	14
University of Texas at El Paso	17	3
University of Utah	12	2
University of Washington	6	2
TOTAL	**426**	**117**

The total cost of the 2014 REAP program was $347,392. The average cost per apprentice was $2,969. Aligned with the rates of similar AEOP initiatives, REAP provides participants with a stipend of $1500 for the 200 hours. REAP mentors receive a stipend of $1,000 for their participation regardless of the number of students they mentored. Table 2 summarizes these and other 2014 REAP program costs.

Table 2. 2014 REAP Program Costs	
2014 REAP - Cost Per Participant	
Total Participants	117
Total Cost	$347,392
Cost Per Participant	**$2,969**
2014 REAP - Cost Breakdown Per Participant	
Average Administrative Cost to AAS	$792
Average Apprentice Stipend	$1,500
Average Mentor Stipend*	$677
Cost Per Participant	**$2,969**

***NOTE:** Universities that host REAP students are provided with $1,000. Often this funding goes to support the mentor. In some cases this funding is reallocated to afford an additional REAP apprenticeship. In 2014, 100 grants were originally provided and 17 additional apprenticeships were supported through this process.*

Evidence-Based Program Change

Based on recommendations from the FY13 summative evaluation report, the AEOP identified three key priorities for programs in FY14: (1) increase outreach to populations that are historically underserved and underrepresented in STEM; (2) increase participants' awareness of Army/DoD STEM careers; and (3) increase participants' awareness of other AEOP opportunities. AAS initiated the following program changes/additions to the FY14 administration of the REAP program in light of programmatic recommendations from the Army and LO, the key AEOP priorities, and the FY13 REAP evaluation study:

I. **Increase outreach to populations that are historically underserved and underrepresented in STEM.**
   a. The FY14 RFP to select REAP host sites was developed and sent to over 1700 recipients throughout the country inclusive of Puerto Rico. Minority serving institutions (MSIs) were specifically targeted in this effort. Selection of host sites included consideration of their proposal to recruit students from underserved and underrepresented populations.
   b. The REAP admnistrator worked with all selected host sites to ensure that applicants met the adminssions requirements of identifying as underserved and underrepresented in STEM.

II. **Increase participants' awareness of other Army/DoD STEM careers.**
   a. Communication was sent to all apprentices, directors and mentors to visit the AEOP Facebook and twitter pages frequently to learn of new Army/DoD STEM research being done.

III. **Increase participants' awareness of other AEOP opportunities.**
   a. The REAP administrator worked with the UNITE program administrator at the Technology Student Association (TSA) to identify laboratories that participated in UNITE in the previous year(s). The REAP administrator then worked with the directors/mentors of those laboratories to secure REAP

apprenticeships for 18 UNITE students which established a UNITE to REAP AEOP pipeline at 5 locations.

b. Mentors and students were provided with brochures, rack cards, pencils, and write-in-the-rain notebooks. Apprentices were supplied with AEOP-branded lab coats.

c. Communications were sent to all students, directors, and mentors inviting them to visit the AEOP website, the AEOP Facebook page, and the AEOP twitter feed to learn of the other AEOP initiatives.

FY14 Evaluation At-A-Glance

Virginia Tech, in collaboration with the Academy for Applied Science, conducted a comprehensive evaluation study of the REAP program. The REAP logic model below presents a summary of the expected outputs and outcomes for the REAP program in relation to the AEOP and REAP-specific priorities. This logic model provided guidance for the overall REAP evaluation strategy.

Inputs	Activities	Outputs	Outcomes (Short term)	Impact (Long Term)
• Army sponsorship • AAS providing oversight of site programming • Operations conducted by 36 universities • Students participating in 117 REAP apprenticeships • STEM professionals and educators serving as REAP mentors • Stipends for apprentices to support meals and travel • Stipends for faculty to support meals and travel • Centralized branding and comprehensive marketing • Centralized evaluation	• Apprentices engage in authentic science and engineering research experiences through hands-on summer apprenticeships at REAP-sponsored colleges and universities • STEM professionals supervise and mentor apprentices' research • Program activities that expose apprentice to AEOP programs and/or STEM careers in the Army or DoD	• Number and diversity of apprentice participants engaged in programs • Number and diversity of STEM professionals serving as mentors for programs • Number and diversity of Army/DoD scientists and engineers and other military personnel engaged in programs • Number and Title 1 status of high schools served through participant engagement • Apprentices, STEM professionals, site coordinators, and AAS contributing to evaluation	• Increased participation in authentic STEM activities • Increased participant STEM competencies (confidence, knowledge, skills, and/or abilities to do STEM) • Increased participant awareness of and interest in other AEOP opportunities • Increased participant awareness of and interest in STEM research and careers • Increased participant awareness of and interest in Army/DoD STEM research and careers • Implementation of evidence-based recommendations to improve REAP programs	• Increased apprentice participation in other AEOP opportunities and Army/DoD-sponsored scholarship/ fellowship programs • Increased apprentice pursuit of STEM coursework in secondary and post-secondary schooling • Increased apprentice pursuit of STEM degrees • Increased apprentice pursuit of STEM careers • Increased apprentice pursuit of Army/DoD STEM careers • Continuous improvement and sustainability of REAP

The REAP evaluation gathered information from apprentice and mentor participants about REAP processes, resources, activities, and their potential effects in order to address key evaluation questions related to program strengths and challenges, benefits to participants, and overall effectiveness in meeting AEOP and REAP program objectives.

Key Evaluation Questions

- What aspects of REAP programs motivate participation?
- What aspects of REAP program structure and processes are working well?
- What aspects of REAP programs could be improved?
- Did participation in REAP programs:
  - Increase apprentices' STEM competencies?
  - Increase apprentices' positive attitudes toward STEM?
  - Increase apprentices' interest in future STEM learning?
  - Increase apprentices' awareness of and interest in other AEOP opportunities?
  - Increase apprentices' awareness of and interest in Army/DoD STEM careers?

The assessment strategy for REAP included apprentice and mentor questionnaires, 3 interviews with apprentices, 1 focus group with apprentices and 1 with mentors, and 1 APR prepared by AAS. Tables 3-8 outline the information collected in apprentice and mentor questionnaires, focus groups, apprentice interviews, and information from the APR that is relevant to this evaluation report.

Table 3. 2014 Apprentice Questionnaires	
Category	**Description**
Profile	**Demographics:** Participant gender, grade level, race/ethnicity, and socioeconomic status indicators
	Education Intentions: Degree level, confidence to achieve educational goals, field sought
AEOP Goal 1	**Capturing the Apprentice Experience:** In-school vs. In-program experience; Mentored research experience and products
	STEM Competencies: Gains in Knowledge of STEM, Science & Engineering Practices; contribution of AEOP
	Transferrable Competencies: Gains in 21st Century Skills
	AEOP Opportunities: Past participation, awareness of, and interest in participating in other AEOP programs; contribution of AEOP, impact of AEOP resources
	Army/DoD STEM: Exposure to Army/DoD STEM jobs, attitudes toward Army/DoD STEM research and careers, change in interest for STEM and Army/DoD STEM jobs; contribution of AEOP, impact of AEOP resources
AEOP Goal 2 and 3	**Mentor Capacity:** Perceptions of mentor/teaching strategies
	Comprehensive Marketing Strategy: How apprentices learn about AEOP, motivating factors for participation, impact of AEOP resources on awareness of AEOPs and Army/DoD STEM research and careers
Satisfaction & Suggestions	Benefits to participants, suggestions for improving programs, overall satisfaction

Table 4. 2014 Mentor Questionnaires	
Category	**Description**
Profile	**Demographics:** Participant gender, race/ethnicity, occupation, past participation
Satisfaction & Suggestions	Awareness of REAP, motivating factors for participation, satisfaction with and suggestions for improving REAP programs, benefits to participants
AEOP Goal 1	**Capturing the Apprentice Experience:** In-program experience
	STEM Competencies: Gains in Knowledge of STEM, Science & Engineering Practices; contribution of AEOP
	Transferrable Competencies: Gains in 21st Century Skills
	AEOP Opportunities: Past participation, awareness of other AEOP programs; efforts to expose apprentices to AEOPs, impact of AEOP resources on efforts; contribution of AEOP in changing apprentice AEOP metrics
	Army/DoD STEM: attitudes toward Army/DoD STEM research and careers, efforts to expose apprentices to Army/DoD STEM research/careers, impact of AEOP resources on efforts; contribution of AEOP in changing apprentice Army/DoD career metrics
	Mentor Capacity: Local Educators – Strategies used to establish relevance of learning activities for apprentices, support diverse needs of apprentices as learners, support development if interpersonal skills/collaboration, support engagement in authentic STEM activities, and support STEM education and career pathways
AEOP Goal 2 Program Efforts	**Mentor Capacity:** Perceptions of mentor/teaching strategies
	Comprehensive Marketing Strategy: How mentors learn about AEOP, usefulness of AEOP resources on awareness of AEOPs and Army/DoD STEM research and careers

Table 5. 2014 Apprentice Focus Groups	
Category	**Description**
Profile	Gender, race/ethnicity, grade level, past participation in REAP, past participation in other AEOP programs
Satisfaction & Suggestions	Awareness of REAP, motivating factors for participation, involvement in other science competitions in addition to REAP, satisfaction with and suggestions for improving REAP programs, benefits to participants
AEOP Goal 1 and 2 Program Efforts	**Army STEM: AEOP Opportunities –** Extent to which apprentices were exposed to other AEOP opportunities
	Army STEM: Army/DoD STEM Careers – Extent to which apprentices were exposed to STEM and Army/DoD STEM jobs

Table 6. 2014 Mentor Focus Groups	
Category	**Description**
Profile	Gender, race/ethnicity, occupation, organization, role in REAP, past participation in REAP, past participation in other AEOP programs
Satisfaction & Suggestions	Perceived value of REAP, benefits to participants suggestions for improving REAP programs
AEOP Goal 1 and 2 Program Efforts	**Army STEM: AEOP Opportunities –** Efforts to expose apprentices to AEOP opportunities
	Army STEM: Army/DoD STEM Careers – Efforts to expose apprentices to STEM and Army/DoD STEM jobs
	Mentor Capacity: Local Educators – Strategies used to increase diversity/support diversity in REAP

Table 7. 2014 Apprentice Interviews	
Category	**Description**
Profile	Gender, race/ethnicity, grade level, past participation in REAP, past participation in other AEOP programs
Satisfaction & Suggestions	Motivating factors for participation in REAP, satisfaction with and suggestions for improving REAP programs
AEOP Goal 1 and 2 Program Efforts	**Army STEM: AEOP Opportunities –** Extent to which apprentices were exposed to other AEOP opportunities
	Army STEM: Army/DoD STEM Careers – Extent to which apprentices were exposed to STEM and Army/DoD STEM jobs

Table 8. 2014 Annual Program Report (APR)	
Category	**Description**
Program	Description of course content, activities, and academic level (high school or college)
AEOP Goal 1 and 2 Program Efforts	**Underrepresented and Underserved Populations:** mechanisms for marketing to and recruitment of apprentices from underrepresented and underserved populations
	Army STEM: Army/DoD STEM Careers – Career day exposure to Army STEM research and careers; Participation of Army engineers and/or Army research facilities in career day activities
	Mentor Capacity: Local Educators - University faculty and student involvement, teacher involvement

Detailed information about methods and instrumentation, sampling and data collection, and analysis are described in Appendix A, the evaluation plan. The reader is strongly encouraged to review Appendix A to clarify how data are summarized, analyzed, and reported in this document. Findings of statistical and/or practical significance are noted in the report narrative, with tables and footnotes providing results from tests for significance. Questionnaires and respective data summaries are provided in Appendix B (apprentice) and Appendix C (mentor). Focus group and interview protocols are provided in Appendix D (apprentices) and Appendix E (mentors); the APR template is located in Appendix F. Major trends in data and analyses are reported herein.

Study Sample

A total of 56 apprentices from 30 REAP sites responded to questionnaires, as did 39 mentors from 22 of the sites. Table 9 shows the number of apprentice and mentor respondents by site.

Table 9. 2014 REAP Site Survey Respondent Numbers

2014 REAP Site	Apprentices		Mentors	
	No. of Participants	No. of Survey Respondents	No. of Participants	No. of Survey Respondents
Alabama State University	8	3	3	3
Arizona State University	2	1	2	3
Ball State University	2	0	2	0
Clark Atlanta	2	1	2	0
Colorado State University	2	2	2	2
Delaware State University	2	1	1	1
Georgia State University	2	0	2	0
Jackson State University	4	4	4	3
Loyola University	4	4	2	0
Miami Dade University	6	5	2	0
Michigan Technical University	2	2	2	0
Montana State University	2	2	2	1
New Jersey Institute of Technology	2	2	3	0
New Mexico State University	2	1	1	1
North Carolina A&T State University	3	1	1	0
North Carolina Central University	1	1	1	0
Oakland University	2	1	2	0
South Dakota School of Mines and Technology	4	0	2	0
Texas Southern University	6	2	4	0
Texas Tech University	4	4	1	2
University of Alabama Huntsville	2	0	3	0
University of Arkansas at Pine Bluff	2	2	1	3
University of CA-Berkeley	2	1	1	1
University of Central Florida	6	2	3	2
University of Colorado Boulder	2	2	1	1
University of Houston	4	2	2	1
University of Maryland–Baltimore	2	1	3	2

University of Massachusetts Lowell	2	1	2	2
University of Missouri	3	0	2	0
University of New Hampshire	2	1	2	0
University of Puerto Rico	3	1	2	1
University of Puerto Rico at Humacao	4	1	1	1
University of South Florida	14	0	5	3
University of Texas at El Paso	3	0	1	2
University of Utah	2	2	1	1
University of Washington	2	2	3	3
Other[†]	0	1	0	0
TOTAL	**117**	**56**	**74**	**39**

[†] One apprentice listed "Invasive Plant Research Laboratory" as the REAP site.

Table 10 provides an analysis of apprentice and mentor participation in the REAP questionnaires, the response rate, and the margin of error at the 95% confidence level (a measure of how representative the sample is of the population). The margin of error for both the apprentice and mentor surveys is larger than generally acceptable, indicating that the samples may not be representative of their respective populations. Note that the apprentice response rate is substantially lower than in 2013 (which had a response rate of 92%). The mentor response rate (75%) is much higher than in 2013 (48%).

Table 10. 2014 REAP Questionnaire Participation

Participant Group	Respondents (Sample)	Total Participants (Population)	Participation Rate	Margin of Error @ 95% Confidence[2]
Apprentices	56	117	48%	±9.5%
Mentors	39	74	53%	±10.9%

One focus group was conducted with one female apprentice from a Northwestern REAP site. Phone interviews were also conducted with three female apprentices from rising grades 11 and 12. Although evaluators had planned to conduct virtual focus groups with more than 15 female and male apprentices, myriad logistical issues prevented execution of the plan. Of note, finding common times for students in different time zones to gather in a virtual environment proved difficult. Additionally, many sites did not have administrative privileges required to install the technology necessary on available computers, making it technologically infeasible to conduct virtual focus groups. As a stopgap, phone interviews

[2] "Margin of error @ 95% confidence" means that 95% of the time, the true percentage of the population who would select an answer lies within the stated margin of error. For example, if 47% of the sample selects a response and the margin of error at 95% confidence is calculated to be 5%, if to the question had been asked of the entire population, there is a 95% likelihood that between 42% and 52% would have selected that answer. A 2-5% margin of error is generally acceptable at the 95% confidence level.

were conducted with the remaining available apprentices to supplement logistical shortcomings. One mentor focus group was conducted, which included 3 male mentors from 3 sites. The mentors were all university faculty members. The focus groups and interviews were not intended to yield generalizable findings; rather they were intended to provide additional evidence of, explanation for, or illustrations of apprentice and mentor questionnaire data. They add to the overall narrative of REAP's efforts and impact, and highlight areas for future exploration in programming and evaluation.

Respondent Profiles

Apprentice Demographics

Demographic information collected from REAP questionnaire respondents is summarized in Table 11.[3] More females (73%) than males (27%) completed the questionnaire. More responding apprentices identified with the race/ethnicity category of Black or African American (47%) than any other single race/ethnicity category, though there is substantial representation of Hispanic or Latino (20%) and Asian (16%) populations. The race/ethnicity proportions of respondents is very similar to the population of participating apprentices reported in the APR (17% Asian, 42% Black or African America, 23% Hispanic or Latino, and 17% White); however, the gender proportions are substantially different (approximately 50% of the total apprentice population was female and 50% was male).

Forty-three percent of respondents were rising 12th graders; the remaining apprentices who answered this item were rising 10th (9%) and 11th (21%) graders, as well as rising college freshmen (27%). Almost half of the respondents (48%) reported qualifying for free or reduced-price lunch (FRL)—a common indicator of low-income status. As can be seen in Table 12, the vast majority of respondents attended public schools (91%); most attended schools in urban areas (64%). The APR does not contain complete data on these characteristics to allow for comparison between the respondents and the population; however, comparisons can be made between the respondents to the 2013 and 2014 apprentice questionnaires. There was a greater percentage of female respondents in 2014 than in 2013 (73% vs 60%), a greater percentage of Black or African American respondents in 2014 (47% compared with 33% in 2013), and a smaller percentage of respondents from suburban schools (27% in 2014 vs 79% in 2013). Other reported demographic characteristics appear to be similar between the two years.

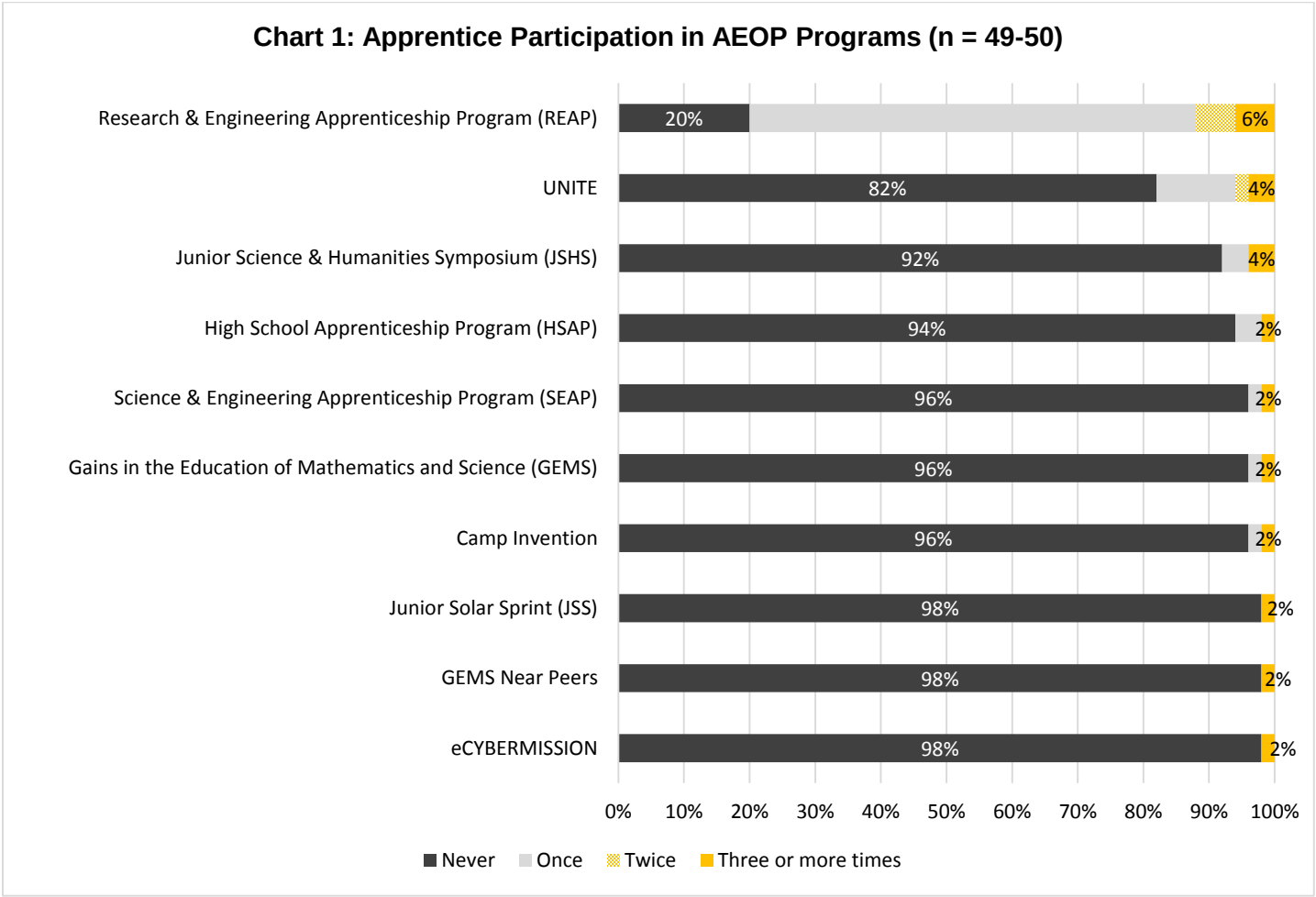
In summary, REAP was successful in attracting participation from female students—a population that is historically underrepresented in some STEM fields. REAP also had success in providing outreach to students from historically underrepresented and underserved race/ethnicity and low-income groups. REAP served students who regularly attended school in a variety of settings, including urban and rural, which historically have lower or limited resources than suburban schools.

[3] In FY15 the AEOP developed and implemented a new application tool through the vendor, Cvent. This centralized tool will facilitate accurate and improved collection of demographic information from participants across the portfolio of AEOP initiatives.

Table 11. 2014 REAP Apprentice Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 56)		
Female	41	73%
Male	15	27%
Respondent Race/Ethnicity (n = 55)		
Asian	9	16%
Black or African American	26	47%
Hispanic or Latino	11	20%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	9	16%
Respondent Grade Level (n = 56)		
Rising 10th	5	9%
Rising 11th	12	21%
Rising 12th	24	43%
Rising first-year college students	15	27%
Respondent Eligible for Free/Reduced-Price Lunch (n = 56)		
Yes	27	48%
No	27	48%
Choose not to report	2	4%

Table 12. 2014 REAP Apprentice Respondent School Information		
Demographic Category	**Questionnaire Respondents**	
Respondent School Location (n = 56)		
Urban (city)	36	64%
Suburban	15	27%
Rural (country)	5	9%
Frontier or tribal school	0	0%
Respondent School Type (n = 56)		
Public school	51	91%
Private school	5	9%

In addition, apprentices were asked how many times they participated in each of the AEOP programs. As can be seen in Chart 1, 80% of responding apprentices reported participating in REAP at least once. Few apprentices (18% or less) reported participating in any of the other AEOP programs. The percentage of REAP apprentices who have participated in UNITE was larger in 2014 than was the case in 2013.



Mentor Demographics

The 2014 Mentor Questionnaire collected extensive demographic information on the mentors, which are summarized in Table 13. More responding mentors were male than female (64% vs. 36%). Unlike the responding apprentices, almost half of the responding mentors identified themselves as White (49%). The majority of the respondents were university educators (67%) or scientists, engineers, or mathematics professionals (18%). The responding mentors come from a variety of research areas, including physical science (31%), biological science (26%), engineering (15%), and mathematics or statistics (13%). Additional characteristics of the mentors are included in Appendix C.

Table 13. 2014 REAP Mentor Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 39)		
Female	14	36%
Male	25	64%
Respondent Race/Ethnicity (n = 39)		
Asian	10	26%
Black or African American	9	23%
Hispanic or Latino	1	3%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	19	49%
Other race or ethnicity, (specify):	0	0%
Choose not to report	0	0%
Respondent Occupation (n = 39)		
University educator	26	67%
Scientist, Engineer, or Mathematics professional	7	18%
Other school staff	2	5%
Scientist, Engineer, or Mathematician in training (undergraduate or graduate student, etc.)	2	5%
Teacher	0	0%
Other, (specify):†	2	5%
Primary Area of Research (n = 39)		
Physical science (physics, chemistry, astronomy, materials science)	12	31%
Biological science	10	26%
Engineering	6	15%
Mathematics or statistics	5	13%
Environmental science	2	5%
Medical, health, or behavioral science	2	5%
Computer science	1	3%
Technology	1	3%

† Other = "Student"

Actionable Program Evaluation

Actionable Program Evaluation is intended to provide assessment and evaluation of program processes, resources, and activities for the purpose of recommending improvements as the program moves forward. This section highlights information outlined in the Satisfaction & Suggestions sections of Tables 3-7.

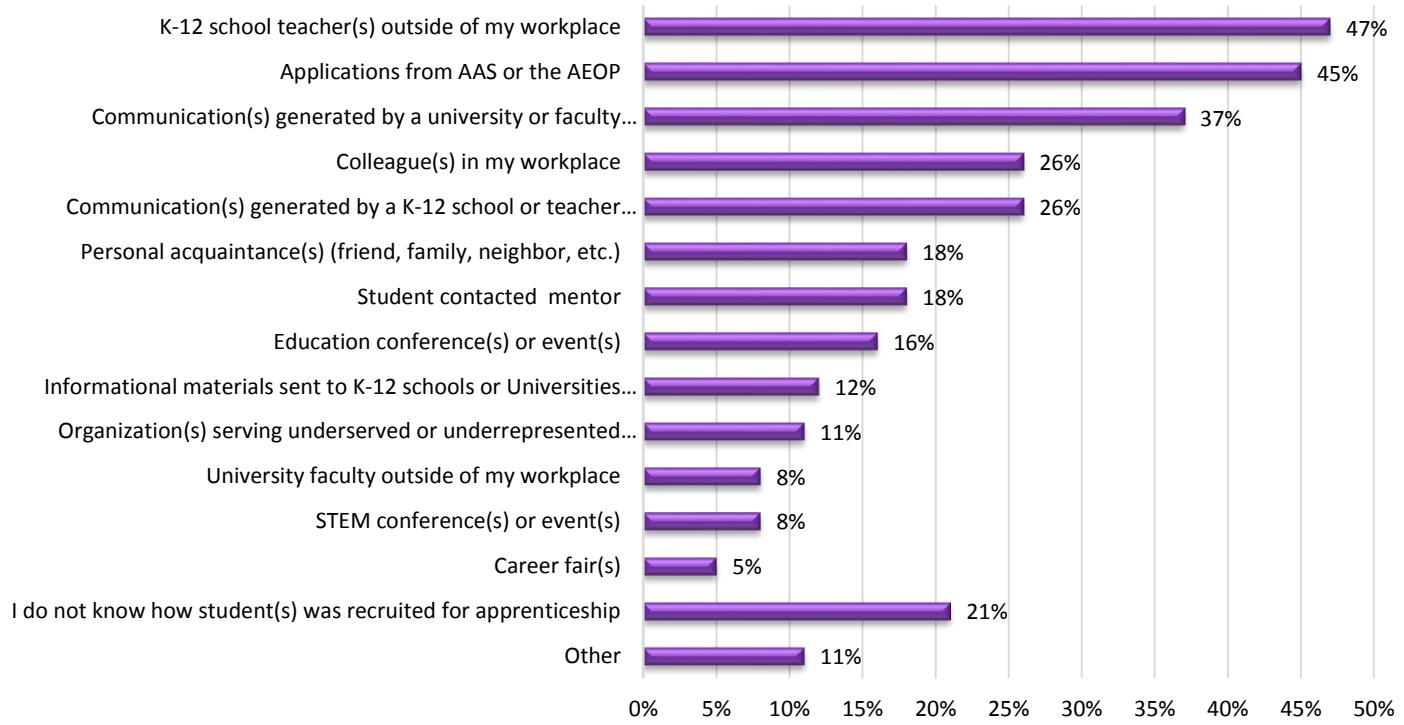
A focus of the Actionable Program Evaluation is efforts toward the long-term goal of REAP and all of the AEOP to increase and diversify the future pool of talent capable of contributing to the nation's scientific and technology progress. REAP sites reach out to students from traditionally underrepresented and underserved populations. Thus, it is important to consider how REAP is marketed and ultimately recruits student participants, the factors that motivate students to participate in REAP, apprentices perceptions of and satisfaction with activities, what value apprentices place on program activities, and what recommendations apprentices have for program improvement. The following sections report perceptions of apprentices and mentors that pertain to current programmatic efforts and recommend evidence-based improvements to help REAP achieve outcomes related to AEOP programs and objectives. Specifically, to help REAP continue to expand participation from and support STEM education for students from underrepresented and underserved groups.

Marketing and Recruiting Underrepresented and Underserved Populations

According to the APR, a Request for Proposals (RFP) was sent out to 1,700 recipients from universities across the country, including Puerto Rico. Ninety-two proposals were submitted, although 18 were disqualified for not meeting the criteria in the RFP. Host sites were selected in consideration of their proposed methods for marketing apprenticeships to underrepresented and underserved populations. In general, the university directors or mentors of selected REAP host sites communicated with local high schools using emails and newsletters to solicit applications for the apprenticeships. The university directors or mentors also provided AEOP brochures and applications for the REAP program to the local high schools.

The mentor questionnaire included an item asking how students were recruited for apprenticeships. As can be seen in Chart 2, many mentors indicated recruiting their apprentice(s) through K-12 school teachers at the local schools (47%), applications from AAS or AEOP (45%), and communications generated by a university or faculty (37%). About a quarter indicated colleagues from the workplace (26%) and communications generated by a K-12 school or teacher (26%) helped with recruitment. Interestingly, 21% reported that they had no knowledge of how their students were recruited.

Chart 2: Mentor Reports of Recruitment Strategies (n = 38)



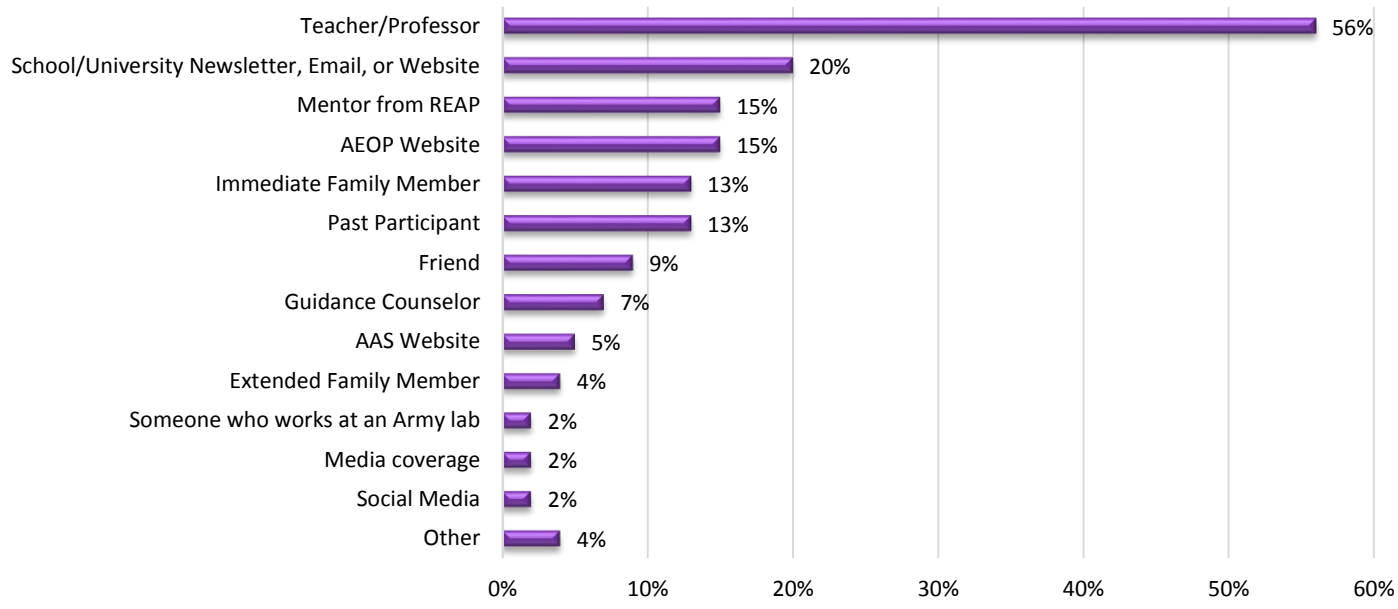
Online questionnaires, focus groups, and phone interviews all included items addressing how apprentices originally learned about REAP, including any personal connections that led them to the program or to the university site, and past experience participating in the program. Chart 3 summarizes apprentices' questionnaire responses. The most frequently mentioned source of information about the local REAP program was teachers and professors (56%). Other sources mentioned relatively frequently were school or university newsletter, email, or website (20%), the AEOP website (15%), REAP mentors (15%), immediate family members (13%), and past REAP participants (13%). The "Other" category included references to existing programs at the sites such as Student and Landowner Education and Watershed Stewardship (SLEWS).

These data were analyzed by apprentice gender, race/ethnicity, FRL, and school location (suburban vs. underserved)[4] to determine if different groups of youth learned about the REAP program in a different manner. Only one meaningful difference was found: minority apprentices were less likely than non-minority apprentices to hear about REAP through the AAS Website. Otherwise, there were no major differences between the groups in how they learned about REAP. It is

[4] Item-level tests were conducted without a Type I error control, increasing the possibility of false positives (i.e., detecting a significant difference when no difference truly exists).

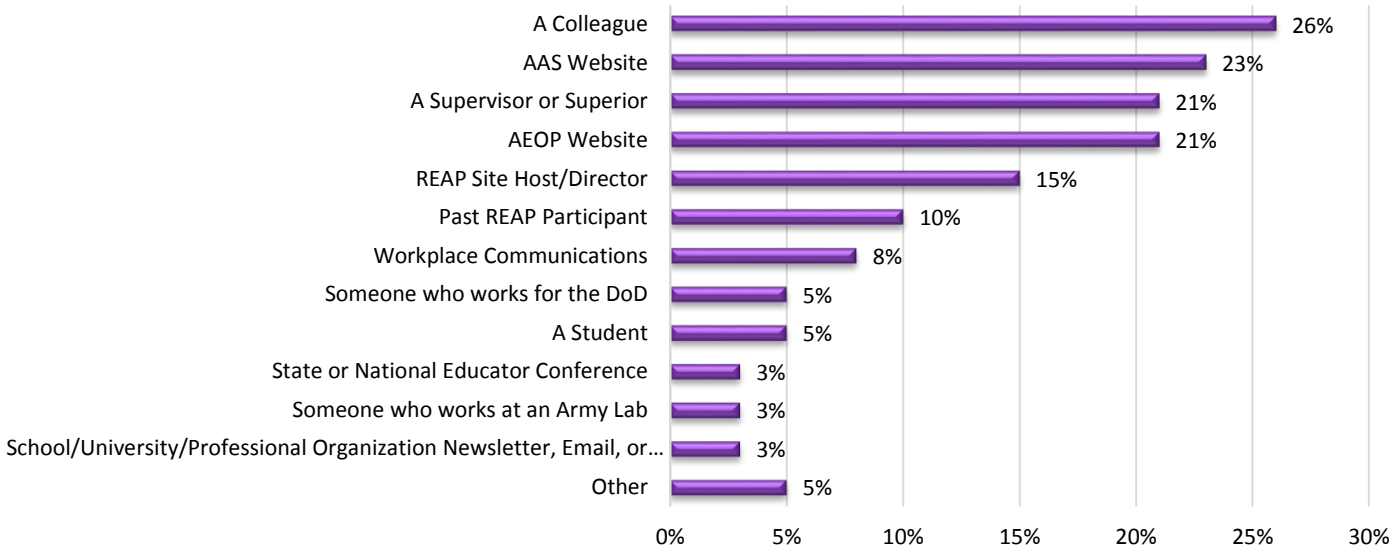
important to note the importance of site selection in recruiting participants from underrepresented and underserved groups. REAP targeted a 30% increase in HCBUs and MSIs for FY14, and accomplished the goal with 47% of host sites located at HCBUs and MSIs, compared with 13% in 2013.

Chart 3: How Apprentices Learned about REAP (n = 55)



Mentors were also asked how they learned about REAP (see Chart 4). The sources that the responding mentors most frequently identified were a colleague (26%), the AAS website (23%), the AEOP website (21%), or a supervisor/superior (21%). The REAP site host or director (15%), past REAP participants (10%), and workplace communications (8%) were also relatively frequently identified.

Chart 4: How Mentors Learned about REAP (n = 39)



Many of the REAP mentors have had previous experience with the program. Half of the mentors reported participating in REAP three or more times, with another third participating one or two times (26% and 11% respectively). To examine whether mentors are expanding their participation in AEOP programs beyond REAP, the questionnaire asked how many times they participated in each of the AEOP programs. With the exception of SMART, URAP, and UNITE, 90% or more of responding mentors indicated never hearing of or never participating in the other AEOP programs. Sixty-three percent indicated never participating in any non-REAP AEOP program. A little less than a quarter of the mentors reported participating in any non-REAP AEOP program one or two times (14% and 9%, respectively). Although REAP has a relationship with UNITE and is hosted in many of the same sites as UNITE, more than a third of the REAP mentors reported being unfamiliar with the UNITE program (35%) and more than half reported never participating in UNITE (54%).

Factors Motivating Apprentice Participation

Apprentice questionnaires, interviews, and focus groups included questions to explore what motivated the apprentices to participate in REAP. Specifically, the questionnaire asked how motivating a number of factors were in their decision to participate. As can be seen in Table 14, 80% or more of responding apprentices indicated that interest in STEM (91%), desire to learn something new or interesting (87%), desire to expand laboratory or research skills (82%), and learning in ways that are not possible in school (80%) were “very much” motivating. The opportunity to use advanced laboratory technology (75%), exploring a unique work environment (75%), building their college application or résumé (69%), networking opportunities (65%), and having fun (65%) were each indicated as very much motivating by a majority of respondents.

Table 14. Factors Motivating Apprentices "Very Much" to Participate in REAP (n = 54-55)	
Item	**Questionnaire Respondents**
Interest in science, technology, engineering, or mathematics (STEM)	91%
Desire to learn something new or interesting	87%
Desire to expand laboratory or research skills	82%
Learning in ways that are not possible in school	80%
Opportunity to use advanced laboratory technology	75%
Exploring a unique work environment	75%
Building college application or résumé	69%
Networking opportunities	65%
Having fun	65%
Earning stipend or award while doing STEM	56%
Teacher or professor encouragement	55%
Serving the community or country	47%
The program mentor(s)	40%
Parent encouragement	38%
Opportunity to do something with friends	26%
An academic requirement or school grade	15%
Interest in STEM careers with the Army	15%

All of the apprentices in the focus group and phone interviews mentioned being encouraged to participate in REAP by teachers and professors. As two apprentices explained:

> *At JSHS I met a professor who was a REAP mentor, and he told me about it. My project was dealing with something downstream in the pathway that he was studying, so he talked to me, told me about the apprenticeship program, and I applied.* (REAP Apprentice)

> *My teacher told me about the REAP apprenticeship at [University A] and I filled out the application online. We have a career counselor, and she usually sends out information about programs. I was originally going to apply for one at [University B], but it was not offered this year. So the counselor found this one instead for my teacher to tell me about.* (REAP Apprentice)

For each item in Table 14, differences between females and males, minority apprentices and non-minority apprentices, FRL-eligible apprentices and non-FRL-eligible apprentices, and apprentices from suburban schools and apprentices from underserved schools were tested to identify whether different factors were more or less motivating for different apprentice groups. Overall, there were few significant differences. Females were moderately more likely than males to

indicate being motivated by a desire to serve the community or country[5] (effect size[6] d = 0.74 standard deviations). Minorities were more likely than non-minorities to indicate that they were motivated to participate in REAP for an academic requirement or school grade[7] (a medium effect, d = 0.61 standard deviations). Apprentices eligible for FRL were moderately more likely than those not eligible for FRL to be motivated by an academic requirement or grade[8] (d = 0.64 standard deviations), and the opportunity to do something with friends[9] (d = 0.56 standard deviations). Apprentices from underserved schools were more likely than apprentices from suburban schools to be motivated by teacher or professor encouragement[10] (a large effect, d = 0.93 standard deviations).

The REAP Experience

The apprentice questionnaire included several items asking about the nature of apprentices' experience in REAP, and how that experience compared to their STEM learning opportunities in school. When asked what field their REAP experience focused on, 61% of responding apprentices selected science, 24% engineering, 12% technology, and 4% mathematics. As can be seen in Chart 5, about half indicated that they were assigned a project for the experience by their mentor (52%), 17% worked with their mentor and members of a research team to design a project, and 15% had a choice among various projects suggested by their mentor. The remaining apprentices reported working with their mentor to design a project (12%), designing a project on their own (2%), or not having a project at all (2%).

[5] Two-tailed independent samples t-test, $t(53) = 2.39$, $p = 0.020$.

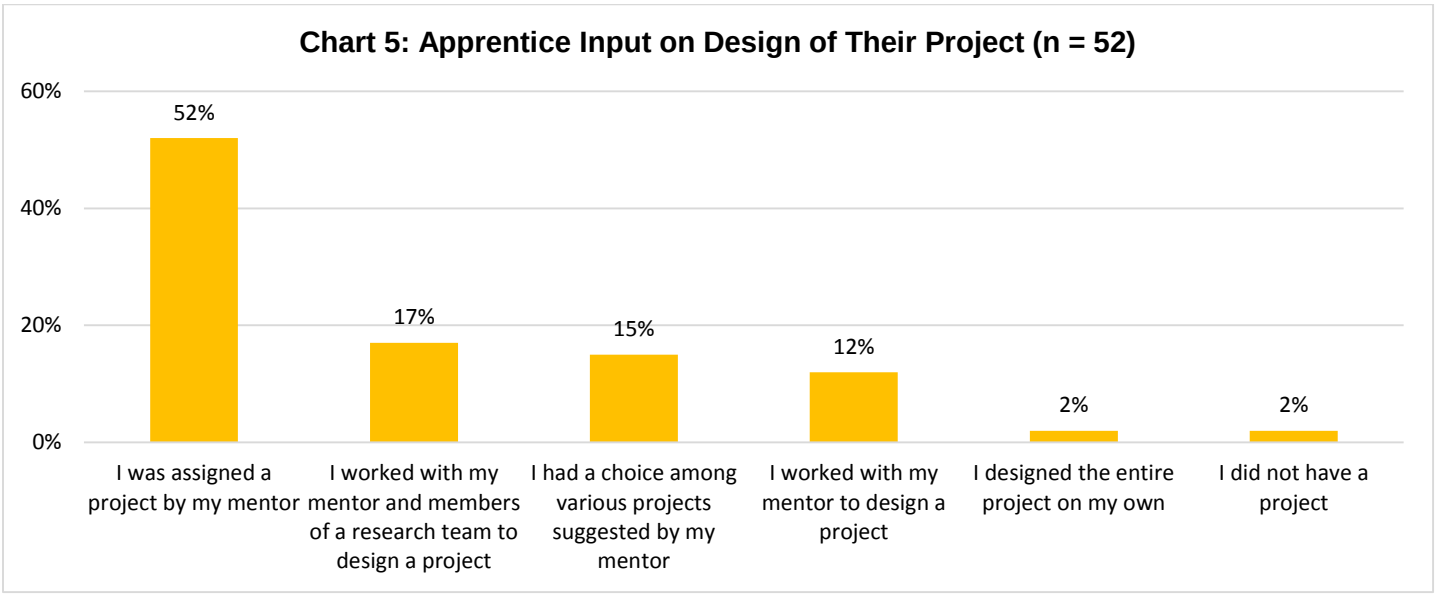
[6] Effect sizes are used to facilitate comparison of the magnitude of differences across different outcomes and/or studies by putting differences on a standardized metric. For difference between means, effect size is calculated as Cohen's d: the difference in means of the two groups divided by the pooled standard deviation. For Cohen's d, effect sizes of about 0.20 are typically considered small, 0.50 medium, and 0.80 large. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

[7] Two-tailed independent samples t-test, $t(52) = 2.08$, $p = 0.043$.

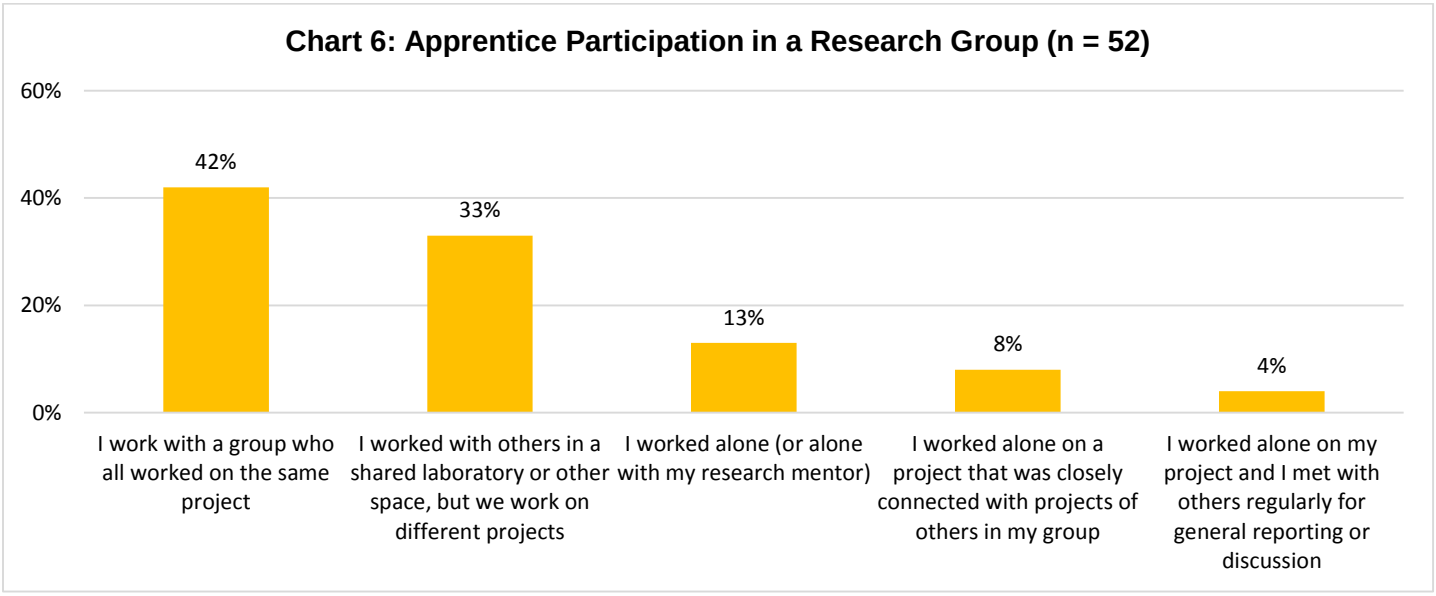
[8] Two-tailed independent samples t-test, $t(51) = 2.29$, $p = 0.026$.

[9] Two-tailed independent samples t-test, $t(50) = 2.03$, $p = 0.048$.

[10] Two-tailed independent samples t-test, $t(53) = 3.00$, $p = 0.004$.

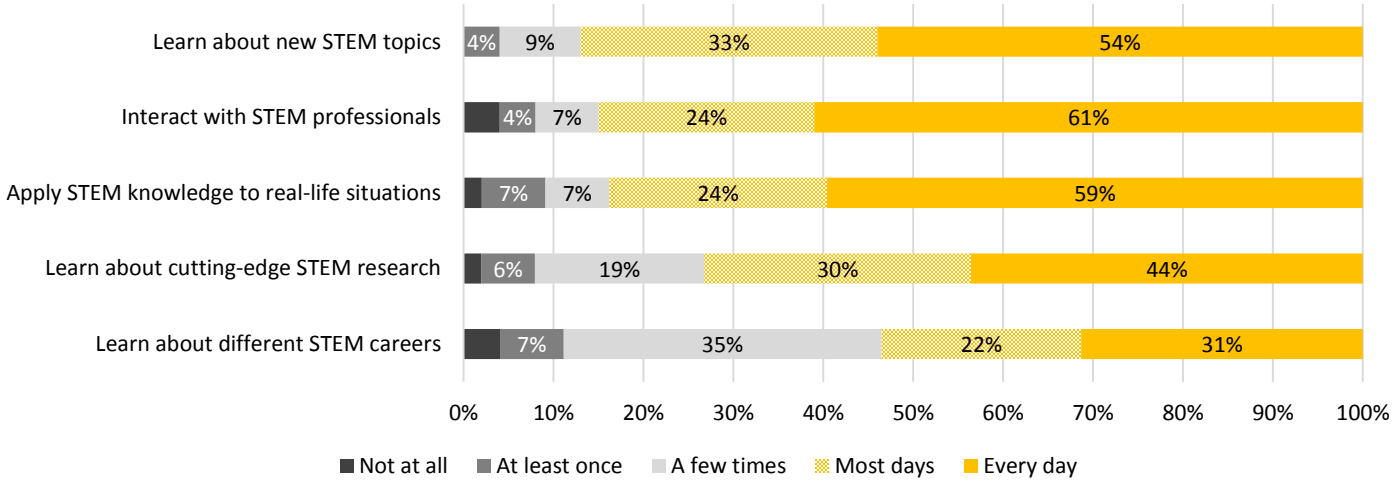


Not quite half of the apprentices worked with a group on the same project during their REAP experience (see Chart 6). The remaining apprentices worked in close proximity with others during their experience, although they tended to work independently on their projects. For example, 33% reported working in a shared laboratory/space with others, but on different projects. Similarly, 13% indicated working alone (or alone with their research mentor), while 8% reported working alone on a project closely connected to other projects in their group, and 4% reported working alone on a project and meeting regularly with others for general reporting or discussion.



Apprentices were also asked a series a questions about the types of activities they engaged in during their REAP experience. As can be seen in Chart 7, the vast majority of respondents indicated reported learning about new STEM topics, interacting with STEM professionals, and applying STEM knowledge to real-life situations on most or every day of the experience. More than half of apprentices also reported learning about cutting-edge STEM research and learning about different STEM careers on most days or every day. Mentors were asked similar questions about the nature of the apprentices' experiences. Overall, their responses paint a similar picture of the REAP experience (responses to these items can be found in Appendix C).

Chart 7: Nature of Apprentice Activities in REAP (n = 54)

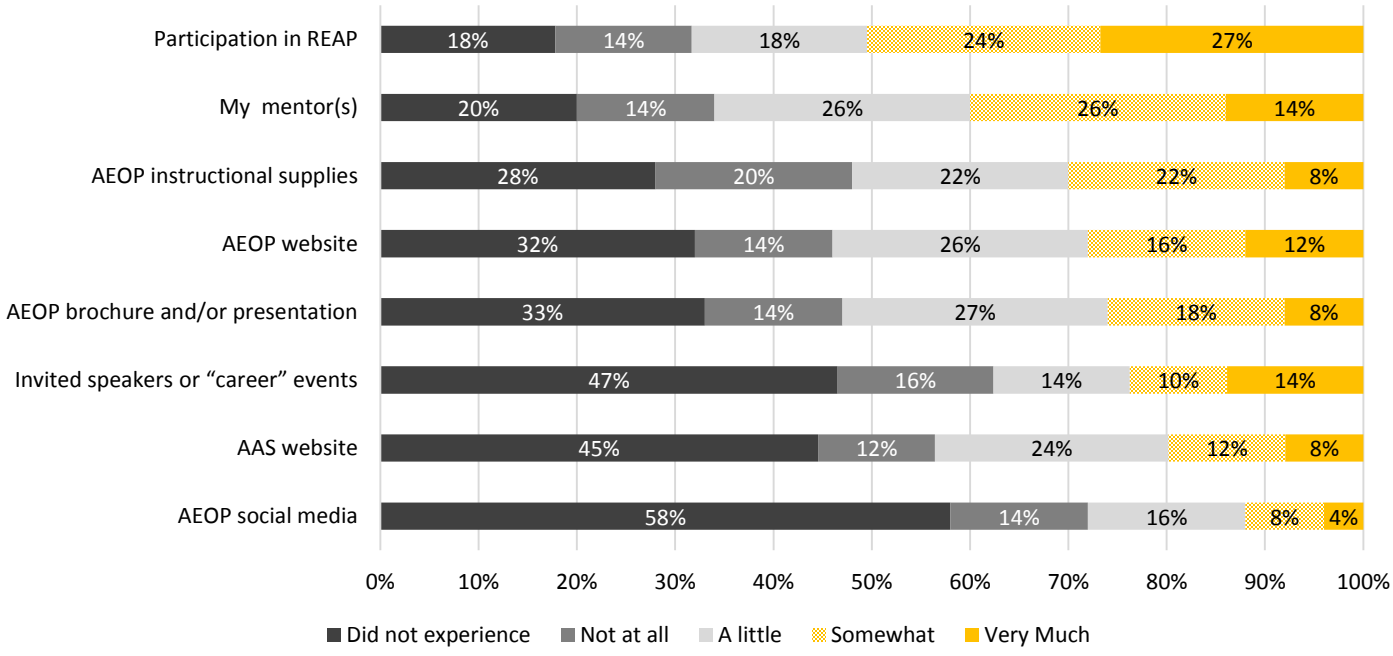


Because increasing the number and diversity of students who pursue STEM careers is one goal of the REAP program, the apprentice questionnaire also asked how many jobs/careers in STEM in general, and STEM jobs/careers in the DoD more specifically, apprentices learned about during their experience. As can be seen in Table 15, nearly all apprentices reported learning about at least one STEM job/career, and the majority (68%) reported learning about three or more. In contrast, 64% of apprentices reported that they did not learn about any DoD STEM jobs/careers, although 16% reported learning about five or more STEM jobs/careers in the DoD.

Table 15. Number of STEM Jobs/Careers Apprentices Learned about During REAP (n = 50)		
	STEM Jobs/Careers	DoD STEM Jobs/Careers
None	10%	64%
1	8%	10%
2	14%	2%
3	26%	4%
4	8%	4%
5 or more	34%	16%

Apprentices were also asked which resources impacted their awareness of DoD STEM careers. Participation in REAP (51%), apprentices' mentors (40%), and AEOP instructional supplies (30%) were most often reported as being somewhat or very much responsible for this impact (see Chart 8).

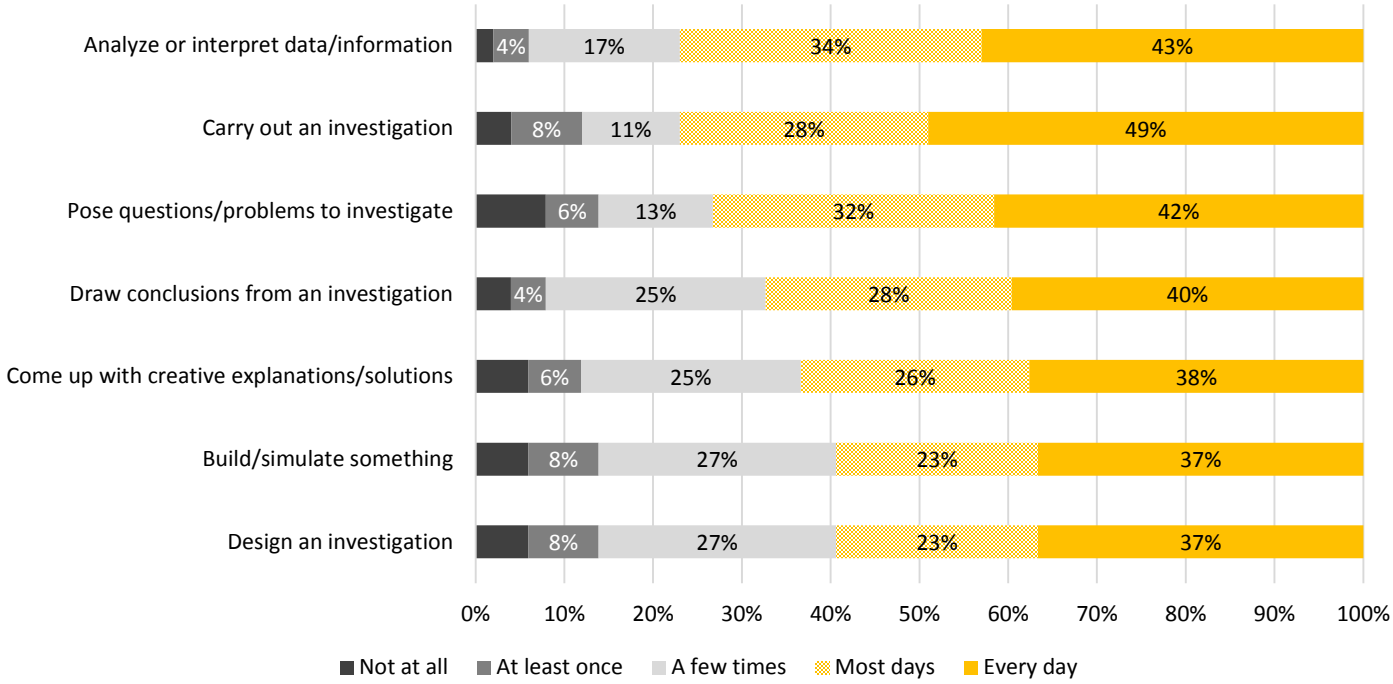
Chart 8: Impact of Resources on Apprentice Awareness of DoD STEM Careers (n = 50-51)



The questionnaire also asked apprentices how often they engaged in various STEM practices during REAP. Results indicate that apprentices were very actively engaged in doing STEM during the program (see Chart 9). For example, 77% of responding apprentices indicated analyzing or interpreting data on most days or every day; 77% reported carrying out

investigations; and 74% reported posing questions to investigate. In addition, apprentices indicated being integrally involved the work of STEM on most days or every day, including drawing conclusions from an investigation (68%), coming up with creative explanations/solutions (64%), building/simulating something (60%), and designing an investigation (60%). Data from the mentor questionnaire about apprentice engagement in STEM practices (shown in Appendix C) are very well aligned with data from the apprentice questionnaire.

Chart 9: Apprentice Engagement in STEM Practices in REAP (n = 52-53)



A composite score[11] was calculated for each of these two sets of items, the first titled "Learning about STEM in REAP,"[12] and the second "Engaging in STEM Practices in REAP."[13] Response categories were converted to a scale of 1 = "Not at all" to 5 = "Every day," and the average across all items in the scale was calculated. The composite scores were used to test

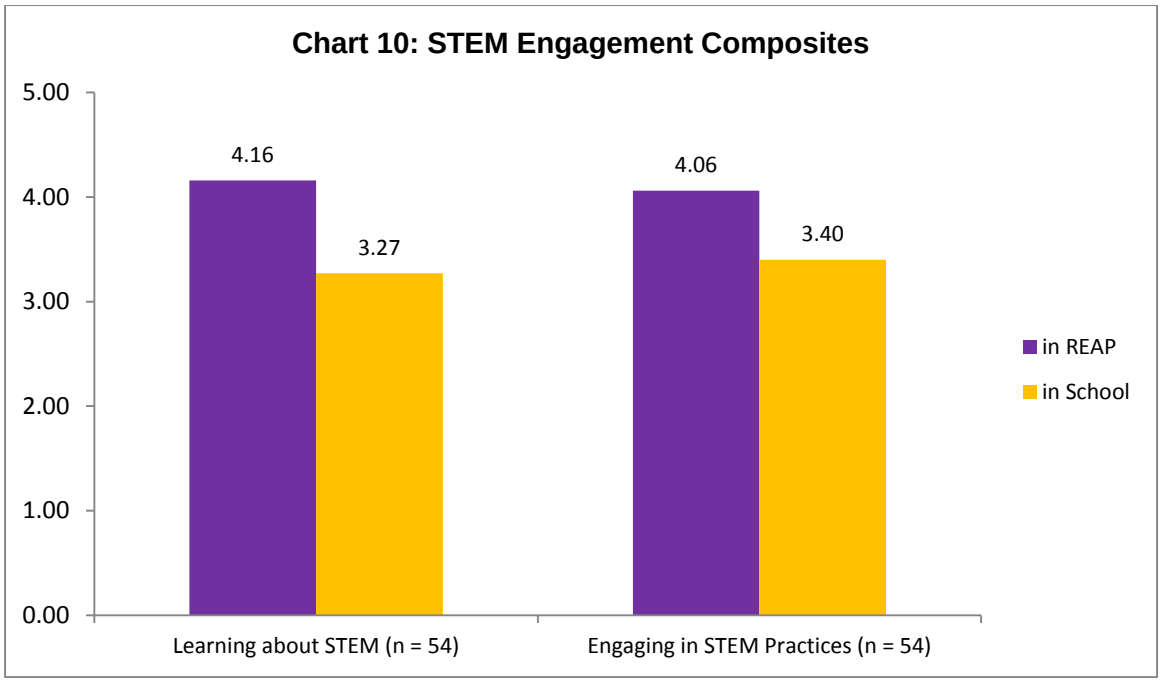
[11] Using multiple statistical tests on related outcomes requires the use of a Type I error rate adjustment to reduce the likelihood of false positives (i.e., detecting a difference when one does not truly exist). However, Type I error rate adjustments lead to a reduction in statistical power (i.e., the ability to detect a difference if it does exist). The use of a composite score helps avoid both of these problems by reducing the total number of statistical tests used. In addition, composite scores are typically more reliable than individual questionnaire items.

[12] The Cronbach's alpha reliability for these 6 items was 0.872.

[13] The Cronbach's alpha reliability for these 10 items was 0.910.

whether there were differences in apprentice experiences by gender, race/ethnic group (minority vs. non-minority), FRL status, and school location. There were no significant differences for any of the groups on either composite.

To examine how the REAP experience compares to their typical school experience, apprentices were asked how often they engaged in the same activities in school (individual item responses can be found in Appendix B). These responses were also combined into two composite variables: "Learning about STEM in School,"[14] and "Engaging in STEM Practices in School"[15] that are parallel to the ones asking about REAP. As can be seen in Chart 10, scores were significantly higher on the "in REAP" versions of both composites than on the "in school" versions (large effect of d = 0.902 standard deviations and medium effect of d = 0.703 standard deviations, respectively).[16] These data indicate that REAP provides apprentices with more intensive STEM learning experiences than they would typically receive in school.



The Role of Mentors

Mentors play a critical role in the REAP program. The nature and quality of mentoring is an important factor in maximizing apprentice participation in these opportunities, and sustaining or inspiring their interest in future STEM work. Consequently, both the apprentice and mentor questionnaires asked about the role of mentors in the program. Because

[14] Cronbach's alpha reliability of 0.904.

[15] Cronbach's alpha reliability of 0.950.

[16] Two-tailed independent samples t-tests: Learning about STEM, $t(53) = 6.63$, $p < 0.001$; Engaging in STEM Practices, $t(53) = 5.17$, $p < 0.001$.

of the nature of the program, it is not surprising that 86% of responding mentors reported working with 1-2 apprentices, with the remaining working with 3 to 5 apprentices.

Mentors were also asked whether or not they used a number of strategies when working with apprentices (referred to as students in the mentor questionnaire items and in the descriptions of those items throughout this section of the report). These strategies comprised five main areas of effective mentoring:

1. Establishing the relevance of learning activities;
2. Supporting the diverse needs of students as learners;
3. Supporting students' development of collaboration and interpersonal skills;
4. Supporting students' engagement in "authentic" STEM activities; and
5. Supporting students' STEM educational and career pathways.

Large proportions of responding mentors reported using several strategies to help make the learning activities relevant to students (see Table 16). For example, nearly all reported finding out about students' backgrounds and interests at the beginning of the program (95%), and most helped students see how STEM can affect them or their communities (84%). Seventy-nine percent reported asking students to relate outside events or activities to topics covered in the program, giving students real-life problems to solve, and selecting readings or activities that relate to students' backgrounds. The majority of mentors also reported helping students understand how STEM can help them improve their communities (74%), encouraging students to suggest new readings, activities, or projects (65%), and making explicit provisions for students wishing to carry out independent studies (63%). Mentors also suggested other ways that they establish relevance, such as demonstrating how skills learned in the laboratory are pertinent to other fields.

Table 16. Mentors Using Strategies to Establish Relevance of Learning Activities (n = 38)

Item	Questionnaire Respondents
Finding out about students' backgrounds and interests at the beginning of the program	95%
Helping students become aware of the roles STEM plays in their everyday lives	84%
Asking students to relate outside events or activities to topics covered in the program	79%
Giving students real-life problems to investigate or solve	79%
Selecting readings or activities that relate to students' backgrounds	79%
Helping students understand how STEM can help them improve their communities	74%
Encouraging students to suggest new readings, activities, or projects	65%
Making explicit provisions for students who wish to carry out independent studies	63%

Similarly, mentors reported using a variety of strategies to support the diverse needs of students as learners. As can be seen in Table 17, 92% of mentors reported treating all students the same way, regardless of gender or race/ethnicity, 84%

indicated using diverse teaching/mentoring activities and gender neutral language. Many also helped students find additional support if needed (79%) and tried to find out about student learning styles (71%). Other strategies mentioned included having students participate in meetings and seminars and accommodating students' busy schedules.

Table 17. Mentors Using Strategies to Support the Diverse Needs of Students as Learners (n = 38)	
Item	**Questionnaire Respondents**
Interacting with all students in the same way regardless of their gender or race and ethnicity	92%
Using diverse teaching/mentoring activities to address a broad spectrum of students	84%
Using gender neutral language	84%
Providing extra readings, activities, or other support for students who lack essential background knowledge or skills	79%
Finding out about students' learning styles at the beginning of the program	71%
Directing students to other individuals or programs if I can only provide limited support	66%
Integrating ideas from the literature on pedagogical activities for women and underrepresented students	61%

Mentors reported using many strategies to support students' development of collaboration and interpersonal skills (see Table 18). For example, nearly all of those responding to the questionnaire indicated having students work as members of a team on activities or projects (95%). The vast majority had students listen to the ideas of others with an open mind (89%), participate in giving and receiving feedback (89%), tell others about their backgrounds and interests (87%), and explain difficult ideas to others (81%).

Table 18. Mentors Using Strategies to Support Student Development of Collaboration and Interpersonal Skills (n = 37-38)	
Item	**Questionnaire Respondents**
Having students work on collaborative activities or projects as a member of a team	95%
Having students listen to the ideas of others with an open mind	89%
Having students participate in giving and receiving feedback	89%
Having students tell others about their backgrounds and interests	87%
Having students explain difficult ideas to others	81%
Having students pay attention to the feelings of all team members	71%
Having students exchange ideas with others whose backgrounds or viewpoints are different from their own	68%
Having students develop ways to resolve conflict and reach agreement among the team	50%

When asked about strategies used to support student engagement in authentic STEM activities, 97% of responding mentors reported allowing students to work independently as appropriate for their self-management abilities and STEM competencies, 95% reported demonstrating the use of laboratory/field techniques, procedures, and tools, and 89% reported helping students practice STEM skills with supervision (see Table 19). The strategies of encouraging opportunities in which students could learn from others, encouraging students to seek support from other team members, and giving constructive feedback to improve students' STEM competencies were each used by 87% of the mentors. Two-thirds or more of the mentors reported teaching/assigning readings about specific STEM subject matter (79%) and having students access and critically review technical texts or media (66%).

Table 19. Mentors Using Strategies to Support Student Engagement in "Authentic" STEM Activities (n = 38)	
Item	**Questionnaire Respondents**
Allowing students to work independently as appropriate for their self-management abilities and STEM competencies	97%
Demonstrating the use of laboratory or field techniques, procedures, and tools students are expected to use	95%
Helping students practice STEM skills with supervision	89%
Encouraging opportunities in which students could learn from others (team projects, team meetings, journal clubs)	87%
Encouraging students to seek support from other team members	87%
Giving constructive feedback to improve students' STEM competencies	87%
Teaching (or assigning readings) about specific STEM subject matter	79%
Having students access and critically review technical texts or media to support their work	66%

The last series of items about mentoring strategies focused on supporting students' STEM educational and career pathways (see Table 20).[17] All of the responding mentors reported asking students about their educational and career interests and nearly all reported sharing their own experiences, attitudes, and values about STEM (97%). Many also provided guidance to students, either about educational pathways that would prepare them for a STEM career (92%).

However, given the REAP program's goals of broadening the talent pool in STEM fields, it is somewhat surprising that only 62%-63% of the responding mentors reported doing each of the following: (1) discussing STEM career opportunities inside and outside of the DoD or other government agencies and (2) highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM. In addition, given the interest in having students

[17] The apprentice questionnaire included subset of these items (found in Appendix B). The apprentices reported lower percentages of use of strategies to support STEM educational and career pathways than did mentors.

graduate into other AEOP opportunities, it is surprising that only 63% of mentors recommended other AEOP programs to students.

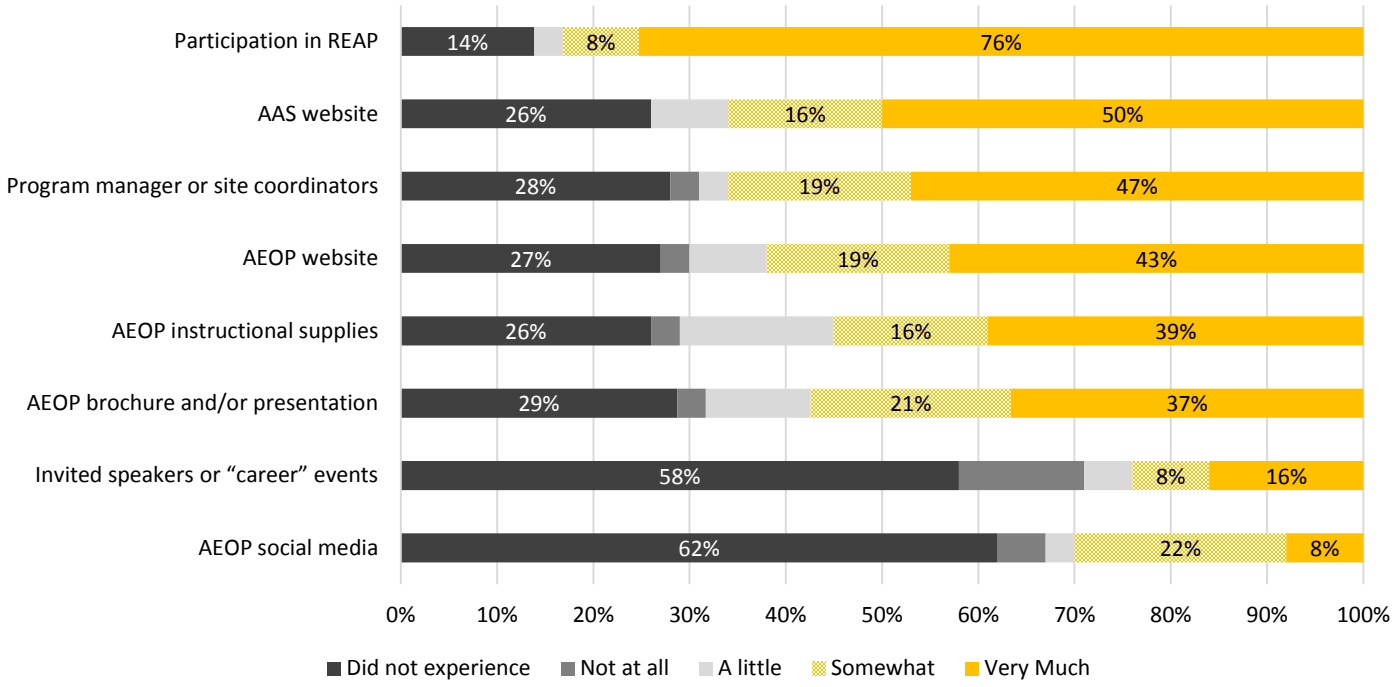
Table 20. Mentors Using Strategies to Support Student STEM Educational and Career Pathways (n = 37-38)	
Item	**Questionnaire Respondents**
Asking about students' educational and career interests	100%
Sharing personal experiences, attitudes, and values pertaining to STEM	97%
Providing guidance about educational pathways that would prepare students for a STEM career	92%
Discussing non-technical aspects of a STEM career (economic, political, ethical, and/or social issues)	66%
Discussing STEM career opportunities outside of the DoD or other government agencies (private industry, academia)	63%
Discussing STEM career opportunities with the DoD or other government agencies	63%
Recommending Army Educational Outreach Programs that align with students' educational goals	63%
Recommending extracurricular programs that align with students' educational goals	63%
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	62%
Helping students build effective STEM networks	58%
Critically reviewing students' résumé, application, or interview preparations	53%
Recommending student and professional organizations in STEM	46%

A separate item on the mentor questionnaire asked which of the AEOP programs mentors explicitly discussed with their students during REAP. Not surprisingly, the most frequently discussed program was REAP (75%), as can be seen in Table 21. Other programs discussed with students by a quarter or more of responding mentors were URAP (36%), SMART (33%), HSAP (32%), SEAP (26%), and UNITE (26%). A large number of mentors reported discussing AEOP generally with students, but not discussing any specific programs (45%).

Table 21. Mentors Explicitly Discussing AEOPs with Students (n = 35-37)	
Item	**Questionnaire Respondents**
REAP	75%
Undergraduate Research Apprenticeship Program (URAP)	36%
Science Mathematics, and Research for Transformation (SMART) College Scholarship	33%
High School Apprenticeship Program (HSAP)	32%
Science & Engineering Apprenticeship Program (SEAP)	26%
UNITE	26%
Gains in the Education of Mathematics and Science (GEMS)	19%
National Defense Science & Engineering Graduate (NDSEG) Fellowship	17%
GEMS Near Peers	14%
Junior Science & Humanities Symposium (JSHS)	14%
College Qualified Leaders (CQL)	11%

Mentors were also asked how useful various resources were in their efforts to expose students to the different AEOPs. As can be seen in Chart 11, participation in REAP (76%), the AAS website (50%), program managers or site coordinators (47%), and the AEOP website (43%) were most often rated as "very much" useful. Invited speakers or "career" events and AEOP social media tended not to be seen as very useful, with large proportions of mentors indicating they did not experience these resources. For example, 58% of responding mentors reported not experiencing invited speakers or "career" events, and only 16% rated them as "very much" useful. Similarly, 62% of responding mentors did not experience AEOP social media and only 8% found it very useful.

Chart 11: Usefulness of Resources for Exposing Students to AEOPs (n = 36-38)



The mentors in the focus group described strategies they used for informing students about AEOP opportunities, including brochures from AEOP and AEOP instructional supplies. As stated by two mentors:

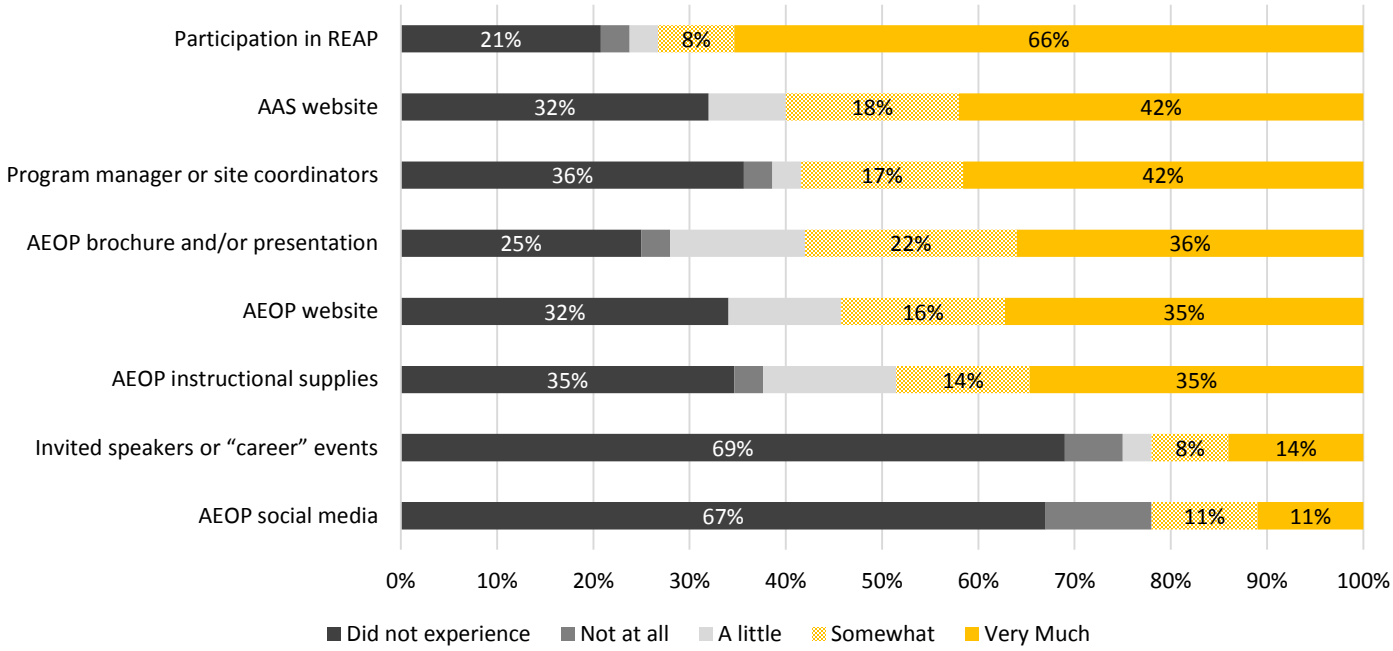
> *So I think REAP sent a care package to the student, to the apprentice, it was I think, at least to my knowledge, the first time they've done that, in terms of sending a care package with a lab coat, and also other reading materials about the different programs. So I definitely passed that on to her, and to her mom. And so that's really been to the extent of making her aware of the different other programs that are out there as it relates to the AEOP. So basically, by word of mouth and actually giving her that care package that included different information about that program.* (REAP Mentor)

> *I put one brochure posted on the wall right next to the white board so that whenever I teach lessons or any student constructive teaching method, they also have a chance to look at this brochure and get a connection to that.* (REAP Mentor)

Mentors were also asked how useful these resources were for exposing students to DoD STEM careers (see Chart 12). As with the previous item, mentors were most likely to rate participation in REAP as useful, with 66% selecting "very much." The AAS website (42%), program managers or site coordinators (42%), and the AEOP brochure and/or presentation (36%)

were most often rated as "very much" useful. Again, invited speakers or "career" events and AEOP social media were less likely to be seen as very useful for this purpose (11-14%), with large proportions of mentors indicating they did not experience these resources (67-69%).

Chart 12: Usefulness of Resources for Exposing Students to DoD STEM Careers (n = 36-68)



The mentors in the focus group were mostly unfamiliar with DoD STEM careers. As stated by two:

> *I have not spoken to them about the, what you mentioned about the Army program, and the details about what they are looking for, they are so busy doing what I tell them to, that I haven't had time to sit down and say 'listen, here are the Army objectives, let us see what you're going to do when you get back to school,' I have not had that- but maybe I will.* (REAP Mentor)

> *So I'm not sure if I'm aware of all of the STEM programs that are offered through the DoD.* (REAP Mentor)

One mentor said that there was an Army Day at the REAP site in which students could learn about DoD careers.

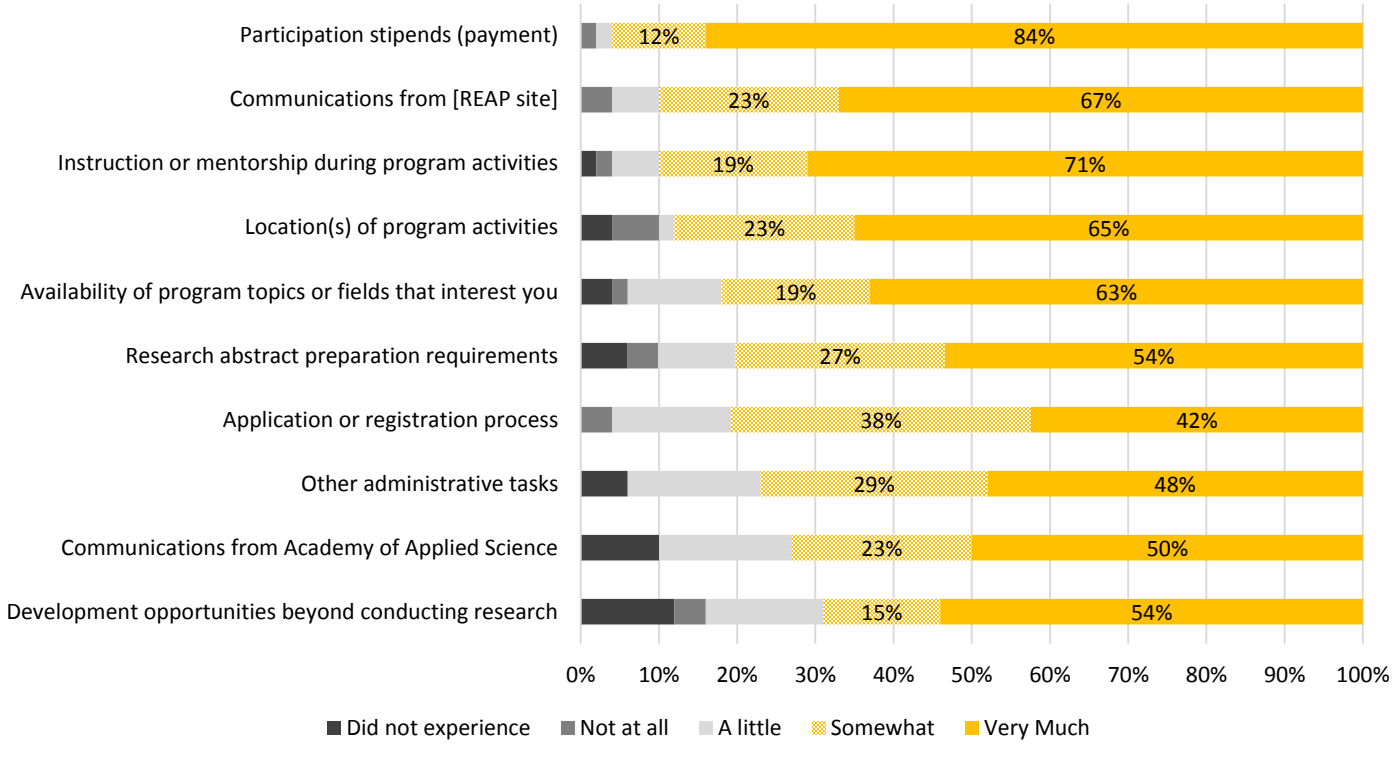
> *We had a whole day, Army Day, in which we invited I think 3 Army personnel, because, we have Army Corps Research Division that is called [site], thirty miles from our university. So I have made arrangements to invite those*

people and we have actually invited 3 of them, even though there are many, many persons interested to come and talk to our students. So these Army research personnel from Army Corps have come down, and then each one has given a presentation for about 30 minutes explaining the research areas they are doing there, at the Army Corps Center, and then somebody highlighted the research and STEM research in environmental science. One other person explained research careers in combinations of science, and one person on civil engineering, and another person on GIS and geography. So they are pretty much explaining the STEM research in the Army Corps' Research Center. (REAP Mentor)

Satisfaction with REAP

Apprentices and mentors were asked how satisfied they were with a number of features of the REAP program. As can be seen in Chart 13, the vast majority of responding apprentices were somewhat or very much satisfied with each of the listed program features. For example, 96% of apprentices were at least somewhat satisfied with the stipend, 90% with the communications from their REAP site, 90% with instruction or mentorship during program activities, and 88% with the location of the program activities.

Chart 13: Apprentice Satisfaction with REAP Program Features (n = 51-52)

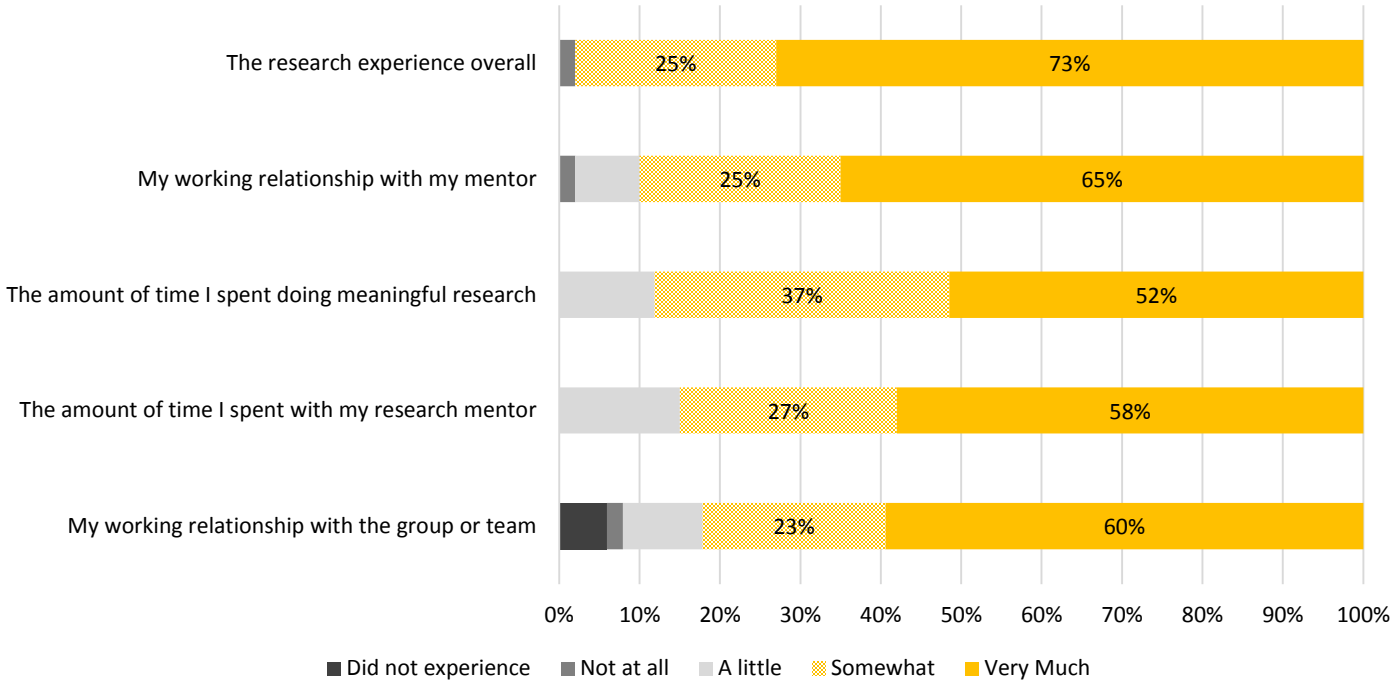


Apprentices were also asked about their satisfaction with access to their mentor. As can be seen in Table 22, 54% of responding apprentices indicated their mentor was always available, and 31% that their mentor was available more than half of the time. Few apprentices indicated that their mentor was available half of the time or less.

Table 22. Apprentice Reports of Availability of Mentors (n = 52)	
Item	**Questionnaire Respondents**
The mentor was always available.	54%
The mentor was available more than half of the time.	31%
The mentor was available about half of the time of my project.	10%
The mentor was available less than half of the time.	6%

Similarly, apprentices were asked about their satisfaction with their mentors and the research experience (see Chart 14). The majority of apprentices indicated being "very much" satisfied with each of the features, with the vast majority being at least somewhat satisfied with each feature. For example, 73% of apprentices indicated "very much" when asked about their research experience overall, with another 25% indicating "somewhat." Similarly, 90% were at least somewhat satisfied with their working relationship with their mentor; 87% reported being at least somewhat satisfied with the time spent doing meaningful research, and 85% with the time spent with their mentor.

Chart 14: Apprentice Satisfaction with Their Experience (n = 51-52)



An open-ended item on the questionnaire asked apprentices about their overall satisfaction with their REAP experience. The responses were overwhelmingly positive. Of the 39 apprentices who answered this question, 34 (87%) commented on only positive aspects of the program. These responses were sometimes as simple as, "I am glad I was chosen to participate and gain the experience that I have gained so far." Other times, they provided more detail about what they enjoyed, such as in the following examples:

> *My experience with REAP overall was amazing; I got to work in a comfortable setting with professionals and older students who had the same values, goals, and interests as I did. Being able to see my research actually put out effective results was really cool and the fact that I got the chance to present the results I found made me all the more interested in pursuing a career in the science field.* (REAP Apprentice)

> *I enjoyed the program a lot. My mentor and the graduate student whom I worked with were very helpful and supportive. I learned a lot about the field of blood substitutes and biochemistry, and my experience has motivated to major in biochem in college.* (REAP Apprentice)

> *Overall, I was very satisfied with the REAP experience. I was exposed first hand to a lab environment, and was able to conduct my very own research with help from others in my lab. Research had always been a field that I'd been*

> *interested in, and this was a fantastic opportunity to explore it firsthand. I gained vast amounts of scientific knowledge, as well as the ability to present scientific results to others through papers and presentations. Everyone was friendly and eager to help, and that comfortable lab environment was one of the most important factors that contributed to my success.* (REAP Apprentice)

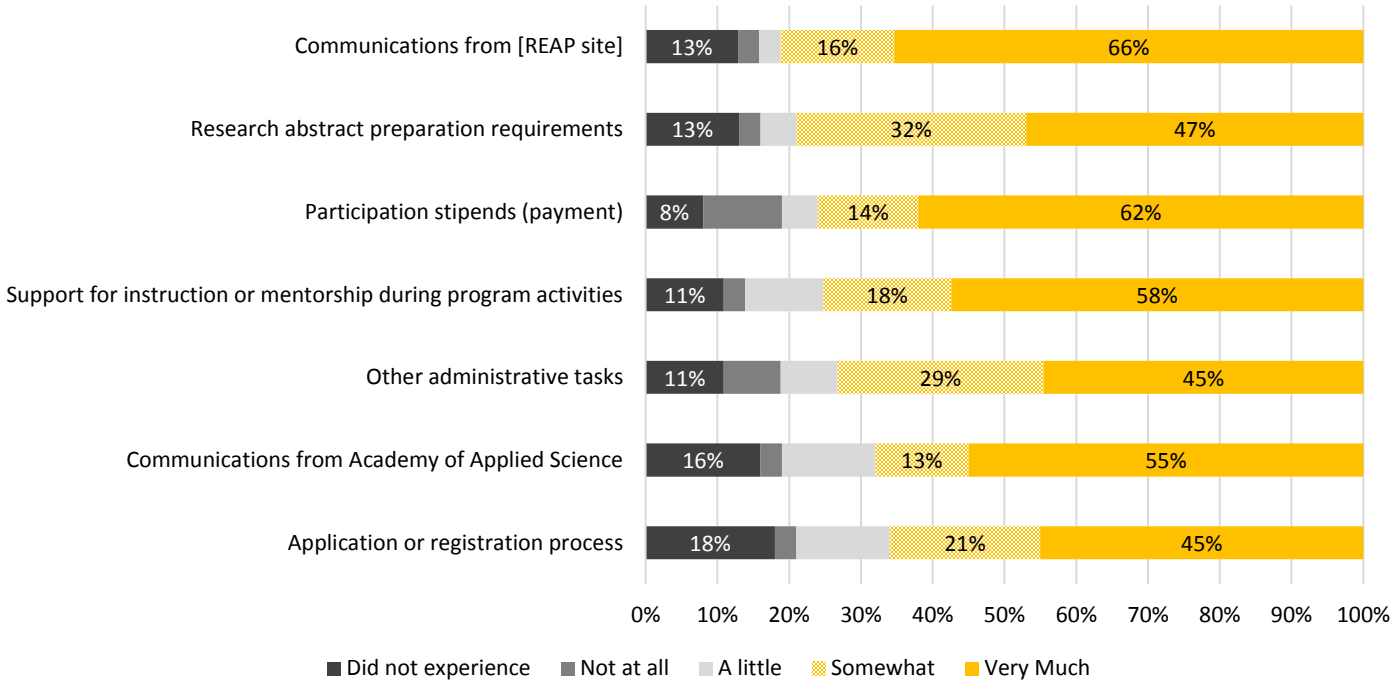
The 5 (13%) other responses included positive comments, but had some caveats. For example, one apprentice indicated that it was interesting to learn about using models and simulations, but did not find the project work challenging. Another apprentice felt that there were too many people working on the project. In this apprentice's words:

> *Overall, I was satisfied with the REAP [experience]. Although the specific branch I worked in is, and was, not the field I intend to work in, I feel that this program has given me new exposure and knowledge of the STEM field. However, I do feel that the project was too small for a group of our size, which left some people, commonly myself, without a role. This was mainly because the more experienced students were able to attempt and complete tasks before I was able to learn about how to work with them.* (REAP Apprentice)

When asked how the program could be improved, 35 apprentices answered. The most common theme in the responses to this open-ended item, described by 8 (23%), was that the apprentices wanted to extend the length of the program. The second most common response, mentioned by 7 (20%) had to do with organization. Two of these 7 apprentices mentioned only the need for better organization, although others gave specific examples such as providing clarification on the schedule and guidelines/instructions. Other suggestions included providing time for REAP apprentices to interact with each other across projects (14%), learning more about STEM and DoD careers (14%), increasing the number of apprentices in each location (11%), and providing more research options for the apprenticeships (11%). These comments are similar to sentiments expressed about the 2013 program.

Mentors also reported being somewhat or very much satisfied with the program components they experienced (see Chart 15). For example, 82% were at least somewhat satisfied with communications from the local REAP site, 79% with the research abstract and preparation requirements, and 76% with the participation stipends.

Chart 15: Mentor Satisfaction with REAP Program Features (n = 37-38)



As with the apprentice questionnaire, the mentor questionnaire included open-ended items asking for their opinions about the program. One item asked them to identify the three most important strengths of REAP; 33 mentors responded to this question. Although several important aspects of the program were listed, the most frequently described was providing apprentices with hands-on research experiences (17 mentors, or 52%). Mentors wrote things like "exposes students to real scientific research" and "ability to work in research labs." This sentiment was echoed in the mentor focus group. As two mentors said:

> *I think the REAP program is very essential in providing high school students a scientific experience that's more realistic…being able to work in a scientist or engineering lab or place of work, it just provides a great opportunity for that student to really get a true taste of what science is all about.* (REAP Mentor)

> *[The value of REAP is] just giving them the opportunity to come into the lab and work with some undergraduate students and get the experience that I never really had as a high school student. So me, I just, I'm explaining to them what an experiment is all about and how to go about doing scientific research.* (REAP Mentor)

Other responses to the open-ended questionnaire item focused on REAP's apprentice stipend (24%), the opportunity for teamwork/collaboration among apprentices and scientists (24%), the inclusion of diverse and/or underrepresented

apprentices (21%), the opportunity for apprentices to increase their knowledge (in general, and also about STEM) (15%), and preparing apprentices for college experiences (15%).

Mentors were also asked to note three ways in which REAP should be improved for future participants. Of the 30 individuals who responded to this question, 50% indicated the need for additional funding. Many of the mentors specified the purpose for the funding, such as "additional support which will afford the opportunity to more students," "more monetary resources for mentors," and "larger stipends for students." Like the apprentices, several mentors suggested increasing the length of the apprenticeship (13%). Other suggestions, though none made by a large number of mentors, included holding a REAP conference/science fair (10%), making improvements to the REAP website (10%), increasing the advertising for the program (10%), providing more information to mentors about STEM and DoD careers (10%), providing training for REAP mentors and support staff (10%), and providing clearer expectations for apprentices and mentors.

Lastly, mentors were asked to share their overall satisfaction with their REAP experience. The responses were largely positive. Of the 28 individuals who responded to this question, 79% described having a positive experience. Nearly all of these responses included a positive comment about the program, along with listing one or more ways in which the program was beneficial to apprentices. For example:

> *The REAP program has been working well for us for many years and we had mostly very good experiences with the students. In several cases, their work resulted in scientific publications where they were coauthors. Often, the students continued to carry out research with us during the semester and used some of the results for science fair projects. In some cases, students recognized that laboratory research and its often tedious nature might not be their prime interest, and it is also valuable to realize that early on and adjust the career goals accordingly.* (REAP Mentor)
>
> *REAP is a great opportunity for underrepresented students to experience research and earn a summer stipend. I feel that the stipend is especially important to recruiting low-income students. Our lab had fun hosting the students, and they contributed significantly to our research project.* (REAP Mentor)
>
> *REAP is an amazing program and I hope it continues. It is always great to see how the students progress over the summer and it is good for the other students (graduate and undergraduate), too, because it is a great opportunity*

"I think the REAP program is very essential in providing high school students a scientific experience that's more realistic…being able to work in a scientist or engineering lab or place of work, it just provides a great opportunity for that student to really get a true taste of what science is all about." – REAP Mentor

to educate them on how to become better mentors. We do not usually have enough time to address every point raised on the survey but the students always learn something valuable over the course of the summer. (REAP Mentor)

In summary, findings from the Actionable Program Evaluation indicate that the program is having success in providing a program that actively engages students in authentic STEM experiences. REAP's purposeful site selection has allowed the program to recruit many students from underrepresented and underserved students.

Once in the REAP program, apprentices are learning about DoD or STEM job/careers, with most mentors crediting apprentice participation in the program, the AAS website, and program managers/site coordinators as useful in this process. In an attempt to catalyze continued student engagement in the AEOP programs, mentors are also discussing other AEOPs with apprentices, with URAP and SMART being the most commonly discussed AEOPs.

The REAP program actively engages apprentices in learning about STEM and in STEM practices, more than they would typically experience in school. As part of this engagement, large proportions of mentors employed strategies to help make the learning activities relevant to apprentices, support the diverse needs of apprentices as learners, support apprentices' development of collaboration and interpersonal skills, and support apprentice engagement in authentic STEM activities. Overall, apprentices and mentors were somewhat or very much satisfied with the REAP program.

Outcomes Evaluation

The evaluation of REAP included measuring several outcomes relating to AEOP and program objectives, including impacts on apprentices' STEM competencies (e.g., knowledge and skills), STEM identity and confidence, interest in and intent for future STEM engagement (e.g., further education, careers), attitudes toward research, and their knowledge of and interest in participating in additional AEOP opportunities.[18] STEM competencies are necessary for a STEM-literate citizenry. STEM

> *"REAP is an amazing program and I hope it continues. It is always great to see how the students progress over the summer and it is good for the other students (graduate and undergraduate), too, because it is a great opportunity to educate them on how to become better mentors."* – REAP Mentor

[18] The outcomes measured in the evaluation study were informed by the following documents:
Committee on STEM Education. (2013*). Federal Science, Technology, Engineering, and Mathematics (STEM) education 5-year strategic plan: A report from the Committee on STEM Education, National Science and Technology Council.* Washington, DC: The White House, Office of Science and Technology Policy.

competencies include foundational knowledge, skills, and abilities in STEM, as well as the confidence to apply them appropriately. STEM competencies are important for those engaging in STEM enterprises, but also for all members of society as critical consumers of information and effective decision makers in a world that is heavily reliant on STEM. The evaluation of REAP measured apprentices' self-reported gains in STEM competencies and engagement in opportunities intended to develop what is considered to be a critical STEM skill in the 21st century—collaboration and teamwork.

STEM Knowledge and Skills

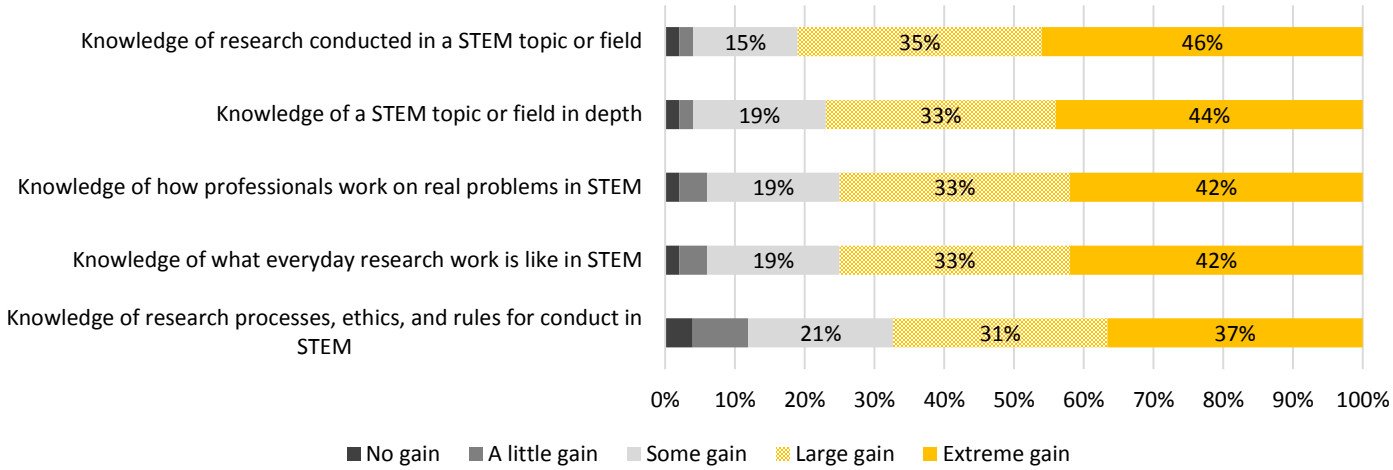
As can be seen in Chart 16, nearly all responding apprentices reported gains in their STEM knowledge as a result of the REAP program, with large majorities indicating large or extreme gains in each area. For example, large or extreme gains were reported by 81% of apprentices on their knowledge of research conducted in a STEM topic/field, and 77% on their knowledge of a STEM topic/field in depth. Similar impacts were reported on knowledge of how professionals work on real problems in STEM (75%), knowledge of what everyday research work is like in STEM (75%), and knowledge of research processes, ethics, and rules for conduct in STEM (68%). Mentors reported similar impacts on their apprentices' STEM knowledge (see Appendix C).

National Research Council. (2009). Learning Science in Informal Environments: People, Places, and Pursuits. Committee on Learning Science in Informal Environments. Philip Bell, Bruce Lewenstein, Andrew W. Shouse, and Michael A. Feder, Editors. Board on Science Education, Center for Education. Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

President's Council of Advisors on Science and Technology (P-CAST). (February 2012). *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics.* Executive Office of the President.

Report of the Academic Competitiveness Council (ACC). (2007). U.S. Department of Education. Available on the Department's Web site at: http://www.ed.gov/about/inits/ed/competitiveness/acc-mathscience/index.html.

Chart 16: Apprentice Report of Impacts on STEM Knoweldge (n = 52)



These apprentice questionnaire items were combined into a composite variable[19] to test for differential impacts across subgroups of apprentices (based on gender, race/ethnicity, FRL status, and school location). There were no significant differences between any of the subgroups; in other words, the subgroups of apprentices reported similar impacts of the program on their STEM knowledge.

The apprentice questionnaire also asked about perceived impacts on STEM skills—i.e., apprentices' abilities to use STEM practices. Apprentices were presented with different sets of items depending on the focus of their REAP experience (science vs. technology, engineering, or mathematics). Table 23 shows the percentage of responding apprentices reporting large or extreme gains in science-related practices. Two-thirds or more of the responding apprentices reported large or greater gains on their ability to read technical or scientific texts to learn about the natural or designed worlds (71%), design procedures for investigations (68%), carry out procedures for an investigation and record data properly (67%), and ask questions to understand the data and interpretations others use to support their explanations (67%). Fewer than half of responding apprentices reported large gains on their ability to identify the limitations of data collected in an investigation (49%), identify the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts (45%), make a model to represent the key features and functions of an observed phenomenon (42%), use mathematics or computers to analyze numeric data (39%), or identify the strengths and limitations of explanations in terms of how well they describe or predict observations (38%).

[19] The Cronbach's alpha reliability for these 5 items was 0.895.

Table 23. Apprentices Reporting Large or Extreme Gains in their STEM Competencies – Science Practices (n = 30-31)	
Item	**Questionnaire Respondents**
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	71%
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	68%
Carrying out procedures for an investigation and recording data accurately	67%
Asking questions to understand the data and interpretations others use to support their explanations	67%
Deciding what type of data to collect in order to answer a question	64%
Asking a question (about a phenomenon) that can be answered with one or more investigations	61%
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	61%
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	60%
Asking questions based on observations of real-world phenomena	58%
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	58%
Using data or interpretations from other researchers or investigations to improve an explanation	58%
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	58%
Communicating information about your investigations and explanations in different formats (orally, written, graphically, mathematically)	58%
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	55%
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	55%
Supporting a proposed explanation (for a phenomenon) with data from investigations	55%
Testing how changing one variable affects another variable, in order to understand relationships between variables	52%
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	52%
Integrating information from multiple sources to support your explanations of phenomena	52%
Identifying the limitations of data collected in an investigation	49%

Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	45%
Making a model to represent the key features and functions of an observed phenomenon	42%
Using mathematics or computers to analyze numeric data	39%
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	38%

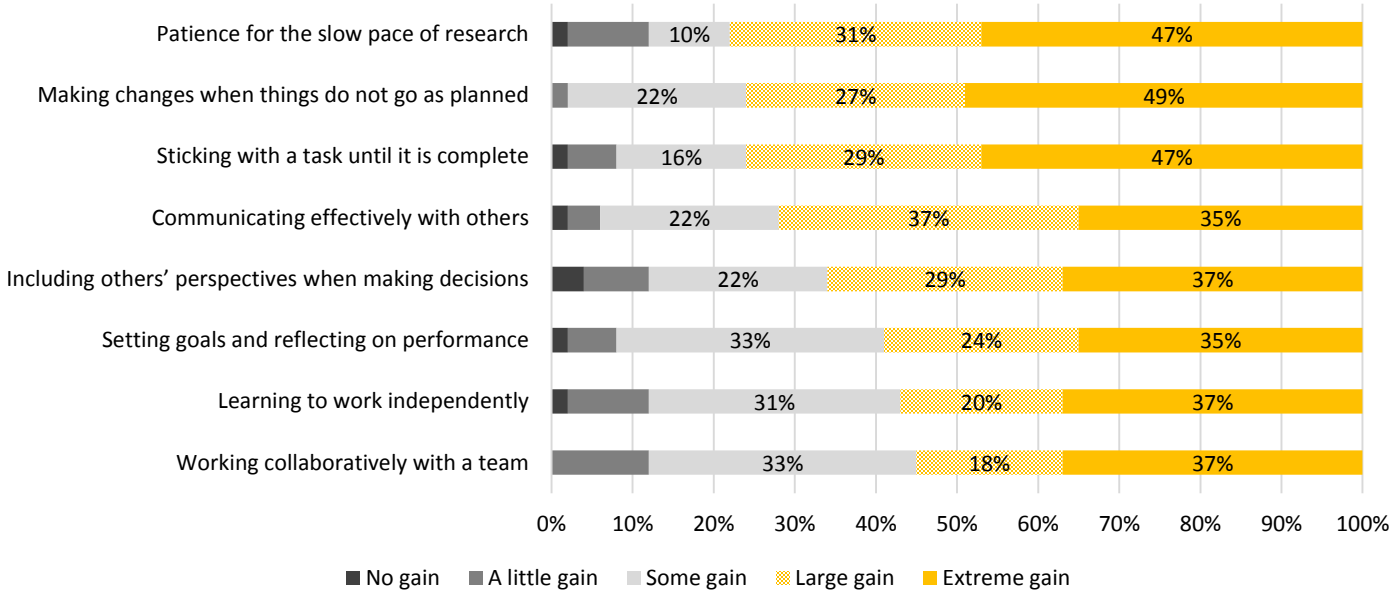
Table 24 shows data for apprentices whose experience focused on the other STEM areas (technology, engineering, and mathematics), specifically self-reported impacts on their abilities related to key engineering practices. Two things stand out in these data. First, the apprentices with technology, engineering, and mathematics focused experiences reported large gains in reading technical or scientific texts (76%), just as those whose experiences focused on science. However, they also reported large gains in using mathematics or computers to analyze numeric data (77%), which was one of the areas of smaller gains for the science-focused apprentices. The other engineering practices where many apprentices reported large and extreme gains included displaying numeric data in charts or graphs to identify patterns and relationships (66%), identifying strengths and limitations of solutions (61%), asking questions to understand data and interpretations (61%), and communicating information about their design processes and/or solutions in different formats (61%). Mentors reported similar gains in apprentices' engineering practices (see Appendix C).

Table 24. Apprentices Reporting Large or Extreme Gains in their STEM Competencies – Engineering Practices (n = 17-18)	
Item	**Questionnaire Respondents**
Using mathematics or computers to analyze numeric data	77%
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	76%
Displaying numeric data in charts or graphs to identify patterns and relationships	66%
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	61%
Asking questions to understand the data and interpretations others use to support their solutions	61%
Communicating information about your design processes and/or solutions in different formats (orally, written, graphically, mathematically)	61%
Carrying out procedures for an investigation and recording data accurately	56%
Using computer-based models to investigate cause and effect relationships of a simulated solution	56%
Defining a problem that can be solved by developing a new or improved object, process, or system	55%
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	55%
Deciding what type of data to collect in order to test if a solution functions as intended	55%
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	55%
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	55%
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	55%
Identifying real-world problems based on social, technological, or environmental issues	50%
Making a model that represents the key features or functions of a solution to a problem	50%
Identifying the limitations of the data collected in an investigation	50%
Using data or interpretations from other researchers or investigations to improve a solution	50%
Deciding what additional data or information may be needed to find the best solution to a problem	50%
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	50%
Integrating information from multiple sources to support your solution to a problem	50%
Considering alternative interpretations of data when deciding if a solution functions as intended	45%
Supporting a proposed solution (for a problem) with data from investigations	44%
Using data from investigations to defend an argument that conveys how a solution meets design criteria	44%

Composite scores were calculated for each set of practices items[20] on the apprentice questionnaire to examine whether the REAP program had differential impacts on subgroups of apprentices. There were no significant differences between males and females, minority and non-minority apprentices, school location, or FRL status on either composite.

The apprentice questionnaire also asked apprentices about the impact of REAP on their "21st Century Skills"[21] that are necessary across a wide variety of fields. As can be seen in Chart 17, more than half of responding apprentices reported large or extreme gains on each of these skills, including patience for the slow pace of research (78%), making changes when things do not go as planned (76%), and sticking with a task until it is complete (76%). Apprentices reported similar gains regardless of race/ethnicity, FRL status, or school location, although there was a difference between males and females. Females reported moderately higher gains in 21st Century Skills than males[22] (d = 0.745 standard deviations). In addition, mentor reports of apprentice gains in this area are generally similar to those of the apprentices, although the mentors often reported greater apprentice gains.

Chart 17: Apprentice Report of Impacts on 21st Century Skills (n = 49)



[20] The science practices composite has a Cronbach's alpha reliability of 0.983; the engineering practices composite has a Cronbach's alpha reliability of 0.970.

[21] The Cronbach's alpha reliability for these 12 items was 0.918.

[22] Two-tailed independent samples t-test, $t(47) = 2.20$, $p = 0.033$.

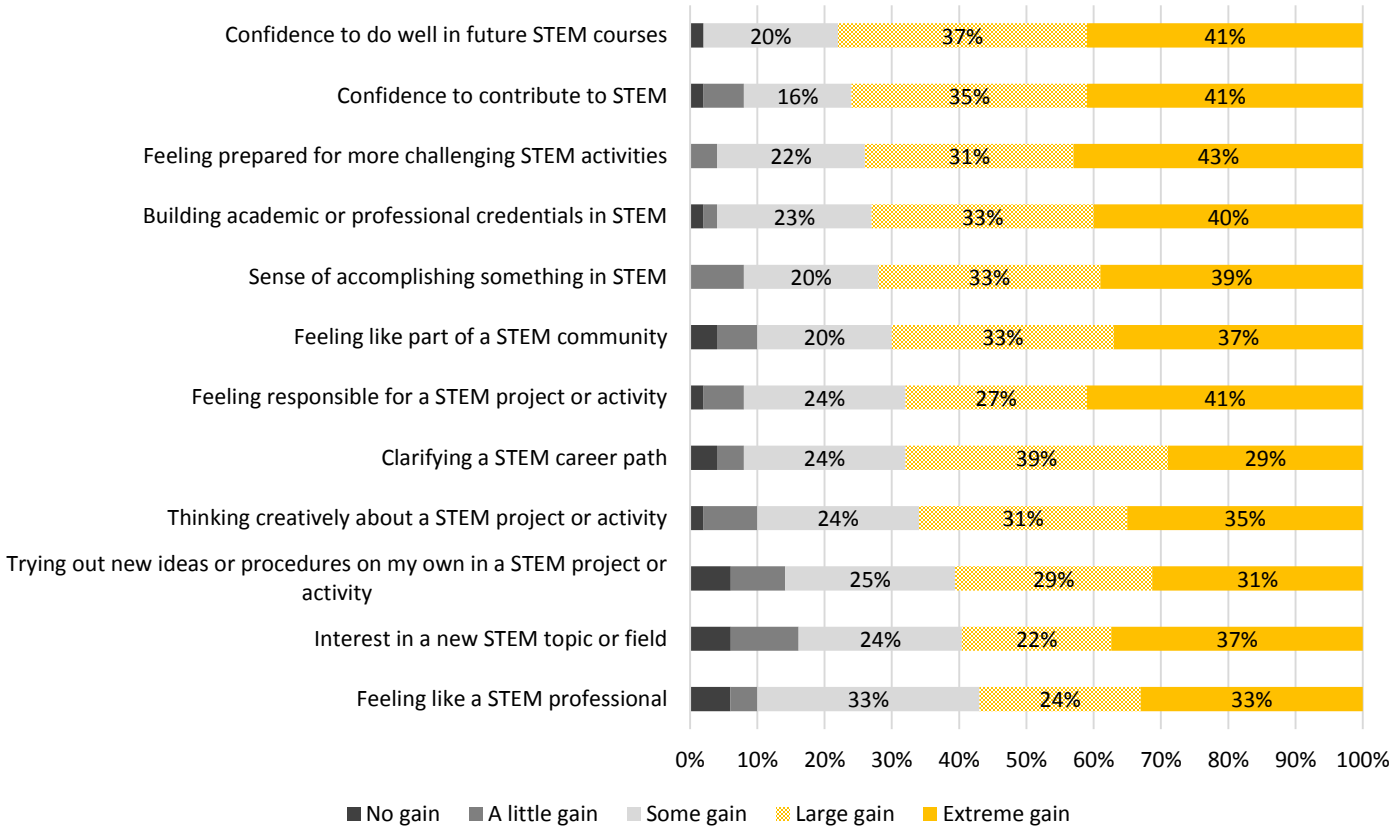
STEM Identity and Confidence

Deepening students' STEM knowledge and skills are important for increasing the likelihood that they will pursue STEM further in their education and/or careers. However, they are unlikely to do so if they do not see themselves as capable of succeeding in STEM.[23] Consequently, the apprentice questionnaire included a series of items intended to measure the impact of REAP on apprentices' STEM identity.[24] These data are shown in Chart 18 and strongly suggest that the program has had a positive impact in this area. For example, 78% of responding apprentices reported a large or extreme gain in their confidence to do well in future STEM courses. Similarly, substantial proportions of apprentices reported large or greater gain in their confidence to contribute to STEM (76%), preparedness for more challenging STEM activities (74%), and building academic or professional STEM credentials (73%). In addition, 72% reported an increase in their sense of accomplishing something in STEM, 70% reported feeling like a part of a STEM community, and 69% reported feeling responsible for a STEM project or activity. There were no differences in impact based on gender, race/ethnicity, FRL eligibility, or school location.

[23] Chang, M. J., Sharkness, J., Hurtado, S. and Newman, C. B. (2014), What matters in college for retaining aspiring scientists and engineers from underrepresented racial groups. J. Res. Sci. Teach., 51: 555–580.

[24] The Cronbach's alpha reliability for these 12 items was 0.958.

Chart 18: Apprentice Report of Impacts on STEM Identity (n = 48-49)



Interest and Future Engagement in STEM

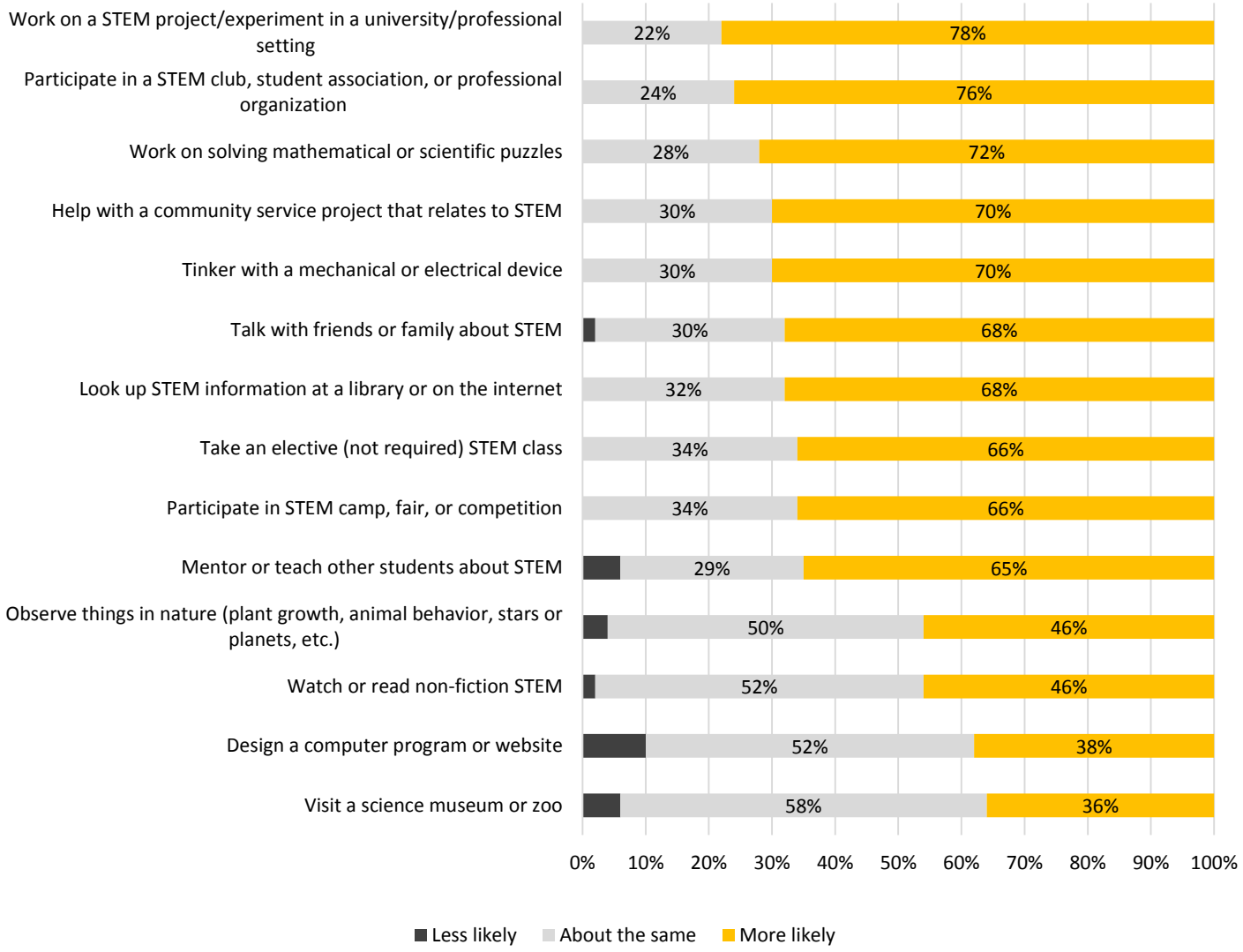
A key goal of the AEOP program is to develop a STEM-literate citizenry. To do so, students need to be engaged in and out of school with high quality STEM activities. In order to examine the impact of REAP on apprentices' interest in future engagement in STEM, the questionnaire asked them to reflect on whether the likelihood of their engaging in STEM activities outside of school changed as a result of their experience, as well as their interest level in participating in future AEOP programs. As can be seen in Chart 19, apprentices indicated they were more likely to engage in many of these activities as a result of REAP. For example, 78% reported being more likely to work on a STEM project or experiment in a university or professional setting; 76% to participate in a STEM club, student association, or professional organization; 72% to work on solving mathematical or scientific puzzles; and 70% to help with a community service project related to STEM. A composite score was created from these items,[25] and composite scores were compared across subgroups of apprentices. There were no statistically significant differences by race/ethnicity, or FRL status; however, there were some

[25] These 15 items had a Cronbach's alpha reliability of 0.930.

differences by gender and school location. As a result of participating in REAP, significantly more females than males reported being more likely to work on solving mathematical or scientific puzzles[26] (a large effect size of d = 0.923 standard deviations), participate in a STEM camp, fair, or competition[27] (large effect, d = 0.807 standard deviations), and participate in a STEM club, student association, or professional organization[28] (large effect, d = 0.798 standard deviations). Additionally, significantly more apprentices from underserved schools than from suburban schools reported being more likely to work on solving mathematical and scientific puzzles[29] (a medium effect, d = 0.668) after participating in REAP.

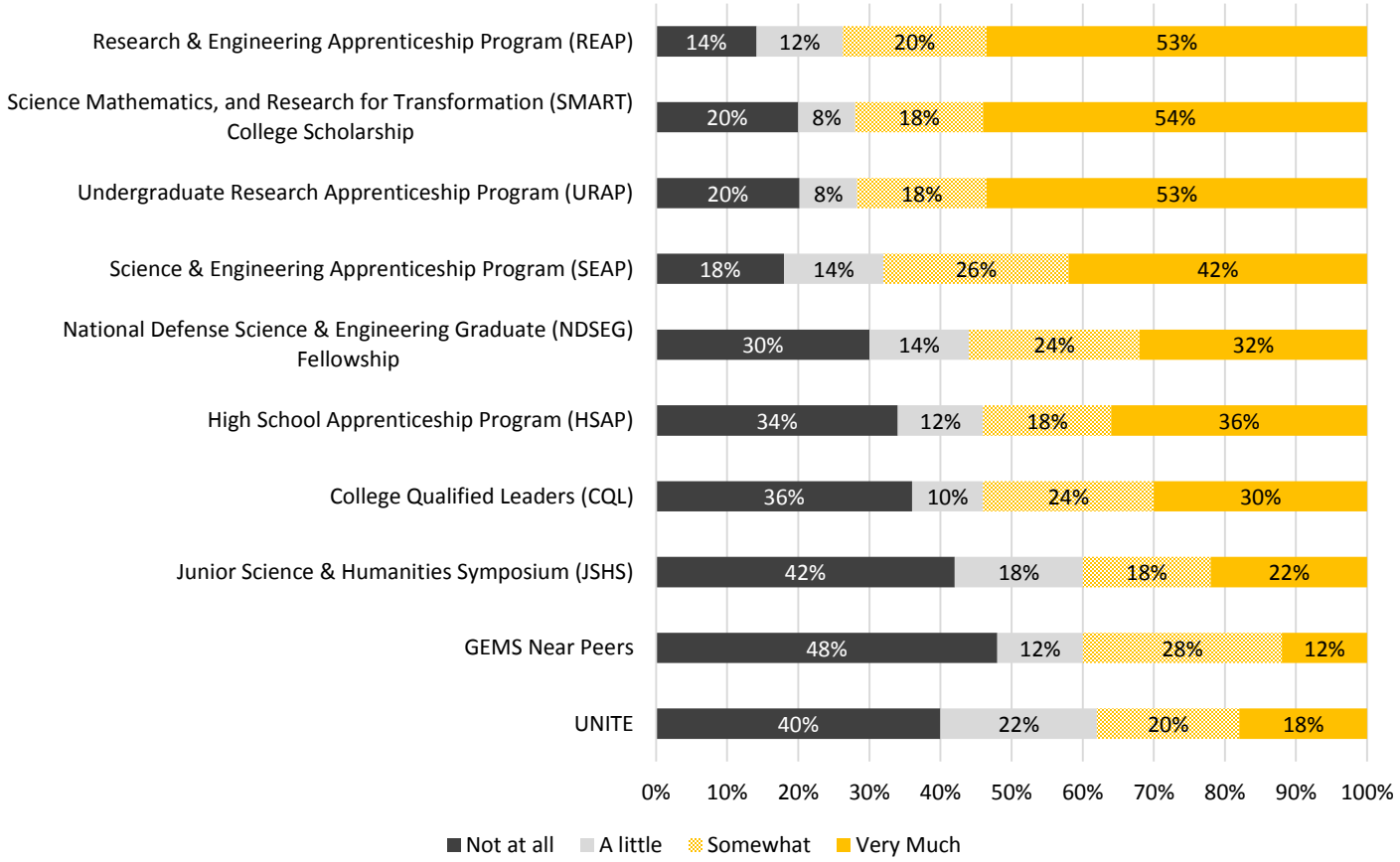
[26] Two-tailed independent samples t-test, $t(48) = 2.74$, $p = 0.009$.
[27] Two-tailed independent samples t-test, $t(48) = 2.37$, $p = 0.022$.
[28] Two-tailed independent samples t-test, $t(48) = 2.36$, $p = 0.022$.
[29] Two-tailed independent samples t-test, $t(48) = 2.07$, $p = 0.044$.

Chart 19: Change in Likelihood Apprentices Will Engage in STEM Activities Outside of School (n = 49-50)



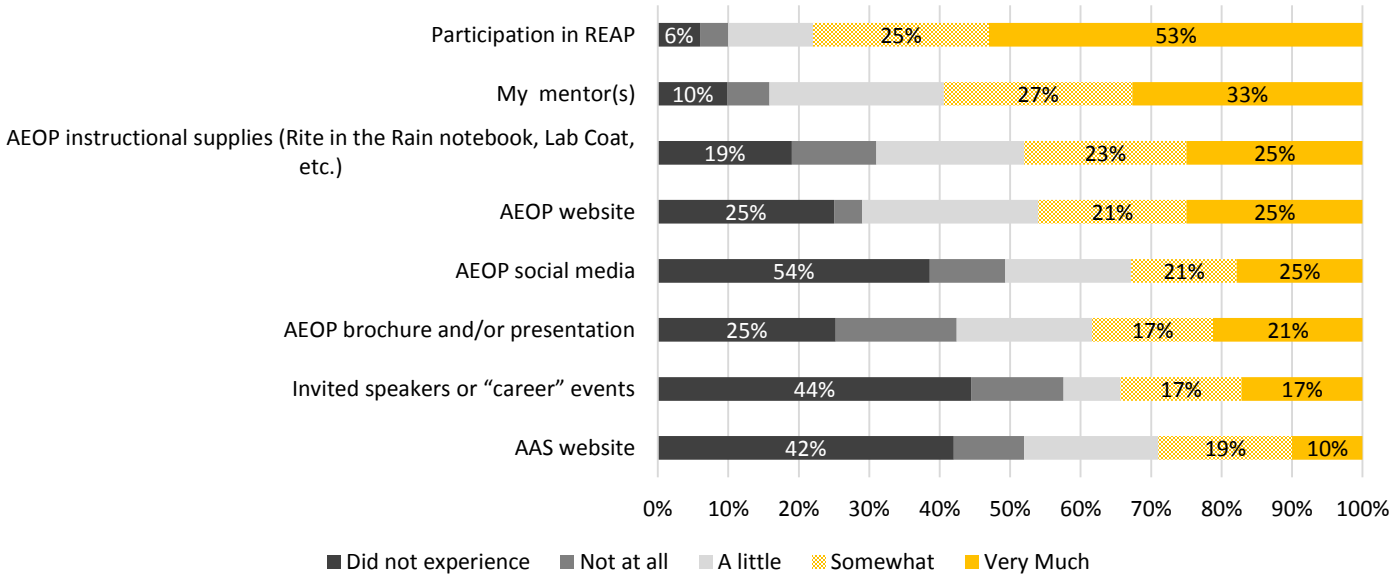
When asked how interested they are in participating in future AEOP programs, a large majority (73%) indicated being interested in participating in REAP again; 72% in SMART, and 71% in URAP (see Chart 20). These results are encouraging as SMART and URAP were among the programs mentors most frequently discussed with their apprentices. Roughly equal proportions of apprentices (~60%) expressed having no interest or a little interest in JSHS, GEMS Near Peers, and UNITE.

Chart 20: Apprentice Interest in Future AEOP Programs (n = 49-50)



Apprentices were asked which resources impacted their awareness of the various AEOPs. As can be seen in Chart 21, simply participating in REAP was most likely to be rated as impacting their awareness "somewhat" or "very much" (78%). Their mentor (60%) was also rated by a majority of apprentices as having at least somewhat of an impact on their awareness of AEOP programs.

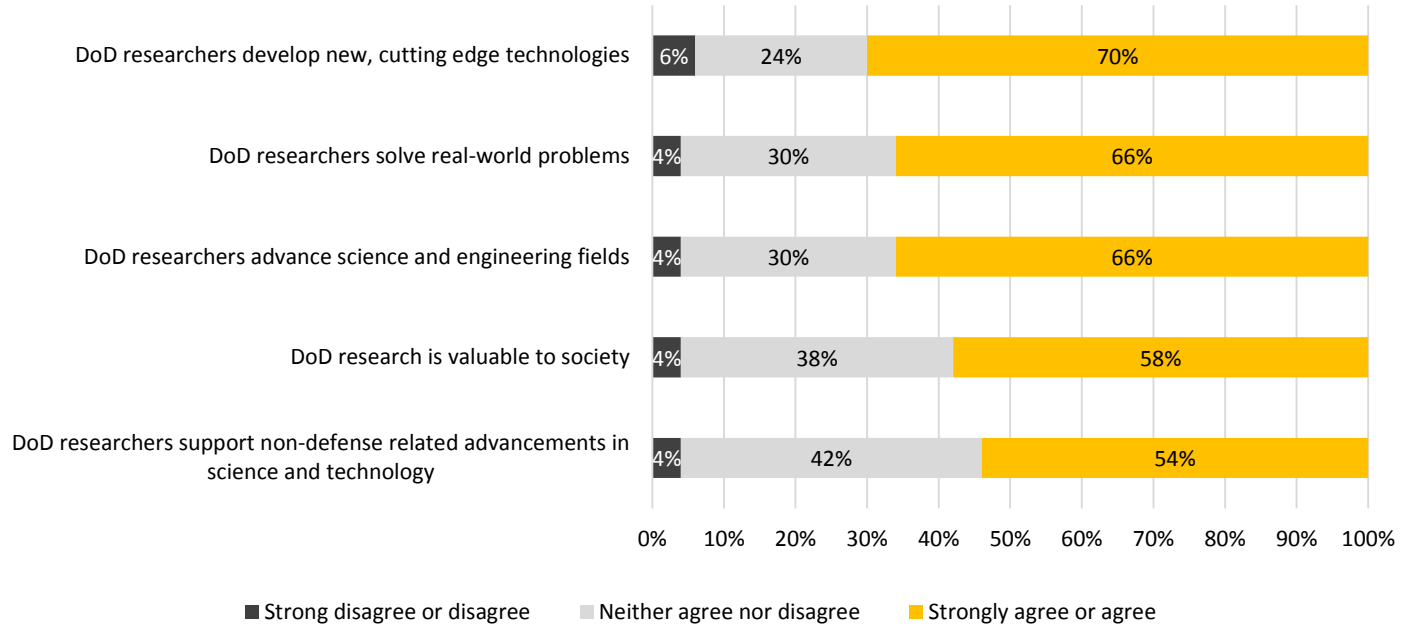
Chart 21: Impact of Resources on Apprentice Awareness of AEOPs (n = 51-52)



Attitudes toward Research

Apprentices' attitudes about the importance of DoD research is an important prerequisite to their continued interest in the field and potential involvement in the future. In order to gauge apprentices' attitudes in this area, the questionnaire also asked about their opinions of what DoD researchers do and the value of DoD research more broadly. The data indicate that most responding apprentices have favorable opinions (see Chart 22). For example, 70% agreed or strongly agreed that DoD research develops cutting-edge technologies, 66% that DoD researchers solve real-world problems, and 66% that DoD researchers advance science and engineering fields.

Chart 22: Apprentice Opinions about DoD Researchers and Research (n = 50)



Education and Career Aspirations

The evaluation also examined the program's impact on apprentices' education and career aspirations. In terms of education, the questionnaire asked apprentices how far they wanted to go in school before and after participating in REAP. As can be seen in Table 25, when asked to think back on how far they wanted to go in school before participating in REAP, 12% indicated graduating from high school, 6% finishing college, and 74% getting more education after college, including some type of graduate degree. In contrast, after REAP, all apprentices reported wanting to go beyond high school: 2% wanted to finish after college, and 96% wanted to get more education after a Bachelor's degree. This shift towards more education was statistically significant[30] and substantial in size (effect size[31] ϕ= 0.624).

[30] Chi-square test of independence, $\chi^2(2) = 19.48$, $p < 0.001$.

[31] The effect size for a chi-square test of independence is calculated as $\varphi = \sqrt{\frac{\chi^2}{n}}$. With 2 degrees of freedom, ϕ of 0.07 is considered small, 0.21 medium, and 0.35 large.

Table 25. Apprentice Education Aspirations (n = 50)		
	Before REAP	After REAP
Graduate from high school	12%	0%
Go to a trade or vocational school	0%	0%
Go to college for a little while	0%	2%
Finish college (get a Bachelor's degree)	6%	2%
Get more education after college	2%	8%
Get a master's degree	28%	26%
Get a Ph.D.	16%	28%
Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)	10%	12%
Get a combined M.D. / Ph.D.	16%	18%
Get another professional degree (law, business, etc.)	2%	4%

In terms of career aspirations, apprentices were asked what kind of work they expect to be doing at age 30, both reflecting on what their aspiration was before participating in REAP and after REAP (see Table 26). A substantial portion of responding apprentices expressed interest in STEM-related careers both before and after participating in REAP. For example, 30% indicated aspiring to a career in engineering before REAP, with another 30% interested in medicine. After REAP, 36% of apprentices expressed interest in engineering, and 28% in medicine. To examine whether the REAP program increased apprentice interest in STEM-related careers, each career option was coded as being STEM related or non-STEM related. Although some apprentices switched their aspirations from a non-STEM field to a STEM field, there was not a statistically significant increase in the proportion of apprentices aspiring to a STEM-related career.

Table 26. Apprentice Career Aspirations (n = 50)		
	Before REAP	**After REAP**
Engineering	30%	36%
Medicine (e.g., doctor, dentist, veterinarian, etc.)	30%	28%
Biological science	10%	12%
Environmental science	4%	6%
Computer science	4%	4%
Physical science (e.g., physics, chemistry, astronomy, materials science)	2%	4%
Technology	2%	4%
Health (e.g., nursing, pharmacy, technician, etc.)	4%	2%
Science (no specific subject)	4%	2%
Art (e.g., writing, dancing, painting, etc.)	2%	0%
Business	2%	0%
Military, police, or security	2%	0%
Agricultural science	0%	0%
Earth, atmospheric or oceanic science	0%	0%
English/language arts	0%	0%
Farming	0%	0%
Law	0%	0%
Mathematics or statistics	0%	0%
Skilled trade (carpenter, electrician, plumber, etc.)	0%	0%
Social science (e.g., psychologist, sociologist)	0%	0%
Teaching, non-STEM	0%	0%
Teaching, STEM	0%	0%
Undecided	2%	2%
Other[†]	2%	0%

[†] Before, the "other" response was "Pro Athlete."

Apprentices were also asked the extent to which they expect to use their STEM knowledge, skills, and/or abilities in their work when they are age 30. As can be seen in Table 27, all apprentices expect to use STEM somewhat in their career. A large majority (75%) expect to use STEM 76-100% of the time in their work, 15% expect to use STEM 51-75% of the time, and 10% expect to use STEM 26-50% of the time.

Table 27. Apprentices Expecting to use STEM in Their Work at Age 30 (n = 48)	
	Questionnaire Respondents
Not at all	0%
Less than 25% of the time	0%
26% to 50% of the time	10%
51% to 75% of the time	15%
75% to 100% of the time	75%

Overall Impact

Lastly, apprentices were asked about impacts of participating in REAP more broadly. From these data, it is clear that apprentices thought the program had a substantial impact on them (see Chart 23). For example, a large majority of responding apprentices indicated being more confident in their STEM knowledge, skills, and abilities after participation, with 54% reporting that REAP contributed to this impact and another 33% reporting that REAP was the primary reason for this impact. Similarly, apprentices indicated increased awareness of other AEOPs (43% reporting that REAP contributed, 35% reporting that REAP was the primary reason) and more interest in participating in STEM activities outside of school requirements (53% and 24%). Apprentices also reported interest in participating in other AEOPs (29% and 39%), interest in pursuing a STEM career with the DoD (49% and 16%), and a greater appreciation of DoD STEM research and careers (33% and 31%). These items were combined into a composite variable[32] to test for differences among subgroups of apprentices; significant differences were found related to gender, race/ethnicity, and FRL status. Females were moderately more likely than males to report having a greater appreciation of DoD STEM research and careers after participating in REAP[33] (d = 0.631 standard deviations). Minority apprentices were moderately more likely than non-minority apprentices to be more interested in attending college after participating in REAP[34] (d = 0.781). Similarly, after participating in REAP, FRL apprentices were largely more likely than non-FRL apprentices to report being more interested in attending college[35] (d = 1.128). FRL apprentices were also more likely than non-FRL apprentices to report being more interested in pursuing a STEM career[36] (large effect, d = 1.063). There were no differences based on apprentices' school location.

Mentors were also asked about impacts on apprentices in these areas; in general, their reports of impacts were somewhat higher than those of the apprentices (see Appendix C).

[32] The Cronbach's alpha reliability for these 11 items was 0.890.

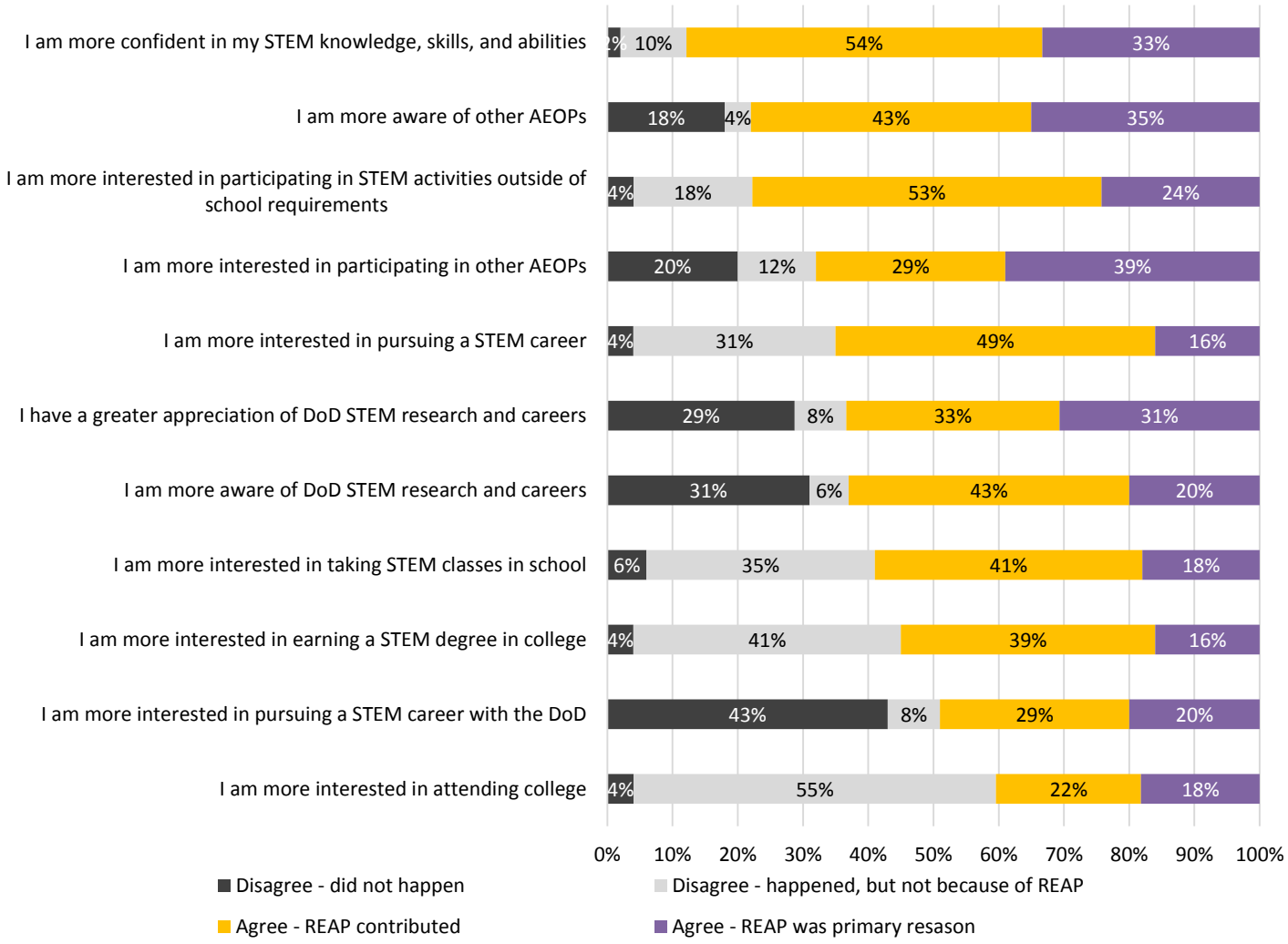
[33] Two-tailed independent samples t-test, $t(47) = 2.12$, $p = 0.039$.

[34] Two-tailed independent samples t-test, $t(46) = 2.54$, $p = 0.015$.

[35] Two-tailed independent samples t-test, $t(46) = 2.97$, $p = 0.005$.

[36] Two-tailed independent samples t-test, $t(46) = 2.27$, $p = 0.028$.

Chart 23: Apprentice Opinions of REAP Impacts (n = 48-49)



An open-ended item on the questionnaire asked apprentices to list the three most important ways they benefited from the program; 47 apprentices provided at least one answer to the question. Apprentice responses addressed a variety of themes. More than half of the responding apprentices (57%) wrote about the opportunity to do hands-on research/work in a laboratory. More than half (57%) also named increased knowledge as a benefit, both general knowledge as well as specific content knowledge. Other benefits mentioned by many apprentices included learning about STEM careers (17%), learning about research (17%), the opportunity to network (17%), or and the opportunity to work on a team/collaborate with STEM professionals (17%).

Apprentice comments from the focus group and interviews expand on some of these impacts. As three said:

> *It's been really good. I'm learning a lot in a short amount of time. I'm learning some coding. I had no experience with coding whatsoever. I do a lot of hands-on, and I like hands-on stuff; I enjoy that.* (REAP Apprentice)

> *I feel like no matter what science you do, it's learning the research process and the lab protocols that's important. Essentially some variation will be used in other places…but you need that lab experience. When I go elsewhere and they ask me what I did in the past, I can say I did gel loading, making solutions, working in the hood, calculating molarity, balancing equations. They will think I am experienced, don't need lots of training, and they'll let me in. I've gone to other researchers and been told I don't have experience and was turned away because they didn't have the time to help me.* (REAP Apprentice)

> *It's just, I came in with no knowledge of anything they were doing. I was assigned to a mentor and she explained it, we can do it on our own, and do everything on our own. We read about it and learned about it and did it. Watching and doing. I learned a lot about biomedical engineering, what they did in the lab, and I also learned what life was like for college students, some of them are in a program or are studying this for a while. I'm not sure what specifically, but our mentor is doing something and to see her working on her own and helping us as well. It's cool.* (REAP Apprentice)

Summary of Findings

The FY14 evaluation of REAP collected data about participants; their perceptions of program processes, resources, and activities; and indicators of achievement in outcomes related to AEOP and program objectives. A summary of findings is provided in Table 28.

Note: Findings from the apprentice and mentor questionnaires should be cautiously generalized with consideration given to the margin of error and triangulation of findings with mentor focus group and interview data.

> *"When I go elsewhere and they ask me what I did in the past, I can say I did gel loading, making solutions, working in the hood, calculating molarity, balancing equations. They will think I am experienced, don't need lots of training, and they'll let me in."* – REAP Apprentice

Table 28. 2014 REAP Evaluation Findings	
Participant Profiles	
REAP continues to have success in serving historically underrepresented and underserved populations.	• REAP was successful in attracting participation of female students (50%)—a population that is historically underrepresented in engineering fields.
	• REAP had 100% success meeting the program requirement of providing outreach to students from historically underrepresented and underserved groups as defined in admission requirements (students must self-identify as meeting at least two of the following requirements: qualifies for free or reduced-price lunch; is a minority historically underrepresented in STEM (Alaskan Native, Native American, Black or African American, Hispanic, Native Hawaiian, or other Pacific Islander); is a female pursuing research in physical science, computer science, mathematics, or engineering; receives special education services; has a disability; speaks English as a second language; or is a potential first-generation college student). Enrollment data from program applications indicate that 42% of apprentices identify as Black or African American, 23% as Hispanic or Latino, and 49% as female. Additionally, 91% of the participating apprentices attend Title I schools (students from Title I schools typically come from underrepresented and underserved populations).
	• REAP served apprentices across a range of school contexts. Most apprentice questionnaire respondents attended public schools (91%) and schools in urban settings (64%), which tend to have higher numbers or proportions of underrepresented and underserved groups.
	• REAP was successful in implementing a bridge with UNITE, another AEOP STEM education initiative that serves students from underrepresented and underserved groups. In 2014, 18 alumni of UNITE participated in REAP apprenticeships.
REAP's mentor diversity did not mirror the diversity of apprentices.	• In 2013, mentors identified as predominantly male (75%) and White (67%). In 2014, there was more diversity among the mentors, as fewer identified as male (64%) or White (49%).
	• A comparison of apprentice and mentor demographics suggested that many apprentices of underserved or underrepresented populations are not likely to have mentors sharing the same gender or race/ethnicity. Having a mentor who shares an apprentice's gender or race/ethnicity is a potential motivator for reducing stereotypes and increasing students' performance and persistence in STEM.
REAP provides outreach to the Nation's future STEM workforce.	• 98% of the 50 apprentice respondents indicated their intent to pursue a career in a STEM-related field. More respondents intended to pursue careers in Engineering (36%) than any other field, with Medicine/Health (28%), Biological Science (12%), and Environmental Science (6%) being the next most frequently reported fields.
Actionable Program Evaluation	
REAP marketing and recruitment was largely a site-based endeavor.	• 47% of mentors reported actively recruiting apprentices through connections with local school teachers, 37% through communications generated by a university or faculty, and 26% through communications generated by local high schools or

	teachers. Applications solicited by the AAS and general AEOP marketing were also used to recruit apprentices (45%).
	• Apprentices most frequently learned about REAP from teachers and professors (56%), school newsletters, emails, or websites (20%) or from a REAP mentor (15%).
	• 26% of mentors learned about REAP from a colleague and 21% from a superior, such as a Department Chair, Center Director, or Dean.
REAP is strongly marketed to students from historically underrepresented and underserved groups.	• The RFP specified to university directors/mentors that the targeted participants were underrepresented and underserved high school students. In addition, the REAP administrator worked with all of the directors and mentors to ensure that the students being considered for the apprenticeships identified as coming from an underrepresented and underserved groups.
REAP apprentices participate to clarify and advance their STEM pathways.	• Many apprentices received encouragement to participate from others, including friends, family members, and school staff, often who have current or past connections to the REAP program. Additionally, apprentices participated to clarify and advance their STEM and research knowledge. A small number were motivated by their own previous positive experiences in REAP or other AEOPs.
REAP engages apprentices in meaningful STEM learning through team-based and hands-on activities.	• Most apprentices (74-87%) report learning about STEM topics, interacting with STEM professionals, applying STEM knowledge to real-life situations, and learning about cutting-edge STEM research on most days or every day of their REAP experience.
	• Most apprentices had opportunities to engage in a variety of STEM practices during their REAP experience. For example, 89% participating in hands-on activities, 82% working as part of a team, 77% analyzing or interpreting data or information, and 68% drawing conclusions from an investigation on most days or every day.
	• Apprentices reported greater opportunities to learn about STEM and greater engagement in STEM practices in their REAP experience than they typically have in school.
	• Large proportions of mentors report using strategies to help make learning activities to students relevant, support the needs of diverse learners, develop students' collaboration and interpersonal skills, and engage students in "authentic" STEM activities.
REAP promotes STEM research and careers but can improve mentors' awareness of and resources for promoting AEOP opportunities and DoD STEM careers.	• Most mentors had limited awareness of or past participation in an AEOP initiative beyond REAP. Nineteen percent of responding mentors had past experience with SMART, an undergraduate scholarship program, and 15% with URAP, an undergraduate research program, but mentors' participation in all other AEOP programs was 10% or less. In addition, although most apprentices reported an increase in awareness of other AEOPs, 68% reported that their mentors never recommended any AEOP programs. However, the majority of the apprentices reported having interest in the SMART and URAP programs, indicating that the mentors did make an impact.

	• Many mentors educated apprentices about STEM majors and careers (68% of apprentices reported learning about three or more STEM careers), but few of those were DoD STEM careers. Some mentors stated that they were unaware of DoD STEM careers, and 63% of apprentices reported that their mentors never discussed STEM career opportunities with the DoD.
The REAP experience is greatly valued by apprentices and mentors.	• All responding apprentices indicated being satisfied with their REAP research experience overall. Open-ended responses about the overall experience highlighted apprentices' opportunity to do hands-on research and learn about STEM content and research. Apprentices also commented on how REAP provided opportunities they do not get in school and would not otherwise have.
	• The vast majority of responding mentors indicated having a positive experience. Further, many commented on the benefits the program provides apprentices, including hands-on research experience and increases in STEM content knowledge.
Outcomes Evaluation	
REAP had positive impacts on apprentices' STEM knowledge and competencies.	• A majority of apprentices reported large or extreme gains on their knowledge of how professionals work on real problems in STEM, what everyday research work is like in STEM, a STEM topic or field in depth, the research processes, ethics, and rules for conduct in STEM, and research conducted in a STEM topic or field. These impacts were identified across all apprentice groups.
	• Many apprentices also reported impacts on their abilities to do STEM, including such things as reading technical or scientific texts to learn about the natural or designed worlds, designing and carrying out procedures for investigations, asking questions to understand data, and deciding what kind of data to collect to answer a question.
REAP had positive impacts on apprentices' 21st Century Skills	• A large majority of apprentices reported large or extreme gains on their patience for the slow pace of research, making changes when things do not go as planned, and sticking with a task until it is complete.
REAP positively impacted apprentices' confidence and identity in STEM, as well as their interest in future STEM engagement.	• Many apprentices reported a large or extreme gain on their confidence to do well in future STEM courses (78%), their ability to contribute to STEM (76%), preparedness for more challenging STEM activities (74%), and building academic or professional STEM credentials (73%). In addition, 72% reported an increase in their sense of accomplishing something in STEM, 70% reported feeling like part of a STEM community, and 69% reported feeling responsible for a STEM project or activity.
	• Apprentices also reported on the likelihood that they would engage in additional STEM activities outside of school. A majority of apprentices indicated that as a result of REAP, they were more likely to work on a STEM project in a university or professional setting; participate in a STEM club, student organization, or professional organization; work on solving mathematical or scientific puzzles; or help with a community service project related to STEM.

REAP succeeded in raising apprentices' education aspirations, but did not change their career aspirations	• After participating in REAP, apprentices indicated being more likely to go further in their schooling than they would have before REAP, with the greatest change being in the proportion of apprentices who expected to continue their education beyond a Bachelor's degree (74% before REAP, 96% after).
	• Apprentices were asked to indicate what kind of work they expected to be doing at age 30, and the data were coded as STEM-related or non-STEM-related. The majority of the apprentices were interested in STEM-related careers before participating in REAP, and almost all were interested in STEM-related careers after participating in REAP; however, there was not a statistically significant difference from before REAP to after. This result is likely due to the requirement for apprentices to demonstrate interest in STEM in order to be selected for the program.
Although many REAP apprentices were largely unaware of other AEOP initiatives, a substantial portion expressed interest in future AEOP opportunities.	• At the end of their apprenticeship, many apprentices reported that they had never heard of any of the AEOPs except for REAP (43-68% of apprentices, depending on the program). However, after participating in REAP, a large proportion of apprentices were somewhat to very interested in participating in other AEOP initiatives in the future (38-72% of apprentices, depending on the program).
REAP raised apprentice awareness and appreciation of DoD STEM research and careers, as well as their interest in pursuing a STEM career with the DoD.	• A majority of apprentices reported that they had a greater appreciation (64%) and awareness (63%) of DoD STEM research and careers. In addition, 49% indicated that REAP raised their interest in pursuing a STEM career with the DoD. Apprentices cited their participation in REAP (53%), their REAP mentor (40%), and the AEOP instructional supplies (30%) as having the most impact on their awareness of DoD STEM careers.

Recommendations

1. The REAP program has the goal of broadening the talent pool in STEM fields, and, overall, the program has been successful at attracting students from groups historically underrepresented and underserved in these fields. The bridge between UNITE and REAP has shown early signs of efficacy in helping REAP attract students from underrepresented and underserved groups; 18 students from UNITE received REAP apprenticeships in 2014. However, on the questionnaires, apprentices and mentors reported that they are largely unaware of UNITE, which indicates that more emphasis should be given to the UNITE-REAP pipeline so that it can be sustained, if not expanded, in the future. It will also be important for evaluation efforts to be focused on the UNITE-REAP bridge to determine if it has a lasting effect on participants' STEM persistence and to collect information about how the bridge program may be improved in subsequent years. Still, the program may want to consider doing more to increase the likelihood that the program has a long-term impact on the number of students who pursue STEM. Strategies that have been shown to be effective in this area include providing role models for students, exposing them to different education and career possibilities, providing guidance on how to pursue specific education and

career paths (e.g., what courses they need to take in school, how to navigate the college application process), and providing coaching on the "soft skills" (e.g., time management, communication skills) needed to be successful in STEM careers. Although many mentors reported using a number of these strategies (e.g., highlighting the under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM), substantive proportions did not. The program should consider ways to ensure that these areas are addressed systematically. For example, the program may want to work with each site to see how these areas could be built into their schedules, or provide more guidance to mentors for how and when to address these issues. Additionally, the program should consider recruiting a more diverse pool of mentors that reflects the gender and race/ethnicity of the apprentices to serve as strong role models for the apprentices. The use of an RFP for to identify sites for the program resulted in 18 host sites that are identified as historically black colleges and universities (HBCUs) or minority serving institutions (MSIs). The program should continue these efforts to create more apprenticeships at HBCUs and MSIs.

2. As was found in 2013, REAP apprentices report having little previous experience with AEOP and limited knowledge of other AEOP programs, even after participating in REAP. Given the goal of having apprentices progress from REAP into other AEOP programs, the program may want to work with sites to increase apprentices' exposure to AEOP. Only 63% of mentors recommended other AEOPs to apprentices, typically SMART and URAP, both undergraduate initiatives. Further, although many apprentices expressed interest in participating in other AEOP programs, a substantial proportion indicated having little or no interest. Many of the apprentices reported learning about other AEOPs through their participation in REAP, their mentor, or the instructional resources provided to them; however, the program may want to work with each site to ensure that all apprentices have access to structured opportunities—such as invited speakers, presentations, and career events—that both describe the other AEOPs and provide information to apprentices on how they can apply to them. In addition, given the limited use of the program website, print materials, and social media, the program should consider how these materials could be adjusted to provide apprentices with more information and facilitate their enrollment in other AEOPs.

3. Similarly, efforts should be made to help make both mentors and apprentices more aware of DoD STEM research and careers. Sixty-four percent of apprentices reported not learning about any DoD STEM careers during their REAP experience. Comments from mentors in the focus group and open-ended questionnaire items suggest that they are not familiar with DoD STEM careers and did not spend very much time discussing DoD STEM careers with apprentices. Consistent with the recommendation from 2013, the program should continue to consider providing mentors and apprentices materials, and resources (website links, articles, etc.) that describe current DoD STEM research and careers that can be provided to apprentices and mentors.

4. A number of apprentices suggested that the REAP program could be improved by extending the length of the experience. Many apprentices noted that 5-8 weeks was not enough time to learn about and get involved with a

research project. Some of the mentors also said that the apprenticeship experience should be lengthened. Suggestions were made by both mentors and apprentices to extend the apprenticeship into the school year and/or to continue working with the same project for at least two summers.

5. Efforts should be undertaken to improve participation in evaluation activities, as the low response rates for both the apprentice and mentor questionnaires raise questions about the representativeness of the results. Improved communication with the individual program sites about expectations for the evaluation may help. In addition, the evaluation instruments may need to be streamlined as perceived response burden can affect participation. In particular, consideration should be given to whether the parallel nature of the apprentice and mentor questionnaires is necessary, with items being asked only of the most appropriate data source.

Appendices

Appendix A

FY14 REAP Evaluation Plan

Questionnaires

Purpose:

As per the approved FY14 AEOP APP, the external evaluation of REAP conducted by VT includes two post-program questionnaires:

1. AEOP Youth Questionnaire to be completed by students (apprentices); and
2. AEOP Mentor Questionnaire to be completed by Army S&Es and/or other laboratory personnel that supervise, guide, or support apprentices during their REAP research activities.

Questionnaires are the primary method of data collection for AEOP evaluation and collect information about participants' experiences with and perceptions of program resources, structures, and activities; potential benefits to participants; and strengths and areas of improvement for programs.

The questionnaires have been revised for FY14 to align with:

- Army's strategic plan and AEOP Priorities 1 (STEM Literate Citizenry), 2 (STEM Savvy Educators) *and* 3 (Sustainable Infrastructure);
- Federal guidance for evaluation of Federal STEM investments (e.g., inclusive of implementation and outcomes evaluation, and outcomes of STEM-specific competencies, transferrable competencies, attitudes about/identifying with STEM, future engagement in STEM-related activities, and educational/career pathways);
- Best practices and published assessment tools in STEM education, STEM informal/outreach, and the evaluation/ research communities;
- AEOP's vision to improve the quality of the data collected, focusing on changes in intended student outcomes and contributions of AEOPs like CQL effecting those changes.

The use of common questionnaires and sets of items that are appropriate across programs will allow for comparisons across AEOP programs and, if administered in successive years, longitudinal studies of students as they advance through pipelines within the AEOP. Because the questionnaires incorporate batteries of items from existing tools that have been validated in published research, external comparisons may also be possible.

All AEOPs are expected to administer the Youth and Mentor questionnaires provided for their program. Both the Youth and Mentor questionnaires have two versions, an "advanced" version (JSHS and apprenticeship programs) or a "basic" version (all other programs). The same basic set of items are used in both, with slightly modified items and/or additional items used in the advanced version. Additionally, the surveys are customized to gather information specific structures, resources, and activities of programs.

Online Focus Groups

Purpose:
As per the approved FY14 AEOP APP, the external evaluation of REAP conducted by VT includes two or three online focus groups across 10-12 sites:

- one or two 45 minute focus group with 6-8 apprentices each; and
- one 45-minute focus group with 6-8 mentors.

Focus groups provide VT evaluation team with first-hand opportunities to speak with apprentices and their mentors. The information gleaned from these focus groups help us in illustrating and more deeply understanding the findings of other data collected (from questionnaires). In total, VT's findings are used to highlight program successes and inform program changes so that the AEOPs can be even better in the future. *Although VT will coordinate the online focus groups, we encourage AAS to alert ALL participants to the possibility that they may be invited by VT evaluators to join an online focus and to encourage their participation.*

Site and Participant Selection:
VT will purposefully sample from REAP participants using site-based enrollment data provided by AAS (site name, apprentice and mentor participant names, basic demographic data for apprentices--gender, race/ethnicity--and research focus). VT will "invite" selected participants comprising sample to participate via email, and will require that each RSVP by a designated date (prior to the scheduled focus group), so that an alternate may be identified in the event an invited participant declines to participate.

Through our purposeful sampling, we are attempting to assemble a diverse group of focus group participants who can provide information about a range of experiences possible in the REAP. Ideally, each apprentice focus group will be inclusive of

- male and female students (equal representation if possible),
- range of grade levels of students,
- range of race/ethnicities of students served by the program, and
- range of STEM content studied/researched.

Scheduling and Technology:
VT has established dates for the three focus groups that generally accommodate the dates of program activities for each site. These dates occur in July, so that we may speak with participants later in or after their REAP experience. VT will attempt to convene focus groups at a scheduled time in the window of 10 a.m. and 2 p.m. in the respective time zone so that apprentices and mentors may participate in the focus groups during a break/lunch, if at all possible, to minimize disruption to the research. However, this is sometimes not possible.

Data Analyses

Quantitative and qualitative data were compiled and analyzed after all data collection concluded. Evaluators summarized quantitative data with descriptive statistics such as numbers of respondents, frequencies and proportions of responses, average response when responses categories are assigned to a 6-point scale (e.g., 1 = "Strongly Disagree" to 6 = "Strongly Agree"), and standard deviations. Emergent coding was used for the qualitative data to identify the most common themes in responses.

Evaluators conducted inferential statistics to study any differences among participant groups (e.g., by gender or race/ethnicity) that could indicate inequities in the REAP program. Statistical significance indicates whether a result is unlikely to be due to chance alone. Statistical significance was determined with t-tests, chi-square tests, and various non-parametric tests as appropriate, with significance defined at $p < 0.05$. Because statistical significance is sensitive to the number of respondents, it is more difficult to detect significant changes with small numbers of respondents. Practical significance, also known as effect size, indicates the magnitude of an effect, and is typically reported when differences are statistically significant. The formula for effect sizes depends on the type of statistical test used, and is specified, along with generally accepted rules of thumb for interpretation, in the body of the report.

Appendix B

FY14 REAP Apprentice Questionnaire and Data Summaries

IT STARTS HERE.

2014 Research and Engineering Apprenticeship Program (REAP): REAP Youth Survey

Virginia Tech conducts program evaluation on behalf of the Academy of Applied Science (AAS) and U.S. Army to determine how well the Army Educational Outreach Programs (AEOP) is achieving its goals of promoting student interest and engagement in science, technology, engineering, and mathematics (STEM). As part of this study Virginia Tech is surveying students (like you) who have participated in the Research and Engineering Apprenticeship Program (REAP). The survey will collect information about you, your experiences in school, and your experiences in REAP.

About this survey:

- While this survey is not anonymous, your responses are CONFIDENTIAL. When analyzing data and reporting results, your name will not be linked to any item responses or any comments you make.
- Responding to this survey is VOLUNTARY. You are not required to participate, although we hope you do because your responses will provide valuable information for meaningful and continuous improvement.
- If you provide your email address, the AEOP may contact you in the future to ask about your academic and career success.

If you have any additional questions or concerns, please contact one of the following people:

Tanner Bateman, Virginia Tech
Senior Project Associate, AEOPCA
(540) 231-4540, tbateman@vt.edu

Rebecca Kruse, Virginia Tech
Evaluation Director, AEOPCA
(703) 336-7922, rkruse75@vt.edu

If you are 17 and under, your parent/guardian provided permission for you to participate in the evaluation study when they authorized your participation in the AEOP program you just completed or will soon complete.

Q1. Do you agree to participate in this survey? (required)

❍ Yes, I agree to participate in this survey
❍ No, I do not wish to participate in this survey **If selected, respondent will be directed to the end of the survey**

Q2. Please provide your personal information below:

First Name: _____
Last Name: _____

Q3. What is your email address? (optional)

Email: _____

Q4. So that we can determine how diverse students respond to participation in AEOP programs please tell us about yourself and your school

What grade will you start in the fall? (select one)

- ❍ 4th
- ❍ 5th
- ❍ 6th
- ❍ 7th
- ❍ 8th
- ❍ 9th
- ❍ 10th
- ❍ 11th
- ❍ 12th
- ❍ College freshman
- ❍ Other (specify): _____
- ❍ Choose not to report

Q5. What is your gender?

- ❍ Male
- ❍ Female
- ❍ Choose not to report

Q6. What is your race or ethnicity?

- ❍ Hispanic or Latino
- ❍ Asian
- ❍ Black or African American
- ❍ Native American or Alaska Native
- ❍ Native Hawaiian or Other Pacific Islander
- ❍ White
- ❍ Other race or ethnicity (specify): _____
- ❍ Choose not to report

Q7. Do you qualify for free or reduced lunches at school?

- ❍ Yes
- ❍ No
- ❍ Choose not to report

Q8. Which best describes the location of your school?

- ❍ Frontier or tribal school
- ❍ Rural (country)
- ❍ Suburban
- ❍ Urban (city)

Q9. What kind of school do you attend?

- ❍ Public school
- ❍ Private school
- ❍ Home school
- ❍ Online school

- ❍ Department of Defense school (DoDDS or DoDEA)

Q10. Where was the REAP program located?

- ❍ Alabama State University
- ❍ Arizona State University
- ❍ Ball State University
- ❍ Clark Atlanta University
- ❍ Colorado State University
- ❍ Delaware State University
- ❍ Georgia State University
- ❍ Jackson State University
- ❍ LeMoyne
- ❍ Loyola University-Chicago
- ❍ Michigan Technological University
- ❍ Montana State University
- ❍ New Jersey Technical Institute
- ❍ New Mexico State
- ❍ North Carolina A&T State University
- ❍ North Carolina Central University
- ❍ Oakland University
- ❍ South Dakota School of Mines & Technology
- ❍ Texas Southern
- ❍ Texas Tech University
- ❍ University of Alabama-Huntsville
- ❍ University of Arkansas at Pine Bluff
- ❍ University of California-Berkeley
- ❍ University of Central Florida
- ❍ University of Colorado-Boulder
- ❍ University of Houston
- ❍ University of Iowa
- ❍ University of Maryland-Baltimore
- ❍ University of Massachusetts-Lowell
- ❍ University of Missouri
- ❍ University of New Hampshire
- ❍ University of Puerto Rico
- ❍ University of Puerto Rico-Hu Macao
- ❍ University of South Florida
- ❍ University of Texas-El Paso
- ❍ University of Utah
- ❍ University of Washington
- ❍ Xavier University of Louisiana
- ❍ Other, (specify): _____

Q11. How did you learn about REAP? (Check all that apply)

- ❑ Academy of Applied Science website
- ❑ Army Educational Outreach Program (AEOP) website
- ❑ Facebook, Twitter, Pinterest, or other social media
- ❑ School or university newsletter or email
- ❑ News story or other media coverage
- ❑ Past participant of REAP
- ❑ Friend
- ❑ Immediate family member (e.g., mother, father, siblings)
- ❑ Extended family member (e.g., grandparents, aunts, uncles, cousins)
- ❑ Friend of the family
- ❑ Teacher or professor
- ❑ Guidance counselor
- ❑ Mentor from REAP
- ❑ Someone who works at an Army laboratory
- ❑ Someone who works with the Department of Defense
- ❑ Other (specify): _____

Q12. How motivating were the following factors in your decision to participate in REAP?

	Not at all	A little	Somewhat	Very much
Teacher or professor encouragement	❍	❍	❍	❍
An academic requirement or school grade	❍	❍	❍	❍
Desire to learn something new or interesting	❍	❍	❍	❍
The program mentor(s)	❍	❍	❍	❍
Building college application or résumé	❍	❍	❍	❍
Networking opportunities	❍	❍	❍	❍
Interest in science, technology, engineering, or mathematics (STEM)	❍	❍	❍	❍
Interest in STEM careers with the Army	❍	❍	❍	❍
Having fun	❍	❍	❍	❍
Earning stipend or award while doing STEM	❍	❍	❍	❍
Opportunity to do something with friends	❍	❍	❍	❍
Opportunity to use advanced laboratory technology	❍	❍	❍	❍
Desire to expand laboratory or research skills	❍	❍	❍	❍
Learning in ways that are not possible in school	❍	❍	❍	❍
Serving the community or country	❍	❍	❍	❍
Parent encouragement	❍	❍	❍	❍
Exploring a unique work environment	❍	❍	❍	❍
Other, (specify)	❍	❍	❍	❍

Q13. How often do you do each of the following in STEM classes at school this year?

	Not at all	At least once	A few times	Most days	Every day
Learn about new science, technology, engineering, or mathematics (STEM) topics	❍	❍	❍	❍	❍
Apply STEM knowledge to real life situations	❍	❍	❍	❍	❍
Learn about cutting-edge STEM research	❍	❍	❍	❍	❍
Learn about different STEM careers	❍	❍	❍	❍	❍
Interact with STEM professionals	❍	❍	❍	❍	❍

Q14. How often did you do each of the following in REAP this year?

	Not at all	At least once	A few times	Most days	Every day
Learn about new science, technology, engineering, or mathematics (STEM) topics	❍	❍	❍	❍	❍
Apply STEM knowledge to real life situations	❍	❍	❍	❍	❍
Learn about cutting-edge STEM research	❍	❍	❍	❍	❍
Learn about different STEM careers	❍	❍	❍	❍	❍
Interact with STEM professionals	❍	❍	❍	❍	❍

Q15. How often do you do each of the following in STEM classes at school this year?

	Not at all	At least once	A few times	Most days	Every day
Practice using laboratory or field techniques, procedures, and tools	❍	❍	❍	❍	❍
Participate in hands-on STEM activities	❍	❍	❍	❍	❍
Work as part of a team	❍	❍	❍	❍	❍
Communicate with other students about STEM	❍	❍	❍	❍	❍

Q16. How often did you do each of the following in REAP this year?

	Not at all	At least once	A few times	Most days	Every day
Practice using laboratory or field techniques, procedures, and tools	❍	❍	❍	❍	❍
Participate in hands-on STEM activities	❍	❍	❍	❍	❍
Work as part of a team	❍	❍	❍	❍	❍
Communicate with other students about STEM	❍	❍	❍	❍	❍

Q17. How often do you do each of the following in STEM classes at school this year?

	Not at all	At least once	A few times	Most days	Every day
Pose questions or problems to investigate	❍	❍	❍	❍	❍
Design an investigation	❍	❍	❍	❍	❍
Carry out an investigation	❍	❍	❍	❍	❍
Analyze and interpret data or information	❍	❍	❍	❍	❍
Draw conclusions from an investigation	❍	❍	❍	❍	❍
Come up with creative explanations or solutions	❍	❍	❍	❍	❍
Build (or simulate) something	❍	❍	❍	❍	❍

Q18. How often did you do each of the following in REAP this year?

	Not at all	At least once	A few times	Most days	Every day
Pose questions or problems to investigate	❍	❍	❍	❍	❍
Design an investigation	❍	❍	❍	❍	❍
Carry out an investigation	❍	❍	❍	❍	❍
Analyze and interpret data or information	❍	❍	❍	❍	❍
Draw conclusions from an investigation	❍	❍	❍	❍	❍
Come up with creative explanations or solutions	❍	❍	❍	❍	❍
Build (or simulate) something	❍	❍	❍	❍	❍

Q19. Rate how the following items impacted your awareness of Army Educational Outreach Programs (AEOPs) during REAP:

	Did Not Experience	Not at all	A little	Somewhat	Very much
Academy of Applied Science website	❍	❍	❍	❍	❍
AEOP website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure and/or presentation	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat, etc.)	❍	❍	❍	❍	❍
My mentor(s)	❍	❍	❍	❍	❍
Invited speakers or “career” events	❍	❍	❍	❍	❍
Participation in REAP	❍	❍	❍	❍	❍

Q20. Rate how the following items impacted your awareness of Department of Defense (DoD) STEM careers during REAP:

	Did Not Experience	Not at all	A little	Somewhat	Very much
Academy of Applied Science website	❍	❍	❍	❍	❍
AEOP website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure and/or presentation	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat, etc.)	❍	❍	❍	❍	❍
My mentor(s)	❍	❍	❍	❍	❍
Invited speakers or "career" events	❍	❍	❍	❍	❍
Participation in REAP	❍	❍	❍	❍	❍

Q21. How SATISFIED were you with each of the following REAP program features?

	Did Not Experience	Not at all	A little	Somewhat	Very much
Application or registration process	❍	❍	❍	❍	❍
Other administrative tasks	❍	❍	❍	❍	❍
Communications from Academy of Applied Science	❍	❍	❍	❍	❍
Communications from [REAP site]	❍	❍	❍	❍	❍
Location(s) of program activities	❍	❍	❍	❍	❍
Availability of program topics or fields that interest you	❍	❍	❍	❍	❍
Instruction or mentorship during program activities	❍	❍	❍	❍	❍
Participation stipends (payment)	❍	❍	❍	❍	❍
Research abstract preparation requirements	❍	❍	❍	❍	❍
Development opportunities beyond conducting research (attending seminars, taking courses, pursuing competitions or scholarships, presenting or publishing research, etc.)	❍	❍	❍	❍	❍

Q22. Which of the following best describes your primary research mentor?

❍ I did not have a research mentor
❍ Teacher
❍ Coach
❍ Parent
❍ Club or activity leader (School club, Boy/Girls Scouts, etc.)
❍ STEM researcher (private industry, university, or DoD/government employee, etc.)
❍ Other (specify) _____

Q23. Which of the following statements best reflects the input you had into your project initially?

❍ I did not have a project

- ❍ I was assigned a project by my mentor
- ❍ I worked with my mentor to design a project
- ❍ I had a choice among various projects suggested by my mentor
- ❍ I worked with my mentor and members of a research team to design a project
- ❍ I designed the entire project on my own

Q24. Which of the following statements best reflects the availability of your mentor?

- ❍ I did not have a mentor
- ❍ The mentor was never available
- ❍ The mentor was available less than half of the time
- ❍ The mentor was available about half of the time of my project
- ❍ The mentor was available more than half of the time
- ❍ The mentor was always available

Q25. Which of the following statements best reflects your working as part of a group or team?

- ❍ I worked alone (or alone with my research mentor)
- ❍ I worked with others in a shared laboratory or other space, but we work on different projects
- ❍ I worked alone on my project and I met with others regularly for general reporting or discussion
- ❍ I worked alone on a project that was closely connected with projects of others in my group
- ❍ I work with a group who all worked on the same project

Q26. How SATISFIED were you with each of the following:

	Did Not Experience	Not at all	A little	Somewhat	Very much
My working relationship with my mentor	❍	❍	❍	❍	❍
My working relationship with the group or team	❍	❍	❍	❍	❍
The amount of time I spent doing meaningful research	❍	❍	❍	❍	❍
The amount of time I spent with my research mentor	❍	❍	❍	❍	❍
The research experience overall	❍	❍	❍	❍	❍

Q27. Which of the following statements apply to your research experience? (Choose all that apply)

- ❑ I presented a talk or poster to other students or faculty
- ❑ I presented a talk or poster at a professional symposium or conference
- ❑ I attended a symposium or conference
- ❑ I wrote or co-wrote a paper that was/will be published in a research journal
- ❑ I wrote or co-wrote a technical paper or patent
- ❑ I will present a talk or poster to other students or faculty
- ❑ I will present a talk or poster at a professional symposium or conference
- ❑ I will attend a symposium or conference
- ❑ I will write or co-write a paper that was/will be published in a research journal
- ❑ I will write or co-write a technical paper or patent
- ❑ I won an award or scholarship based on my research

Q28. The list below describes mentoring strategies that are effective ways to support STEM learners. From the list below, please indicate which strategies that your mentor(s) used when working directly with you in REAP:

	Yes - my mentor used this strategy with me	No - my mentor did not use this strategy with me
Helped me become aware of the roles STEM play in my everyday life	❍	❍
Helped me understand how STEM can help me improve my community	❍	❍
Used teaching/mentoring activities that addressed my learning style	❍	❍
Provided me with extra support when I needed it	❍	❍
Encouraged me to exchange ideas with others whose backgrounds or viewpoints are different from mine	❍	❍
Allowed me to work on a collaborative project as a member of a team	❍	❍
Helped me practice a variety of STEM skills with supervision	❍	❍
Gave me constructive feedback to improve my STEM knowledge, skills, or abilities	❍	❍
Gave me guidance about educational pathways that would prepare me for a STEM career	❍	❍
Recommended Army Educational Outreach Programs that match my interests	❍	❍
Discussed STEM career opportunities with DoD or other government agencies	❍	❍

Q29. Which category best describes the focus of your REAP experience?

❍ Science
❍ Technology
❍ Engineering
❍ Mathematics

Q30. AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Knowledge of a STEM topic or field in depth	❍	❍	❍	❍	❍
Knowledge of research conducted in a STEM topic or field	❍	❍	❍	❍	❍
Knowledge of research processes, ethics, and rules for conduct in STEM	❍	❍	❍	❍	❍
Knowledge of how professionals work on real problems in STEM	❍	❍	❍	❍	❍
Knowledge of what everyday research work is like in STEM	❍	❍	❍	❍	❍

Q31. AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas? **Only presented to respondents who selected "science" in Q29**

	No gain	A little gain	Some gain	Large gain	Extreme gain
Asking questions based on observations of real-world phenomena	❍	❍	❍	❍	❍
Asking a question (about a phenomenon) that can be answered with one or more investigations	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	❍	❍	❍	❍	❍
Making a model to represent the key features and functions of an observed phenomenon	❍	❍	❍	❍	❍
Deciding what type of data to collect in order to answer a question	❍	❍	❍	❍	❍
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	❍	❍	❍	❍	❍
Identifying the limitations of data collected in an investigation	❍	❍	❍	❍	❍
Carrying out procedures for an investigation and recording data accurately	❍	❍	❍	❍	❍
Testing how changing one variable affects another variable, in order to understand relationships between variables	❍	❍	❍	❍	❍
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	❍	❍	❍	❍	❍
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	❍	❍	❍	❍	❍
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics or computers to analyze numeric data	❍	❍	❍	❍	❍
Supporting a proposed explanation (for a phenomenon) with data from investigations	❍	❍	❍	❍	❍

Q31-CONTINUED. AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas? **Only presented to respondents who selected "science" in Q29**

	No gain	A little gain	Some gain	Large gain	Extreme gain
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	❍	❍	❍	❍	❍
Using data or interpretations from other researchers or investigations to improve an explanation	❍	❍	❍	❍	❍

Asking questions to understand the data and interpretations others use to support their explanations	❍	❍	❍	❍	❍
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	❍	❍	❍	❍	❍
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	❍	❍	❍	❍	❍
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	❍	❍	❍	❍	❍
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	❍	❍	❍	❍	❍
Integrating information from multiple sources to support your explanations of phenomena	❍	❍	❍	❍	❍
Communicating information about your investigations and explanations in different formats (orally, written, graphically, mathematically)	❍	❍	❍	❍	❍

Q32. AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas? **Only presented to respondents who selected "technology," "engineering," or "mathematics" in Q29**

	No gain	A little gain	Some gain	Large gain	Extreme gain
Identifying real-world problems based on social, technological, or environmental issues	❍	❍	❍	❍	❍
Defining a problem that can be solved by developing a new or improved object, process, or system	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	❍	❍	❍	❍	❍
Making a model that represents the key features or functions of a solution to a problem	❍	❍	❍	❍	❍
Deciding what type of data to collect in order to test if a solution functions as intended	❍	❍	❍	❍	❍
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	❍	❍	❍	❍	❍
Identifying the limitations of the data collected in an investigation	❍	❍	❍	❍	❍
Carrying out procedures for an investigation and recording data accurately	❍	❍	❍	❍	❍

Q32-CONTINUED. AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas? **Only presented to respondents who selected "technology," "engineering," or "mathematics" in Q29**

	No gains	A little gain	Some gain	Large gain	Extremely large gains

Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	❍	❍	❍	❍	❍
Using computer-based models to investigate cause and effect relationships of a simulated solution	❍	❍	❍	❍	❍
Considering alternative interpretations of data when deciding if a solution functions as intended	❍	❍	❍	❍	❍
Displaying numeric data in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics or computers to analyze numeric data	❍	❍	❍	❍	❍
Supporting a proposed solution (for a problem) with data from investigations	❍	❍	❍	❍	❍
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	❍	❍	❍	❍	❍
Using data or interpretations from other researchers or investigations to improve a solution	❍	❍	❍	❍	❍
Asking questions to understand the data and interpretations others use to support their solutions	❍	❍	❍	❍	❍
Using data from investigations to defend an argument that conveys how a solution meets design criteria	❍	❍	❍	❍	❍
Deciding what additional data or information may be needed to find the best solution to a problem	❍	❍	❍	❍	❍
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	❍	❍	❍	❍	❍
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	❍	❍	❍	❍	❍
Integrating information from multiple sources to support your solution to a problem	❍	❍	❍	❍	❍
Communicating information about your design processes and/or solutions in different formats (orally, written, graphically, mathematically)	❍	❍	❍	❍	❍

Q33. AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Learning to work independently	❍	❍	❍	❍	❍
Setting goals and reflecting on performance	❍	❍	❍	❍	❍
Sticking with a task until it is complete	❍	❍	❍	❍	❍
Making changes when things do not go as planned	❍	❍	❍	❍	❍

Patience for the slow pace of research	❍	❍	❍	❍	❍
Working collaboratively with a team	❍	❍	❍	❍	❍
Communicating effectively with others	❍	❍	❍	❍	❍
Including others' perspectives when making decisions	❍	❍	❍	❍	❍
Sense of being part of a learning community	❍	❍	❍	❍	❍
Sense of contributing to a body of knowledge	❍	❍	❍	❍	❍
Building relationships with professionals in a field	❍	❍	❍	❍	❍
Connecting a topic or field and my personal values	❍	❍	❍	❍	❍

Q34. AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Interest in a new STEM topic or field	❍	❍	❍	❍	❍
Clarifying a STEM career path	❍	❍	❍	❍	❍
Sense of accomplishing something in STEM	❍	❍	❍	❍	❍
Building academic or professional credentials in STEM	❍	❍	❍	❍	❍
Feeling prepared for more challenging STEM activities	❍	❍	❍	❍	❍
Confidence to do well in future STEM courses	❍	❍	❍	❍	❍
Confidence to contribute to STEM	❍	❍	❍	❍	❍
Thinking creatively about a STEM project or activity	❍	❍	❍	❍	❍
Trying out new ideas or procedures on my own in a STEM project or activity	❍	❍	❍	❍	❍
Feeling responsible for a STEM project or activity	❍	❍	❍	❍	❍
Feeling like a STEM professional	❍	❍	❍	❍	❍
Feeling like part of a STEM community	❍	❍	❍	❍	❍

Q35. AS A RESULT OF YOUR REAP experience, how much MORE or LESS likely are you to engage in the following activities in science, technology, engineering, or mathematics (STEM) outside of school requirements or activities?

	Much less likely	Less likely	About the same before and after	More likely	Much more likely
Visit a science museum or zoo	❍	❍	❍	❍	❍
Watch or read non-fiction STEM	❍	❍	❍	❍	❍
Look up STEM information at a library or on the internet	❍	❍	❍	❍	❍
Tinker with a mechanical or electrical device	❍	❍	❍	❍	❍
Work on solving mathematical or scientific puzzles	❍	❍	❍	❍	❍

Design a computer program or website	❍	❍	❍	❍	❍
Observe things in nature (plant growth, animal behavior, stars or planets, etc.)	❍	❍	❍	❍	❍
Talk with friends or family about STEM	❍	❍	❍	❍	❍
Mentor or teach other students about STEM	❍	❍	❍	❍	❍
Help with a community service project that relates to STEM	❍	❍	❍	❍	❍
Participate in a STEM club, student association, or professional organization	❍	❍	❍	❍	❍
Participate in STEM camp, fair, or competition	❍	❍	❍	❍	❍
Take an elective (not required) STEM class	❍	❍	❍	❍	❍
Work on a STEM project or experiment in a university or professional setting	❍	❍	❍	❍	❍
Receive an award or special recognition for STEM accomplishments	❍	❍	❍	❍	❍

Q36. How far did you want to go in school BEFORE participating in REAP?

❍ Graduate from high school
❍ Go to a trade or vocational school
❍ Go to college for a little while
❍ Finish college (get a Bachelor's degree)
❍ Get more education after college
❍ Get a master's degree
❍ Get a Ph.D.
❍ Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)
❍ Get a combined M.D. / Ph.D.
❍ Get another professional degree (law, business, etc.)

Q37. How far do you want to go in school AFTER participating in REAP?

❍ Graduate from high school
❍ Go to a trade or vocational school
❍ Go to college for a little while
❍ Finish college (get a Bachelor's degree)
❍ Get more education after college
❍ Get a master's degree
❍ Get a Ph.D.
❍ Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)
❍ Get a combined M.D. / Ph.D.
❍ Get another professional degree (law, business, etc.)

Q38. BEFORE REAP, what kind of work did you expect to be doing when you are 30 years old? (select the ONE answer that best describes your career goals BEFORE REAP)

❍ Undecided
❍ Teaching, non-STEM

- ❍ Science (no specific subject)
- ❍ Physical science (e.g., physics, chemistry, astronomy, materials science)
- ❍ Biological science
- ❍ Earth, atmospheric or oceanic science
- ❍ Agricultural science
- ❍ Environmental science
- ❍ Computer science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics or statistics
- ❍ Teaching, STEM
- ❍ Medicine (e.g., doctor, dentist, veterinarian, etc.)
- ❍ Health (e.g., nursing, pharmacy, technician, etc.)
- ❍ Social science (e.g., psychologist, sociologist)
- ❍ Business
- ❍ Law
- ❍ English/language arts
- ❍ Farming
- ❍ Military, police, or security
- ❍ Art (e.g., writing, dancing, painting, etc.)
- ❍ Skilled trade (carpenter, electrician, plumber, etc.)

Other _____

Q39. AFTER REAP, what kind of work do you expect to be doing when you are 30 years old? (select the ONE answer that best describes your career AFTER REAP)

- ❍ Undecided
- ❍ Science (no specific subject)
- ❍ Physical science (e.g., physics, chemistry, astronomy, materials science)
- ❍ Biological science
- ❍ Earth, atmospheric or oceanic science
- ❍ Agricultural science
- ❍ Environmental science
- ❍ Computer science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics or statistics
- ❍ Teaching, STEM
- ❍ Teaching, non-STEM
- ❍ Medicine (e.g., doctor, dentist, veterinarian, etc.)
- ❍ Health (e.g., nursing, pharmacy, technician, etc.)
- ❍ Social science (e.g., psychologist, sociologist)
- ❍ Business
- ❍ Law
- ❍ English/language arts
- ❍ Farming
- ❍ Military, police, or security
- ❍ Art (e.g., writing, dancing, painting, etc.)
- ❍ Skilled trade (carpenter, electrician, plumber, etc.)

Other _____

Q40. When you are 30, to what extent do you expect to use your STEM knowledge, skills, and/or abilities in your work?

- ❍ not at all
- ❍ up to 25% of the time
- ❍ up to 50% of the time
- ❍ up to 75% of the time
- ❍ up to 100% of the time

Q41. How many times have you participated in any of the following Army Educational Outreach Programs (AEOPs)?
If you have heard of an AEOP but never participated select "Never". If you have not heard of an AEOP select "Never heard of it".

	Never	Once	Twice	Three or more times	Never heard of it
Camp Invention	❍	❍	❍	❍	❍
eCYBERMISSION	❍	❍	❍	❍	❍

Junior Solar Sprint (JSS)	❍	❍	❍	❍	❍
West Point Bridge Design Contest (WPBDC)	❍	❍	❍	❍	❍
Junior Science & Humanities Symposium (JSHS)	❍	❍	❍	❍	❍
Gains in the Education of Mathematics and Science (GEMS)	❍	❍	❍	❍	❍
GEMS Near Peers	❍	❍	❍	❍	❍
UNITE	❍	❍	❍	❍	❍
Science & Engineering Apprenticeship Program (REAP)	❍	❍	❍	❍	❍
Research & Engineering Apprenticeship Program (REAP)	❍	❍	❍	❍	❍
High School Apprenticeship Program (HSAP)	❍	❍	❍	❍	❍
College Qualified Leaders (CQL)	❍	❍	❍	❍	❍
Undergraduate Research Apprenticeship Program (URAP)	❍	❍	❍	❍	❍
Science Mathematics, and Research for Transformation (SMART) College Scholarship	❍	❍	❍	❍	❍
National Defense Science & Engineering Graduate (NDSEG) Fellowship	❍	❍	❍	❍	❍

Q42. How interested are you in participating in the following programs in the future?

	Not at all	A little	Somewhat	Very much
Camp Invention	❍	❍	❍	❍
eCYBERMISSION	❍	❍	❍	❍
Junior Solar Sprint (JSS)	❍	❍	❍	❍
West Point Bridge Design Contest (WPBDC)	❍	❍	❍	❍
Junior Science & Humanities Symposium (JSHS)	❍	❍	❍	❍
Gains in the Education of Mathematics and Science (GEMS)	❍	❍	❍	❍
GEMS Near Peers	❍	❍	❍	❍
UNITE	❍	❍	❍	❍
Science & Engineering Apprenticeship Program (REAP)	❍	❍	❍	❍
Research & Engineering Apprenticeship Program (REAP)	❍	❍	❍	❍
High School Apprenticeship Program (HSAP)	❍	❍	❍	❍
College Qualified Leaders (CQL)	❍	❍	❍	❍
Undergraduate Research Apprenticeship Program (URAP)	❍	❍	❍	❍
Science Mathematics, and Research for Transformation (SMART) College Scholarship	❍	❍	❍	❍
National Defense Science & Engineering Graduate (NDSEG) Fellowship	❍	❍	❍	❍

Q43. How many jobs/careers in science, technology, engineering, or math (STEM) did you learn about during REAP?

- ❍ None
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5 or more

Q44. How many Department of Defense (DoD) STEM jobs/careers did you learn about during REAP?

- ❍ None
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5 or more

Q45. Rate how much you agree or disagree with each of the following statements about Department of Defense (DoD) researchers and research:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
DoD researchers advance science and engineering fields	❍	❍	❍	❍	❍
DoD researchers develop new, cutting edge technologies	❍	❍	❍	❍	❍
DoD researchers support non-defense related advancements in science and technology	❍	❍	❍	❍	❍
DoD researchers solve real-world problems	❍	❍	❍	❍	❍
DoD research is valuable to society	❍	❍	❍	❍	❍

Q46. Which of the following statements describe you after participating in REAP?

	Disagree - This did not happen	Disagree - This happened but not because of the program	Agree - The program contributed	Agree - The program was primary reason
I am more confident in my STEM knowledge, skills, and abilities	❍	❍	❍	❍
I am more interested in participating in STEM activities outside of school requirements	❍	❍	❍	❍
I am more aware of other AEOPs	❍	❍	❍	❍
I am more interested in participating in other AEOPs	❍	❍	❍	❍
I am more interested in taking STEM classes in school	❍	❍	❍	❍
I am more interested in attending college	❍	❍	❍	❍

I am more interested in earning a STEM degree in college	❍	❍	❍	❍
I am more interested in pursuing a STEM career	❍	❍	❍	❍
I am more aware of DoD STEM research and careers	❍	❍	❍	❍
I have a greater appreciation of DoD STEM research and careers	❍	❍	❍	❍
I am more interested in pursuing a STEM career with the DoD	❍	❍	❍	❍

Q47. What are the three most important ways that you have benefited from REAP?

Benefit #1:

Benefit #2:

Benefit #3:

Q48. What are the three ways that REAP should be improved for future participants?

Improvement #1:

Improvement #2:

Improvement #3:

Q49. Tell us about your overall satisfaction with your REAP experience.

REAP Youth Data Summary

So that we can determine how diverse students respond to participation in AEOP programs, please tell us about yourself and your school. What grade will you start in the fall? (select one) (Avg. = 11.88, SD = 0.92)		
	Freq.	**%**
9th	0	0%
10th	5	9%
11th	12	21%
12th	24	43%
College freshman	15	27%
College sophomore	0	0%
College junior	0	0%
College senior	0	0%
Graduate program	0	0%
Other, (specify)	0	0%
Choose not to report	0	0%
Total	**56**	**100%**

What is your gender?		
	Freq.	**%**
Male	15	27%
Female	41	73%
Choose not to report	0	0%
Total	**56**	**100%**

What is your race or ethnicity?		
	Freq.	**%**
Hispanic or Latino	11	20%
Asian	9	16%
Black or African American	26	47%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	9	16%

Other race or ethnicity, (specify):	0	0%
Choose not to report	0	0%
Total	**55**	**100%**

Do you qualify for free or reduced lunches at school?

	Freq.	%
Yes	27	48%
No	27	48%
Choose not to report	2	4%
Total	**56**	**100%**

Which best describes the location of your school?

	Freq.	%
Frontier or tribal school	0	0%
Rural (country)	5	9%
Suburban	15	27%
Urban (city)	36	64%
Total	**56**	**100%**

What kind of school do you attend?

	Freq.	%
Public school	51	91%
Private school	5	9%
Home school	0	0%
Online school	0	0%
Department of Defense school (DoDDS or DoDEA)	0	0%
Total	**56**	**100%**

At which of the following REAP sites did you participate? (Select ONE)

	Freq.	%			Freq.	%
Alabama State University	3	5%		**Texas Tech University**	4	7%
Arizona State University	1	2%		**University of Alabama-Huntsville**	0	0%

Ball State University	0	0%		University of Arkansas at Pine Bluff	2	4%
Clark Atlanta University	1	2%		University of California-Berkeley	1	2%
Colorado State University	2	4%		University of Central Florida	2	4%
Delaware State University	1	2%		University of Colorado-Boulder	2	4%
Georgia State University	0	0%		University of Houston	2	4%
Jackson State University	4	7%		University of Iowa	0	0%
LeMoyne	0	0%		University of Maryland-Baltimore	1	2%
Loyola University-Chicago	4	7%		University of Massachusetts-Lowell	1	2%
Michigan Technological University	2	4%		University of Missouri	0	0%
Montana State University	2	4%		University of New Hampshire	1	2%
New Jersey Technical Institute	2	4%		University of Puerto Rico	1	2%
New Mexico State	1	2%		University of Puerto Rico-Hu Macao	1	2%
North Carolina A&T State University	1	2%		University of South Florida	0	0%
North Carolina Central University	1	2%		University of Texas-El Paso	0	0%
Oakland University	1	2%		University of Utah	2	4%
South Dakota School of Mines & Technology	0	0%		University of Washington	2	4%
Texas Southern	2	4%		Xavier University of Louisiana	0	0%
				Other, (specify):	6	10%
				Total	**56**	**100%**

Note. Other = "Miami Dade College" (n = 5), and "Invasive Plant Research Laboratory".

How did you learn about REAP? (Check all that apply) (n = 55)

	Freq.	%			Freq.	%
Academy of Applied Science website	3	5%		Extended family member (grandparents, aunts, uncles, cousins)	2	4%
Army Educational Outreach Program (AEOP) website	8	15%		Friend of the family	0	0%
Facebook, Twitter, Pinterest, or other social media	1	2%		Teacher or professor	31	56%
School or university newsletter, email, or website	11	20%		Guidance counselor	4	7%
News story or other media coverage	1	2%		Mentor from REAP	8	15%
Past participant of REAP	7	13%		Someone who works at an Army laboratory	1	2%
Friend	5	9%		Someone who works with the Department of Defense	0	0%

Immediate family member (mother, father, siblings)	7	13%		Other, (specify):	2	4%

Note. Other = "S.L.E.W.S. Leader", and "Past participant of UNITE".

How motivating were the following factors in your decision to participate in REAP?							
	1	2	3	4	n	Avg.	SD
Teacher or professor encouragement	11 (20%)	4 (7%)	10 (18%)	30 (55%)	55	**3.07**	1.20
An academic requirement or school grade	33 (60%)	4 (7%)	10 (18%)	8 (15%)	55	**1.87**	1.17
Desire to learn something new or interesting	0 (0%)	0 (0%)	7 (13%)	48 (87%)	55	**3.87**	0.34
The program mentor(s)	8 (15%)	4 (7%)	21 (38%)	22 (40%)	55	**3.04**	1.04
Building college application or résumé	0 (0%)	1 (2%)	16 (29%)	38 (69%)	55	**3.67**	0.51
Networking opportunities	1 (2%)	5 (9%)	13 (24%)	36 (65%)	55	**3.53**	0.74
Interest in science, technology, engineering, or mathematics (STEM)	0 (0%)	0 (0%)	5 (9%)	49 (91%)	54	**3.91**	0.29
Interest in STEM careers with the Army	17 (31%)	17 (31%)	13 (24%)	8 (15%)	55	**2.22**	1.05
Having fun	1 (2%)	4 (7%)	14 (25%)	36 (65%)	55	**3.55**	0.72
Earning stipend or award while doing STEM	1 (2%)	5 (9%)	18 (33%)	31 (56%)	55	**3.44**	0.74
Opportunity to do something with friends	21 (39%)	6 (11%)	13 (24%)	14 (26%)	54	**2.37**	1.25
Opportunity to use advanced laboratory technology	0 (0%)	1 (2%)	13 (24%)	41 (75%)	55	**3.73**	0.49
Desire to expand laboratory or research skills	1 (2%)	1 (2%)	8 (15%)	45 (82%)	55	**3.76**	0.58
Learning in ways that are not possible in school	0 (0%)	1 (2%)	10 (18%)	44 (80%)	55	**3.78**	0.46
Serving the community or country	4 (7%)	4 (7%)	21 (38%)	26 (47%)	55	**3.25**	0.89
Parent encouragement	6 (11%)	9 (16%)	19 (35%)	21 (38%)	55	**3.00**	1.00
Exploring a unique work environment	0 (0%)	0 (0%)	14 (25%)	41 (75%)	55	**3.75**	0.44
Other, (specify)	4 (67%)	0 (0%)	0 (0%)	2 (33%)	6	**2.00**	1.55

Note. Response scale: 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

How often do you do each of the following in STEM classes at school this year?								
	1	2	3	4	5	n	Avg.	SD
Learn about new science, technology, engineering, or mathematics (STEM) topics	2 (4%)	2 (4%)	13 (24%)	17 (31%)	20 (37%)	54	**3.94**	1.05
Apply STEM knowledge to real life situations	4 (7%)	3 (6%)	17 (31%)	22 (41%)	8 (15%)	54	**3.50**	1.06
Learn about cutting-edge STEM research	5 (9%)	9 (17%)	29 (54%)	6 (11%)	5 (9%)	54	**2.94**	1.02
Learn about different STEM careers	7 (13%)	8 (15%)	22 (41%)	11 (20%)	6 (11%)	54	**3.02**	1.16
Interact with STEM professionals	16 (30%)	15 (28%)	7 (13%)	10 (19%)	6 (11%)	54	**2.54**	1.38

Note. Response scale: 1 = "Not at all," 2 = "At least once," 3 = "A few times," 4 = "Most days," 5 = "Every day".

How often do you do each of the following in REAP this year?								
	1	2	3	4	5	n	Avg.	SD
Learn about new science, technology, engineering, or mathematics (STEM) topics	0 (0%)	2 (4%)	5 (9%)	18 (33%)	29 (54%)	54	**4.37**	0.81
Apply STEM knowledge to real life situations	1 (2%)	4 (7%)	4 (7%)	13 (24%)	32 (59%)	54	**4.31**	1.02
Learn about cutting-edge STEM research	1 (2%)	3 (6%)	10 (19%)	16 (30%)	24 (44%)	54	**4.09**	1.01
Learn about different STEM careers	2 (4%)	4 (7%)	19 (35%)	12 (22%)	17 (31%)	54	**3.70**	1.11
Interact with STEM professionals	2 (4%)	2 (4%)	4 (7%)	13 (24%)	33 (61%)	54	**4.35**	1.03

Note. Response scale: 1 = "Not at all," 2 = "At least once," 3 = "A few times," 4 = "Most days," 5 = "Every day".

How often do you do each of the following in STEM classes at school this year?								
	1	2	3	4	5	n	Avg.	SD
Practice using laboratory or field techniques, procedures, and tools	1 (2%)	8 (15%)	21 (39%)	15 (28%)	9 (17%)	54	**3.43**	1.00
Participate in hands-on STEM activities	3 (6%)	6 (11%)	21 (39%)	15 (28%)	9 (17%)	54	**3.39**	1.07
Work as part of a team	0 (0%)	1 (2%)	15 (28%)	21 (39%)	17 (31%)	54	**4.00**	0.82
Communicate with other students about STEM	3 (6%)	5 (9%)	14 (26%)	17 (31%)	15 (28%)	54	**3.67**	1.15

Note. Response scale: 1 = "Not at all," 2 = "At least once," 3 = "A few times," 4 = "Most days," 5 = "Every day".

How often do you do each of the following in REAP this year?								
	1	2	3	4	5	n	Avg.	SD
Practice using laboratory or field techniques, procedures, and tools	0 (0%)	3 (6%)	3 (6%)	11 (21%)	36 (68%)	53	**4.51**	0.85
Participate in hands-on STEM activities	1 (2%)	2 (4%)	3 (6%)	12 (23%)	35 (66%)	53	**4.47**	0.91
Work as part of a team	0 (0%)	2 (4%)	8 (15%)	13 (25%)	30 (57%)	53	**4.34**	0.88
Communicate with other students about STEM	1 (2%)	6 (11%)	6 (11%)	13 (25%)	27 (51%)	53	**4.11**	1.12

Note. Response scale: 1 = "Not at all," 2 = "At least once," 3 = "A few times," 4 = "Most days," 5 = "Every day".

How often do you do each of the following in STEM classes at school this year?								
	1	2	3	4	5	n	Avg.	SD
Pose questions or problems to investigate	2 (4%)	10 (19%)	13 (25%)	19 (37%)	8 (15%)	52	**3.40**	1.09
Design an investigation	7 (13%)	10 (19%)	20 (38%)	13 (25%)	3 (6%)	53	**2.91**	1.10
Carry out an investigation	5 (9%)	9 (17%)	21 (40%)	13 (25%)	5 (9%)	53	**3.08**	1.09
Analyze and interpret data or information	1 (2%)	6 (11%)	8 (15%)	29 (55%)	9 (17%)	53	**3.74**	0.94
Draw conclusions from an investigation	1 (2%)	3 (6%)	20 (38%)	22 (42%)	7 (13%)	53	**3.58**	0.86
Come up with creative explanations or solutions	3 (6%)	6 (11%)	18 (34%)	20 (38%)	6 (11%)	53	**3.38**	1.02
Build (or simulate) something	5 (9%)	12 (23%)	17 (32%)	14 (26%)	5 (9%)	53	**3.04**	1.13

Note. Response scale: 1 = "Not at all," 2 = "At least once," 3 = "A few times," 4 = "Most days," 5 = "Every day".

How often do you do each of the following in REAP this year?								
	1	2	3	4	5	n	Avg.	SD
Pose questions or problems to investigate	4 (8%)	3 (6%)	7 (13%)	17 (32%)	22 (42%)	53	**3.94**	1.22
Design an investigation	5 (9%)	5 (9%)	14 (26%)	12 (23%)	17 (32%)	53	**3.58**	1.29
Carry out an investigation	2 (4%)	4 (8%)	6 (11%)	15 (28%)	26 (49%)	53	**4.11**	1.12
Analyze and interpret data or information	1 (2%)	2 (4%)	9 (17%)	18 (34%)	23 (43%)	53	**4.13**	0.96
Draw conclusions from an investigation	2 (4%)	2 (4%)	13 (25%)	15 (28%)	21 (40%)	53	**3.96**	1.07
Come up with creative explanations or solutions	3 (6%)	3 (6%)	13 (25%)	14 (26%)	20 (38%)	53	**3.85**	1.17
Build (or simulate) something	3 (6%)	4 (8%)	14 (27%)	12 (23%)	19 (37%)	52	**3.77**	1.20

Note. Response scale: 1 = "Not at all," 2 = "At least once," 3 = "A few times," 4 = "Most days," 5 = "Every day".

Rate how the following items impacted your awareness of Army Educational Outreach Programs (AEOPs) during REAP:								
	0	1	2	3	4	n	Avg.	SD
Academy of Applied Science website	22 (42%)	5 (10%)	10 (19%)	10 (19%)	5 (10%)	52	**2.50**	0.97
Army Educational Outreach Program (AEOP) website	13 (25%)	2 (4%)	13 (25%)	11 (21%)	13 (25%)	52	**2.90**	0.94
AEOP social media	28 (54%)	8 (15%)	8 (15%)	5 (10%)	3 (6%)	52	**2.13**	1.03
AEOP brochure and/or presentation	13 (25%)	9 (17%)	10 (19%)	9 (17%)	11 (21%)	52	**2.56**	1.14
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat, etc.)	10 (19%)	6 (12%)	11 (21%)	12 (23%)	13 (25%)	52	**2.76**	1.05
My mentor(s)	5 (10%)	3 (6%)	13 (25%)	14 (27%)	17 (33%)	52	**2.96**	0.95
Invited speakers or "career" events	23 (44%)	7 (13%)	4 (8%)	9 (17%)	9 (17%)	52	**2.69**	1.17

Participation in REAP	3 (6%)	2 (4%)	6 (12%)	13 (25%)	27 (53%)	51	**3.35**	0.86

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

Rate how the following items impacted your awareness of Department of Defense (DoD) STEM careers during REAP:

	0	1	2	3	4	n	Avg.	SD
Academy of Applied Science website	23 (45%)	6 (12%)	12 (24%)	6 (12%)	4 (8%)	51	**2.29**	0.98
Army Educational Outreach Program (AEOP) website	16 (32%)	7 (14%)	13 (26%)	8 (16%)	6 (12%)	50	**2.38**	1.02
AEOP social media	29 (58%)	7 (14%)	8 (16%)	4 (8%)	2 (4%)	50	**2.05**	0.97
AEOP brochure and/or presentation	17 (33%)	7 (14%)	14 (27%)	9 (18%)	4 (8%)	51	**2.29**	0.94
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat, etc.)	14 (28%)	10 (20%)	11 (22%)	11 (22%)	4 (8%)	50	**2.25**	1.00
My mentor(s)	10 (20%)	7 (14%)	13 (26%)	13 (26%)	7 (14%)	50	**2.50**	0.99
Invited speakers or "career" events	24 (47%)	8 (16%)	7 (14%)	5 (10%)	7 (14%)	51	**2.41**	1.19
Participation in REAP	9 (18%)	7 (14%)	9 (18%)	12 (24%)	14 (27%)	51	**2.79**	1.09

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

How SATISFIED were you with each of the following REAP program features?

	0	1	2	3	4	n	Avg.	SD
Application or registration process	0 (0%)	2 (4%)	8 (15%)	20 (38%)	22 (42%)	52	**3.19**	0.84
Other administrative tasks	3 (6%)	0 (0%)	9 (17%)	15 (29%)	25 (48%)	52	**3.33**	0.77
Communications from Academy of Applied Science	5 (10%)	0 (0%)	9 (17%)	12 (23%)	26 (50%)	52	**3.36**	0.79
Communications from [REAP site]	0 (0%)	2 (4%)	3 (6%)	12 (23%)	35 (67%)	52	**3.54**	0.78
Location(s) of program activities	2 (4%)	3 (6%)	1 (2%)	12 (23%)	34 (65%)	52	**3.54**	0.81
Availability of program topics or fields that interest you	2 (4%)	1 (2%)	6 (12%)	10 (19%)	33 (63%)	52	**3.50**	0.79
Instruction or mentorship during program activities	1 (2%)	1 (2%)	3 (6%)	10 (19%)	37 (71%)	52	**3.63**	0.69
Participation stipends (payment)	0 (0%)	1 (2%)	1 (2%)	6 (12%)	43 (84%)	51	**3.78**	0.58
Research abstract preparation requirements	3 (6%)	2 (4%)	5 (10%)	14 (27%)	28 (54%)	52	**3.39**	0.84
Development opportunities beyond conducting research (attending seminars, taking courses, pursuing competitions or scholarships, presenting or publishing research, etc.)	6 (12%)	2 (4%)	8 (15%)	8 (15%)	28 (54%)	52	**3.35**	0.92

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

Which of the following best describes your primary research mentor?		
	Freq.	%
I did not have a research mentor	0	0%
Teacher	14	27%
Coach	1	2%
Parent	0	0%
Club or activity leader (School club, Boy/Girls Scouts)	0	0%
STEM researcher (university, industry, or DoD/government employee)	32	63%
Other (specify)	4	8%
Total	51	100%

Note. Other = "Associate of Dean, Professor, previous Graduate student", "Graduate Student", "PhD Student", and "Student (College)".

Which of the following statements best reflects the input you had into your project initially?		
	Freq.	%
I did not have a project	1	2%
I was assigned a project by my mentor	27	52%
I worked with my mentor to design a project	6	12%
I had a choice among various projects suggested by my mentor	8	15%
I worked with my mentor and members of a research team to design a project	9	17%
I designed the entire project on my own	1	2%
Total	52	100%

Which of the following statements best reflects the availability of your mentor?		
	Freq.	%
I did not have a mentor	0	0%
The mentor was never available	0	0%
The mentor was available less than half of the time	3	6%
The mentor was available about half of the time of my project	5	10%
The mentor was available more than half of the time	16	31%

The mentor was always available	28	54%
Total	**52**	**100%**

Which of the following statements best reflects your working as part of a group or team?

	Freq.	%
I worked alone (or alone with my research mentor)	7	13%
I worked with others in a shared laboratory or other space, but we work on different projects	17	33%
I worked alone on my project and I met with others regularly for general reporting or discussion	2	4%
I worked alone on a project that was closely connected with projects of others in my group	4	8%
I work with a group who all worked on the same project	22	42%
Total	**52**	**100%**

How SATISFIED were you with each of the following?

	0	1	2	3	4	n	Avg.	SD
My working relationship with my mentor	0 (0%)	1 (2%)	4 (8%)	13 (25%)	34 (65%)	52	**3.54**	0.73
My working relationship with the group or team	3 (6%)	1 (2%)	5 (10%)	12 (23%)	31 (60%)	52	**3.49**	0.77
The amount of time I spent doing meaningful research	0 (0%)	0 (0%)	6 (12%)	19 (37%)	27 (52%)	52	**3.40**	0.69
The amount of time I spent with my research mentor	0 (0%)	0 (0%)	8 (15%)	14 (27%)	30 (58%)	52	**3.42**	0.75
The research experience overall	0 (0%)	1 (2%)	0 (0%)	13 (25%)	37 (73%)	51	**3.69**	0.58

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

Which of the following statements apply to your research experience? (choose all that apply) (n = 39)

	Freq.	%			Freq.	%
I presented a talk or poster to other students or faculty	17	44%		I will present a talk or poster to other students or faculty	18	46%
I presented a talk or poster at a professional symposium or conference	3	8%		I will present a talk or poster at a professional symposium or conference	10	26%
I attended a symposium or conference	4	10%		I will attend a symposium or conference	6	15%
I wrote or co-wrote a paper that was/will be published in a research journal	3	8%		I will write or co-write a paper that was/will be published in a research journal	7	18%

I wrote or co-wrote a technical paper or patent	1	3%		I will write or co-write a technical paper or patent	3	8%
				I won an award or scholarship based on my research	1	3%

The list below describes mentoring strategies that are effective ways to support STEM learners. From the list below, please indicate which strategies that your mentor(s) used when working directly with you for REAP:					
		Yes - my mentor used this strategy with me		No - my mentor did not use this strategy with me	
	n	Freq.	%	Freq.	%
Helped me become aware of the roles STEM play in my everyday life	52	38	73%	14	27%
Helped me understand how STEM can help me improve my community	52	38	73%	14	27%
Used teaching/mentoring activities that addressed my learning style	52	42	81%	10	19%
Provided me with extra support when I needed it	52	50	96%	2	4%
Encouraged me to exchange ideas with others whose backgrounds or viewpoints are different from mine	52	33	63%	19	37%
Allowed me to work on a collaborative project as a member of a team	51	41	80%	10	20%
Helped me practice a variety of STEM skills with supervision	51	39	76%	12	24%
Gave me constructive feedback to improve my STEM knowledge, skills, or abilities	52	46	88%	6	12%
Gave me guidance about educational pathways that would prepare me for a STEM career	51	33	65%	18	35%
Recommended Army Educational Outreach Programs that match my interests	50	16	32%	34	68%
Discussed STEM career opportunities with DoD or other government agencies	51	19	37%	32	63%

Which category best describes the focus of your REAP experience?		
	Freq.	%
Science	31	61%
Technology	6	12%
Engineering	12	24%
Mathematics	2	4%
Total	**51**	**100%**

AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas?								
	1	2	3	4	5	n	Avg.	SD
Knowledge of a STEM topic or field in depth	1 (2%)	1 (2%)	10 (19%)	17 (33%)	23 (44%)	52	**4.15**	0.94
Knowledge of research conducted in a STEM topic or field	1 (2%)	1 (2%)	8 (15%)	18 (35%)	24 (46%)	52	**4.21**	0.91
Knowledge of research processes, ethics, and rules for conduct in STEM	2 (4%)	4 (8%)	11 (21%)	16 (31%)	19 (37%)	52	**3.88**	1.11
Knowledge of how professionals work on real problems in STEM	1 (2%)	2 (4%)	10 (19%)	17 (33%)	22 (42%)	52	**4.10**	0.98
Knowledge of what everyday research work is like in STEM	1 (2%)	2 (4%)	5 (10%)	14 (27%)	30 (58%)	52	**4.35**	0.95

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas?								
	1	2	3	4	5	n	Avg.	SD
Asking questions based on observations of real-world phenomena	1 (3%)	1 (3%)	11 (35%)	9 (29%)	9 (29%)	31	**3.77**	1.02
Asking a question (about a phenomenon) that can be answered with one or more investigations	1 (3%)	3 (10%)	8 (26%)	10 (32%)	9 (29%)	31	**3.74**	1.09
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	1 (3%)	4 (13%)	7 (23%)	10 (33%)	8 (27%)	30	**3.67**	1.12
Making a model to represent the key features and functions of an observed phenomenon	4 (13%)	5 (16%)	9 (29%)	6 (19%)	7 (23%)	31	**3.23**	1.33
Deciding what type of data to collect in order to answer a question	1 (3%)	2 (6%)	8 (26%)	14 (45%)	6 (19%)	31	**3.71**	0.97
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	1 (3%)	2 (6%)	7 (23%)	13 (42%)	8 (26%)	31	**3.81**	1.01
Identifying the limitations of data collected in an investigation	1 (3%)	3 (10%)	12 (39%)	8 (26%)	7 (23%)	31	**3.55**	1.06
Carrying out procedures for an investigation and recording data accurately	1 (3%)	2 (6%)	7 (23%)	10 (32%)	11 (35%)	31	**3.90**	1.08
Testing how changing one variable affects another variable, in order to understand relationships between variables	1 (3%)	4 (13%)	10 (32%)	7 (23%)	9 (29%)	31	**3.61**	1.15
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	6 (19%)	2 (6%)	7 (23%)	7 (23%)	9 (29%)	31	**3.35**	1.47
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	4 (13%)	3 (10%)	7 (23%)	8 (26%)	9 (29%)	31	**3.48**	1.36

Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	3 (10%)	3 (10%)	8 (26%)	8 (26%)	9 (29%)	31	**3.55**	1.29
Using mathematics or computers to analyze numeric data	4 (13%)	6 (19%)	9 (29%)	4 (13%)	8 (26%)	31	**3.19**	1.38
Supporting a proposed explanation (for a phenomenon) with data from investigations	3 (10%)	3 (10%)	8 (26%)	9 (29%)	8 (26%)	31	**3.52**	1.26
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	5 (16%)	2 (6%)	6 (19%)	9 (29%)	9 (29%)	31	**3.48**	1.41
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	2 (6%)	5 (16%)	12 (39%)	6 (19%)	6 (19%)	31	**3.29**	1.16
Using data or interpretations from other researchers or investigations to improve an explanation	3 (10%)	3 (10%)	7 (23%)	10 (32%)	8 (26%)	31	**3.55**	1.26
Asking questions to understand the data and interpretations others use to support their explanations	2 (6%)	4 (13%)	4 (13%)	11 (35%)	10 (32%)	31	**3.74**	1.24
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	3 (10%)	4 (13%)	6 (19%)	11 (35%)	7 (23%)	31	**3.48**	1.26
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	2 (6%)	3 (10%)	7 (23%)	13 (42%)	6 (19%)	31	**3.58**	1.12
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	3 (10%)	1 (3%)	5 (16%)	9 (29%)	13 (42%)	31	**3.90**	1.27
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	3 (10%)	3 (10%)	11 (35%)	8 (26%)	6 (19%)	31	**3.35**	1.20
Integrating information from multiple sources to support your explanations of phenomena	2 (6%)	3 (10%)	10 (32%)	9 (29%)	7 (23%)	31	**3.52**	1.15
Communicating information about your investigations and explanations in different formats (orally, written, graphically, mathematically)	1 (3%)	2 (6%)	10 (32%)	9 (29%)	9 (29%)	31	**3.74**	1.06

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Identifying real-world problems based on social, technological, or environmental issues	0 (0%)	3 (17%)	6 (33%)	4 (22%)	5 (28%)	18	**3.61**	1.09
Defining a problem that can be solved by developing a new or improved object, process, or system	0 (0%)	1 (6%)	7 (39%)	4 (22%)	6 (33%)	18	**3.83**	0.99

Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	1 (6%)	1 (6%)	6 (33%)	4 (22%)	6 (33%)	18	**3.72**	1.18
Making a model that represents the key features or functions of a solution to a problem	1 (6%)	3 (17%)	5 (28%)	4 (22%)	5 (28%)	18	**3.50**	1.25
Deciding what type of data to collect in order to test if a solution functions as intended	0 (0%)	2 (11%)	6 (33%)	6 (33%)	4 (22%)	18	**3.67**	0.97
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	0 (0%)	3 (17%)	5 (28%)	6 (33%)	4 (22%)	18	**3.61**	1.04
Identifying the limitations of the data collected in an investigation	3 (17%)	0 (0%)	6 (33%)	5 (28%)	4 (22%)	18	**3.39**	1.33
Carrying out procedures for an investigation and recording data accurately	1 (6%)	2 (11%)	5 (28%)	3 (17%)	7 (39%)	18	**3.72**	1.27
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	2 (11%)	0 (0%)	6 (33%)	2 (11%)	8 (44%)	18	**3.78**	1.35
Using computer-based models to investigate cause and effect relationships of a simulated solution	3 (17%)	2 (11%)	3 (17%)	5 (28%)	5 (28%)	18	**3.39**	1.46
Considering alternative interpretations of data when deciding if a solution functions as intended	0 (0%)	3 (17%)	7 (39%)	5 (28%)	3 (17%)	18	**3.44**	0.98
Displaying numeric data in charts or graphs to identify patterns and relationships	1 (6%)	1 (6%)	4 (22%)	6 (33%)	6 (33%)	18	**3.83**	1.15
Using mathematics or computers to analyze numeric data	0 (0%)	2 (11%)	2 (11%)	6 (33%)	8 (44%)	18	**4.11**	1.02
Supporting a proposed solution (for a problem) with data from investigations	1 (6%)	4 (22%)	5 (28%)	4 (22%)	4 (22%)	18	**3.33**	1.24
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	1 (6%)	3 (17%)	4 (22%)	6 (33%)	4 (22%)	18	**3.50**	1.20
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	1 (6%)	3 (17%)	3 (17%)	5 (28%)	6 (33%)	18	**3.67**	1.28
Using data or interpretations from other researchers or investigations to improve a solution	0 (0%)	4 (22%)	5 (28%)	4 (22%)	5 (28%)	18	**3.56**	1.15
Asking questions to understand the data and interpretations others use to support their solutions	1 (6%)	3 (17%)	3 (17%)	5 (28%)	6 (33%)	18	**3.67**	1.28
Using data from investigations to defend an argument that conveys how a solution meets design criteria	3 (17%)	5 (28%)	2 (11%)	6 (33%)	2 (11%)	18	**2.94**	1.35
Deciding what additional data or information may be needed to find the best solution to a problem	2 (11%)	1 (6%)	6 (33%)	6 (33%)	3 (17%)	18	**3.39**	1.20
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	1 (6%)	1 (6%)	2 (12%)	7 (41%)	6 (35%)	17	**3.94**	1.14
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	2 (11%)	5 (28%)	2 (11%)	5 (28%)	4 (22%)	18	**3.22**	1.40

Integrating information from multiple sources to support your solution to a problem	1 (6%)	2 (11%)	6 (33%)	4 (22%)	5 (28%)	18	**3.56**	1.20
Communicating information about your design processes and/or solutions in different formats (orally, written, graphically, mathematically)	1 (6%)	1 (6%)	5 (28%)	8 (44%)	3 (17%)	18	**3.61**	1.04

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas?

	1	2	3	4	5	n	Avg.	SD
Learning to work independently	1 (2%)	5 (10%)	15 (31%)	10 (20%)	18 (37%)	49	**3.80**	1.12
Setting goals and reflecting on performance	1 (2%)	3 (6%)	16 (33%)	12 (24%)	17 (35%)	49	**3.84**	1.05
Sticking with a task until it is complete	1 (2%)	3 (6%)	8 (16%)	14 (29%)	23 (47%)	49	**4.12**	1.03
Making changes when things do not go as planned	0 (0%)	1 (2%)	11 (22%)	13 (27%)	24 (49%)	49	**4.22**	0.87
Patience for the slow pace of research	1 (2%)	5 (10%)	5 (10%)	15 (31%)	23 (47%)	49	**4.10**	1.08
Working collaboratively with a team	0 (0%)	6 (12%)	16 (33%)	9 (18%)	18 (37%)	49	**3.80**	1.08
Communicating effectively with others	1 (2%)	2 (4%)	11 (22%)	18 (37%)	17 (35%)	49	**3.98**	0.97
Including others' perspectives when making decisions	2 (4%)	4 (8%)	11 (22%)	14 (29%)	18 (37%)	49	**3.86**	1.14
Sense of being part of a learning community	1 (2%)	3 (6%)	16 (33%)	7 (14%)	22 (45%)	49	**3.94**	1.11
Sense of contributing to a body of knowledge	1 (2%)	3 (6%)	12 (24%)	16 (33%)	17 (35%)	49	**3.92**	1.02
Building relationships with professionals in a field	0 (0%)	2 (4%)	9 (18%)	16 (33%)	22 (45%)	49	**4.18**	0.88
Connecting a topic or field and my personal values	2 (4%)	4 (8%)	15 (31%)	9 (18%)	19 (39%)	49	**3.80**	1.17

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF YOUR REAP EXPERIENCE, how much did you GAIN in the following areas?

	1	2	3	4	5	n	Avg.	SD
Interest in a new STEM topic or field	3 (6%)	5 (10%)	12 (24%)	11 (22%)	18 (37%)	49	**3.73**	1.24
Clarifying a STEM career path	2 (4%)	2 (4%)	12 (24%)	19 (39%)	14 (29%)	49	**3.84**	1.03
Sense of accomplishing something in STEM	0 (0%)	4 (8%)	10 (20%)	16 (33%)	19 (39%)	49	**4.02**	0.97
Building academic or professional credentials in STEM	1 (2%)	1 (2%)	11 (23%)	16 (33%)	19 (40%)	48	**4.06**	0.95
Feeling prepared for more challenging STEM activities	0 (0%)	2 (4%)	11 (22%)	15 (31%)	21 (43%)	49	**4.12**	0.90
Confidence to do well in future STEM courses	1 (2%)	0 (0%)	10 (20%)	18 (37%)	20 (41%)	49	**4.14**	0.89
Confidence to contribute to STEM	1 (2%)	3 (6%)	8 (16%)	17 (35%)	20 (41%)	49	**4.06**	1.01

Thinking creatively about a STEM project or activity	1 (2%)	4 (8%)	12 (24%)	15 (31%)	17 (35%)	49	**3.88**	1.05
Trying out new ideas or procedures on my own in a STEM project or activity	3 (6%)	4 (8%)	12 (25%)	14 (29%)	15 (31%)	48	**3.71**	1.18
Feeling responsible for a STEM project or activity	1 (2%)	3 (6%)	12 (24%)	13 (27%)	20 (41%)	49	**3.98**	1.05
Feeling like a STEM professional	3 (6%)	2 (4%)	16 (33%)	12 (24%)	16 (33%)	49	**3.73**	1.15
Feeling like part of a STEM community	2 (4%)	3 (6%)	10 (20%)	16 (33%)	18 (37%)	49	**3.92**	1.10

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF YOUR REAP experience, how much MORE or LESS likely are you to engage in the following activities in science, technology, engineering, or mathematics (STEM) outside of school requirements or activities?

	1	2	3	4	5	n	Avg.	SD
Visit a science museum or zoo	1 (2%)	2 (4%)	29 (58%)	12 (24%)	6 (12%)	50	**3.40**	0.83
Watch or read non-fiction STEM	0 (0%)	1 (2%)	26 (52%)	16 (32%)	7 (14%)	50	**3.58**	0.76
Look up STEM information at a library or on the internet	0 (0%)	0 (0%)	16 (32%)	20 (40%)	14 (28%)	50	**3.96**	0.78
Tinker with a mechanical or electrical device	0 (0%)	0 (0%)	15 (30%)	20 (40%)	15 (30%)	50	**4.00**	0.78
Work on solving mathematical or scientific puzzles	0 (0%)	0 (0%)	14 (28%)	23 (46%)	13 (26%)	50	**3.98**	0.74
Design a computer program or website	0 (0%)	5 (10%)	26 (52%)	11 (22%)	8 (16%)	50	**3.44**	0.88
Observe things in nature (plant growth, animal behavior, stars or planets, etc.)	0 (0%)	2 (4%)	25 (50%)	13 (26%)	10 (20%)	50	**3.62**	0.85
Talk with friends or family about STEM	0 (0%)	1 (2%)	15 (30%)	20 (40%)	14 (28%)	50	**3.94**	0.82
Mentor or teach other students about STEM	2 (4%)	1 (2%)	14 (29%)	21 (43%)	11 (22%)	49	**3.78**	0.96
Help with a community service project that relates to STEM	0 (0%)	0 (0%)	15 (30%)	23 (46%)	12 (24%)	50	**3.94**	0.74
Participate in a STEM club, student association, or professional organization	0 (0%)	0 (0%)	12 (24%)	21 (42%)	17 (34%)	50	**4.10**	0.76
Participate in STEM camp, fair, or competition	0 (0%)	0 (0%)	17 (34%)	18 (36%)	15 (30%)	50	**3.96**	0.81
Take an elective (not required) STEM class	0 (0%)	0 (0%)	17 (34%)	17 (34%)	16 (32%)	50	**3.98**	0.82
Work on a STEM project or experiment in a university or professional setting	0 (0%)	0 (0%)	11 (22%)	16 (32%)	23 (46%)	50	**4.24**	0.80
Receive an award or special recognition for STEM accomplishments	1 (2%)	0 (0%)	15 (31%)	17 (35%)	16 (33%)	49	**3.96**	0.91

Note. Response scale: 1 = "Much less likely," 2 = "Less likely," 3 = "About the same before and after," 4 = "More likely," 5 = "Much more likely".

How far did you want to go in school BEFORE participating in REAP?

	Freq.	%
Graduate from high school	6	12%
Go to a trade or vocational school	0	0%
Go to college for a little while	0	0%
Finish college (get a Bachelor's degree)	6	12%
Get more education after college	2	4%
Get a master's degree	14	28%
Get a Ph.D.	8	16%
Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)	5	10%
Get a combined M.D. / Ph.D.	8	16%
Get another professional degree (law, business, etc.)	1	2%
Total	**50**	**100%**

How far did you want to go in school AFTER participating in REAP?

	Freq.	%
Graduate from high school	0	0%
Go to a trade or vocational school	0	0%
Go to college for a little while	1	2%
Finish college (get a Bachelor's degree)	1	2%
Get more education after college	4	8%
Get a master's degree	13	26%
Get a Ph.D.	14	28%
Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)	6	12%
Get a combined M.D. / Ph.D.	9	18%
Get another professional degree (law, business, etc.)	2	4%
Total	**50**	**100%**

BEFORE REAP, what kind of work did you expect to be doing when you are 30 years old (select the ONE answer that best describes your career goals BEFORE REAP)

	Freq.	%			Freq.	%
Undecided	1	2%		Teaching, non-STEM	0	0%
Science (no specific subject)	2	4%		Medicine (doctor, dentist, veterinarian, etc.)	15	30%

Physical science (physics, chemistry, astronomy, materials science, etc.)	1	2%		Health (nursing, pharmacy, technician, etc.)	2	4%
Biological science	5	10%		Social science (psychologist, sociologist, etc.)	0	0%
Earth, atmospheric or oceanic science	0	0%		Business	1	2%
Agricultural science	0	0%		Law	0	0%
Environmental science	2	4%		English/language arts	0	0%
Computer science	2	4%		Farming	0	0%
Technology	1	2%		Military, police, or security	1	2%
Engineering	15	30%		Art (writing, dancing, painting, etc.)	1	2%
Mathematics or statistics	0	0%		Skilled trade (carpenter, electrician, plumber, etc.)	0	0%
Teaching, STEM	0	0%		Other, (specify):	1	2%
				Total	50	100%

Note. Other = "Pro Athlete".

AFTER REAP, what kind of work do you expect to be doing when you are 30 years old? (select the ONE answer that best describes your career goals AFTER REAP)						
	Freq.	%			Freq.	%
Undecided	1	2%		Teaching, non-STEM	0	0%
Science (no specific subject)	1	2%		Medicine (doctor, dentist, veterinarian, etc.)	14	28%
Physical science (physics, chemistry, astronomy, materials science, etc.)	2	4%		Health (nursing, pharmacy, technician, etc.)	1	2%
Biological science	6	12%		Social science (psychologist, sociologist, etc.)	0	0%
Earth, atmospheric or oceanic science	0	0%		Business	0	0%
Agricultural science	0	0%		Law	0	0%
Environmental science	3	6%		English/language arts	0	0%
Computer science	2	4%		Farming	0	0%
Technology	2	4%		Military, police, or security	0	0%
Engineering	18	36%		Art (writing, dancing, painting, etc.)	0	0%
Mathematics or statistics	0	0%		Skilled trade (carpenter, electrician, plumber, etc.)	0	0%
Teaching, STEM	0	0%		Other, (specify):	0	0%
				Total	50	100%

When you are 30, to what extent do you expect to use your STEM knowledge, skills, and/or abilities in your work?		
	Freq.	**%**
not at all	0	0%
less than 25% of the time	0	0%
26% to 50% of the time	5	10%
51% to 75% of the time	7	15%
76% to 100% of the time	36	75%
Total	**48**	**100%**

How many times have you participated in any of the following Army Educational Outreach Programs? If you have not heard of an AEOP, select "Never heard of it." If you have heard of an AEOP but never participated, select "Never."								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
Camp Invention	36 (72%)	12 (24%)	1 (2%)	0 (0%)	1 (2%)	50	**1.29**	0.83
eCYBERMISSION	34 (68%)	15 (30%)	0 (0%)	0 (0%)	1 (2%)	50	**1.19**	0.75
Junior Solar Sprint (JSS)	34 (69%)	14 (29%)	0 (0%)	0 (0%)	1 (2%)	49	**1.20**	0.77
West Point Bridge Design Contest (WPBDC)	29 (60%)	16 (33%)	2 (4%)	0 (0%)	1 (2%)	48	**1.26**	0.73
Junior Science & Humanities Symposium (JSHS)	29 (58%)	17 (34%)	2 (4%)	0 (0%)	2 (4%)	50	**1.38**	0.92
Gains in the Education of Mathematics and Science (GEMS)	27 (54%)	21 (42%)	1 (2%)	0 (0%)	1 (2%)	50	**1.17**	0.65
GEMS Near Peers	32 (64%)	17 (34%)	0 (0%)	0 (0%)	1 (2%)	50	**1.17**	0.71
UNITE	22 (45%)	18 (37%)	6 (12%)	1 (2%)	2 (4%)	49	**1.52**	0.89
Science & Engineering Apprenticeship Program (SEAP)	21 (43%)	26 (53%)	1 (2%)	0 (0%)	1 (2%)	49	**1.14**	0.59
Research & Engineering Apprenticeship Program (REAP)	4 (8%)	6 (12%)	34 (68%)	3 (6%)	3 (6%)	50	**2.07**	0.68
High School Apprenticeship Program (HSAP)	27 (54%)	20 (40%)	2 (4%)	0 (0%)	1 (2%)	50	**1.22**	0.67
College Qualified Leaders (CQL)	31 (62%)	16 (32%)	2 (4%)	0 (0%)	1 (2%)	50	**1.26**	0.73
Undergraduate Research Apprenticeship Program (URAP)	31 (62%)	18 (36%)	0 (0%)	0 (0%)	1 (2%)	50	**1.16**	0.69
Science Mathematics, and Research for Transformation (SMART) College Scholarship	30 (60%)	18 (36%)	0 (0%)	0 (0%)	2 (4%)	50	**1.30**	0.92
National Defense Science & Engineering Graduate (NDSEG) Fellowship	34 (68%)	15 (30%)	0 (0%)	0 (0%)	1 (2%)	50	**1.19**	0.75

Note. Response scale: 0 = “Never heard of it,” 1 = “Never,” 2 = “Once,” 3= “Twice,” 4 = “Three or more times”.

How interested are you in participating in the following programs in the future?							
	1	2	3	4	n	Avg.	SD
Camp Invention	23 (47%)	11 (22%)	8 (16%)	7 (14%)	49	**1.98**	1.11
eCYBERMISSION	26 (53%)	10 (20%)	9 (18%)	4 (8%)	49	**1.82**	1.01
Junior Solar Sprint (JSS)	28 (57%)	9 (18%)	7 (14%)	5 (10%)	49	**1.78**	1.05
West Point Bridge Design Contest (WPBDC)	28 (57%)	9 (18%)	9 (18%)	3 (6%)	49	**1.73**	0.97
Junior Science & Humanities Symposium (JSHS)	21 (42%)	9 (18%)	9 (18%)	11 (22%)	50	**2.20**	1.21
Gains in the Education of Mathematics and Science (GEMS)	19 (38%)	8 (16%)	14 (28%)	9 (18%)	50	**2.26**	1.16
GEMS Near Peers	24 (48%)	6 (12%)	14 (28%)	6 (12%)	50	**2.04**	1.12
UNITE	20 (40%)	11 (22%)	10 (20%)	9 (18%)	50	**2.16**	1.15
Science & Engineering Apprenticeship Program (SEAP)	9 (18%)	7 (14%)	13 (26%)	21 (42%)	50	**2.92**	1.14
Research & Engineering Apprenticeship Program (REAP)	7 (14%)	6 (12%)	10 (20%)	26 (53%)	49	**3.12**	1.11
High School Apprenticeship Program (HSAP)	17 (34%)	6 (12%)	9 (18%)	18 (36%)	50	**2.56**	1.30
College Qualified Leaders (CQL)	18 (36%)	5 (10%)	12 (24%)	15 (30%)	50	**2.48**	1.27
Undergraduate Research Apprenticeship Program (URAP)	10 (20%)	4 (8%)	9 (18%)	26 (53%)	49	**3.04**	1.21
Science Mathematics, and Research for Transformation (SMART) College Scholarship	10 (20%)	4 (8%)	9 (18%)	27 (54%)	50	**3.06**	1.20
National Defense Science & Engineering Graduate (NDSEG) Fellowship	15 (30%)	7 (14%)	12 (24%)	16 (32%)	50	**2.58**	1.23

Note. Response scale: 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

How many jobs/careers in science, technology, engineering, or math (STEM) did you learn about during REAP?		
	Freq.	%
None	5	10%
1	4	8%
2	7	14%
3	13	26%
4	4	8%
5 or more	17	34%
Total	**50**	**100%**

How many Department of Defense (DoD) STEM jobs/careers did you learn about during REAP?		
	Freq.	**%**
None	32	64%
1	5	10%
2	1	2%
3	2	4%
4	2	4%
5 or more	8	16%
Total	**50**	**100%**

Rate how much you agree or disagree with each of the following statements about Department of Defense (DoD) researchers and research:								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
DoD researchers advance science and engineering fields	1 (2%)	1 (2%)	15 (30%)	19 (38%)	14 (28%)	50	**3.88**	0.92
DoD researchers develop new, cutting edge technologies	1 (2%)	2 (4%)	12 (24%)	23 (46%)	12 (24%)	50	**3.86**	0.90
DoD researchers support non-defense related advancements in science and technology	1 (2%)	1 (2%)	21 (42%)	16 (32%)	11 (22%)	50	**3.70**	0.91
DoD researchers solve real-world problems	1 (2%)	1 (2%)	15 (30%)	19 (38%)	14 (28%)	50	**3.88**	0.92
DoD research is valuable to society	1 (2%)	1 (2%)	19 (38%)	16 (32%)	13 (26%)	50	**3.78**	0.93

Note. Response scale: 1 = "Strongly Disagree," 2 = "Disagree," 3 = "Neither Agree nor Disagree," 4 = "Agree," 5 = "Strongly Agree".

Which of the following statements describe you after participating in REAP?							
	1	**2**	**3**	**4**	**n**	**Avg.**	**SD**
I am more confident in my STEM knowledge, skills, and abilities	1 (2%)	5 (10%)	26 (54%)	16 (33%)	48	**3.19**	0.70
I am more interested in participating in STEM activities outside of school requirements	2 (4%)	9 (18%)	26 (53%)	12 (24%)	49	**2.98**	0.78
I am more aware of other AEOPs	9 (18%)	2 (4%)	21 (43%)	17 (35%)	49	**2.94**	1.07
I am more interested in participating in other AEOPs	10 (20%)	6 (12%)	14 (29%)	19 (39%)	49	**2.86**	1.15
I am more interested in taking STEM classes in school	3 (6%)	17 (35%)	20 (41%)	9 (18%)	49	**2.71**	0.84
I am more interested in attending college	2 (4%)	27 (55%)	11 (22%)	9 (18%)	49	**2.55**	0.84
I am more interested in earning a STEM degree in college	2 (4%)	20 (41%)	19 (39%)	8 (16%)	49	**2.67**	0.80
I am more interested in pursuing a STEM career	2 (4%)	15 (31%)	24 (49%)	8 (16%)	49	**2.78**	0.77

I am more aware of DoD STEM research and careers	15 (31%)	3 (6%)	21 (43%)	10 (20%)	49	**2.53**	1.14
I have a greater appreciation of DoD STEM research and careers	14 (29%)	4 (8%)	16 (33%)	15 (31%)	49	**2.65**	1.20
I am more interested in pursuing a STEM career with the DoD	21 (43%)	4 (8%)	14 (29%)	10 (20%)	49	**2.27**	1.22

Note. Response scale: **1** = "Disagree – This did not happen," **2** = "Disagree – This happened but not because of REAP," **3** = "Agree – REAP contributed," **4** = "Agree – REAP was the primary reason".

Appendix C

FY14 REAP Mentor Questionnaire and Data Summaries

2014 Research and Engineering Apprenticeship Program (REAP): REAP Mentor Survey

Virginia Tech is conducting an evaluation study on behalf of the Academy of Applied Science and the U.S. Army to determine how well JSHS is achieving its goals of promoting student interest and engagement in science, technology, engineering, and mathematics (STEM). As part of this study Virginia Tech is surveying adults who participate in JSHS in the capacity of STEM mentors (e.g., instructors, research mentors, or competition advisors). The questionnaire will collect information about you, your experiences in school, and your experiences in JSHS. The results of this survey will be used to help us improve JSHS and to report to the organizations that support JSHS.

About this survey:

- This research protocol has been approved for use with human subjects by the Virginia Tech IRB office.
- Although this questionnaire is not anonymous, it is CONFIDENTIAL. Prior to analysis and reporting responses will be de-identified and no one will be able to connect your responses to you or your apprentice's name.
- Only AEOP evaluation personnel will have access to completed questionnaires and personal information will be stored securely.
- Responding to this survey is VOLUNTARY. You are not required to participate, although we hope you do because your responses will provide valuable information for meaningful and continuous improvement.
- If you provide your email address, the AEOP may contact you in the future to ask about you or your students.

If you have any additional questions or concerns, please contact one of the following people:

Tanner Bateman, Virginia Tech
Senior Project Associate, AEOPCA
(540) 231-4540, tbateman@vt.edu

Rebecca Kruse, Virginia Tech
Evaluation Director, AEOPCA
(540) 315-5807, rkruse75@vt.edu

Q1 Do you agree to participate in this survey? (required)

❍ Yes, I agree to participate in this survey
❍ No, I do not wish to participate in this survey

If No, I do not wish to partic... Is Selected, Then Skip To End of Survey

Q2 Please provide your personal information below: (required)

First Name _____
Last Name _____

Q3 Please provide your email address: (optional)

Email _____

Q4 What is your gender?

- ❍ Male
- ❍ Female
- ❍ Choose not to report

Q5 What is your race or ethnicity?

- ❍ Hispanic or Latino
- ❍ Asian
- ❍ Black or African American
- ❍ Native American or Alaska Native
- ❍ Native Hawaiian or Other Pacific Islander
- ❍ White
- ❍ Other race or ethnicity, (specify): _____
- ❍ Choose not to report

Q6 Which of the following BEST describes your current occupation (select ONE)

- ❍ Teacher
- ❍ Other school staff
- ❍ University educator
- ❍ Scientist, Engineer, or Mathematician in training (undergraduate or graduate student, etc.)
- ❍ Scientist, Engineer, or Mathematics professional
- ❍ Other, (specify): _____

Q7 Which of the following BEST describes your organization? (select ONE)

- ❍ No organization
- ❍ School or district (K-12)
- ❍ State educational agency
- ❍ Institution of higher education (vocational school, junior college, college, or university)
- ❍ Industry
- ❍ Department of Defense or other government agency
- ❍ Non-profit
- ❍ Other, (specify): _____

Q8 Which of the following best describes your primary area of research?

- ❍ Physical science (physics, chemistry, astronomy, materials science)
- ❍ Biological science
- ❍ Earth, atmospheric, or oceanic science
- ❍ Agricultural science
- ❍ Environmental science
- ❍ Computer science
- ❍ Technology

- ❍ Engineering
- ❍ Mathematics or statistics
- ❍ Medical, health, or behavioral science
- ❍ Social science (psychology, sociology, anthropology, etc.)
- ❍ Other, (specify) _____

Q9 Where was the REAP program located?

- ❍ Alabama State University
- ❍ Arizona State University
- ❍ Ball State University
- ❍ Clark Atlanta University
- ❍ Colorado State University
- ❍ Delaware State University
- ❍ Georgia State University
- ❍ Jackson State University
- ❍ LeMoyne
- ❍ Loyola University-Chicago
- ❍ Michigan Technological University
- ❍ Montana State University
- ❍ New Jersey Technical Institute
- ❍ New Mexico State
- ❍ North Carolina A&T State University
- ❍ North Carolina Central University
- ❍ Oakland University
- ❍ South Dakota School of Mines & Technology
- ❍ Texas Southern
- ❍ Texas Tech University
- ❍ University of Alabama-Huntsville
- ❍ University of Arkansas at Pine Bluff
- ❍ University of California-Berkeley
- ❍ University of Central Florida
- ❍ University of Colorado-Boulder
- ❍ University of Houston
- ❍ University of Iowa
- ❍ University of Maryland-Baltimore
- ❍ University of Massachusetts-Lowell
- ❍ University of Missouri
- ❍ University of New Hampshire
- ❍ University of Puerto Rico
- ❍ University of Puerto Rico-Hu Macao
- ❍ University of South Florida
- ❍ University of Texas-El Paso
- ❍ University of Utah
- ❍ University of Washington
- ❍ Xavier University of Louisiana
- ❍ Other, (specify): _____

Q10 Which of the following BEST describes your role during REAP?

- ❍ Research Mentor
- ❍ Research Team Member but not a Principal Investigator (PI)
- ❍ Other, (specify) _____

Q11 How many REAP students did you work with this year?

Q12 How did you learn about REAP? (Check all that apply)

- ❑ Academy of Applied Science website
- ❑ Army Educational Outreach Program (AEOP) website
- ❑ Facebook, Twitter, Pinterest, or other social media
- ❑ State or national educator conference
- ❑ STEM conference
- ❑ School, university, or professional organization newsletter, email or website
- ❑ A news story or other media coverage
- ❑ Past REAP participant
- ❑ A student
- ❑ A colleague
- ❑ A supervisor or superior
- ❑ REAP event or site host/director
- ❑ Workplace communications
- ❑ Someone who works at an Army laboratory
- ❑ Someone who works with the Department of Defense
- ❑ Other, (specify): _____

Q13 How many times have YOU PARTICIPATED in any of the following Army Educational Outreach Programs (AEOPs) in any capacity? If you have heard of an AEOP but never participated select "Never." If you have not heard of an AEOP select "Never heard of it."

	Never	Once	Twice	Three or more times	Never heard of it
Camp Invention	❍	❍	❍	❍	❍
eCYBERMISSION	❍	❍	❍	❍	❍
Junior Solar Sprint (JSS)	❍	❍	❍	❍	❍
West Point Bridge Design Contest (WPBDC)	❍	❍	❍	❍	❍
Junior Science & Humanities Symposium (JSHS)	❍	❍	❍	❍	❍
Gains in the Education of Mathematics and Science (GEMS)	❍	❍	❍	❍	❍

GEMS Near Peers	❍	❍	❍	❍	❍
UNITE	❍	❍	❍	❍	❍
Science & Engineering Apprenticeship Program (SEAP)	❍	❍	❍	❍	❍
Research & Engineering Apprenticeship Program (REAP)	❍	❍	❍	❍	❍
High School Apprenticeship Program (HSAP)	❍	❍	❍	❍	❍
College Qualified Leaders (CQL)	❍	❍	❍	❍	❍
Undergraduate Research Apprenticeship Program (URAP)	❍	❍	❍	❍	❍
Science Mathematics, and Research for Transformation (SMART) College Scholarship	❍	❍	❍	❍	❍
National Defense Science & Engineering Graduate (NDSEG) Fellowship	❍	❍	❍	❍	❍

Q14 Which of the following were used for the purpose of recruiting your student(s) for apprenticeships? (select ALL that apply)

- ❑ Applications from Academy of Applied Science or the AEOP
- ❑ Personal acquaintance(s) (friend, family, neighbor, etc.)
- ❑ Colleague(s) in my workplace
- ❑ K-12 school teacher(s) outside of my workplace
- ❑ University faculty outside of my workplace
- ❑ Informational materials sent to K-12 schools or Universities outside of my workplace
- ❑ Communication(s) generated by a K-12 school or teacher (newsletter, email blast, website)
- ❑ Communication(s) generated by a university or faculty (newsletter, email blast, website)
- ❑ Career fair(s)
- ❑ Education conference(s) or event(s)
- ❑ STEM conference(s) or event(s)
- ❑ Organization(s) serving underserved or underrepresented populations
- ❑ Student contacted mentor
- ❑ I do not know how student(s) was recruited for apprenticeship
- ❑ Other, Specify: _____

Q15 How SATISFIED were you with each of the following REAP features?

	Did not experience	Not at all	A little	Somewhat	Very much
Application or registration process	❍	❍	❍	❍	❍
Other administrative tasks	❍	❍	❍	❍	❍
Communications from Academy of Applied Science	❍	❍	❍	❍	❍

Communications from [REAP site]	❍	❍	❍	❍	❍
Support for instruction or mentorship during program activities	❍	❍	❍	❍	❍
Participation stipends (payment)	❍	❍	❍	❍	❍
Research abstract preparation requirements	❍	❍	❍	❍	❍

Q16 The list below describes instructional and mentoring strategies that are effective ways to establish the relevance of learning activities for students. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

	Yes - I used this strategy	No - I did not use this strategy
Finding out about students' backgrounds and interests at the beginning of the program	❍	❍
Giving students real-life problems to investigate or solve	❍	❍
Asking students to relate outside events or activities to topics covered in the program	❍	❍
Selecting readings or activities that relate to students' backgrounds	❍	❍
Encouraging students to suggest new readings, activities, or projects	❍	❍
Making explicit provisions for students who wish to carry out independent studies	❍	❍
Helping students become aware of the roles STEM plays in their everyday lives	❍	❍
Helping students understand how STEM can help them improve their communities	❍	❍
Other, (specify):	❍	❍

Q17 The list below describes instructional and mentoring strategies that are effective ways to support the diverse needs of students as learners. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

	Yes - I used this strategy	No - I did not use this strategy
Finding out about students' learning styles at the beginning of the program	❍	❍
Interacting with all students in the same way regardless of their gender or race and ethnicity	❍	❍
Using gender neutral language	❍	❍
Using diverse teaching/mentoring activities to address a broad spectrum of students	❍	❍

Integrating ideas from the literature on pedagogical activities for women and underrepresented students	❍	❍
Providing extra readings, activities, or other support for students who lack essential background knowledge or skills	❍	❍
Directing students to other individuals or programs if I can only provide limited support	❍	❍
Other, (specify):	❍	❍

Q18 The list below describes instructional and mentoring strategies that are effective ways to support students development of collaboration and interpersonal skills. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

	Yes - I used this strategy	No - I did not use this strategy
Having students tell others about their backgrounds and interests	❍	❍
Having students explain difficult ideas to others	❍	❍
Having students exchange ideas with others whose backgrounds or viewpoints are different from their own	❍	❍
Having students participate in giving and receiving feedback	❍	❍
Having students work on collaborative activities or projects as a member of a team	❍	❍
Having students listen to the ideas of others with an open mind	❍	❍
Having students pay attention to the feelings of all team members	❍	❍
Having students develop ways to resolve conflict and reach agreement among the team	❍	❍
Other, (specify):	❍	❍

Q19 The list below describes instructional and mentoring strategies that are effective ways to support students' engagement in "authentic" STEM activities. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

	Yes - I used this strategy	No - I did not use this strategy
Teaching (or assigning readings) about specific STEM subject matter	❍	❍
Having students access and critically review technical texts or media to support their work	❍	❍
Demonstrating the use of laboratory or field techniques, procedures, and tools students are expected to use	❍	❍
Helping students practice STEM skills with supervision	❍	❍

Giving constructive feedback to improve students' STEM competencies	❍	❍
Allowing students to work independently as appropriate for their self-management abilities and STEM competencies	❍	❍
Encouraging students to seek support from other team members	❍	❍
Encouraging opportunities in which students could learn from others (team projects, team meetings, journal clubs)	❍	❍
Other, (specify):	❍	❍

Q20 The list below describes instructional and mentoring strategies that are effective ways to support students' STEM educational and career pathways. The list also includes items that reflect AEOP and Army priorities. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

	Yes - I used this strategy	No - I did not use this strategy
Asking about students' educational and career interests	❍	❍
Recommending extracurricular programs that align with students' educational goals	❍	❍
Recommending Army Educational Outreach Programs that align with students' educational goals	❍	❍
Providing guidance about educational pathways that would prepare students for a STEM career	❍	❍
Sharing personal experiences, attitudes, and values pertaining to STEM	❍	❍
Discussing STEM career opportunities with the DoD or other government agencies	❍	❍
Discussing STEM career opportunities outside of the DoD or other government agencies (private industry, academia)	❍	❍
Discussing non-technical aspects of a STEM career (economic, political, ethical, and/or social issues)	❍	❍
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	❍	❍
Recommending student and professional organizations in STEM	❍	❍
Helping students build effective STEM networks	❍	❍
Critically reviewing students' résumé, application, or interview preparations	❍	❍
Other, (specify):	❍	❍

Q21 How USEFUL were each of the following in your efforts to expose student(s) to Army Educational Outreach Programs (AEOPs) during REAP?

	Did not experience	Not at all	A little	Somewhat	Very much
Academy of Applied Science website	❍	❍	❍	❍	❍
Army Educational Outreach Program (AEOP) website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab coats, etc.)	❍	❍	❍	❍	❍
Program manager or site coordinators	❍	❍	❍	❍	❍
Invited speakers or "career" events	❍	❍	❍	❍	❍
Participation in REAP	❍	❍	❍	❍	❍

Q22 Which of the following AEOPs did YOU EXPLICITLY DISCUSS with your student(s) during REAP? (check ALL that apply)

	Yes - I discussed this program with my student(s)	No - I did not discuss this program with my student(s)
Camp Invention	❍	❍
eCYBERMISSION	❍	❍
Junior Solar Sprint (JSS)	❍	❍
West Point Bridge Design Contest (WPBDC)	❍	❍
Junior Science & Humanities Symposium (JSHS)	❍	❍
Gains in the Education of Mathematics and Science (GEMS)	❍	❍
GEMS Near Peers	❍	❍
UNITE	❍	❍
Science & Engineering Apprenticeship Program (SEAP)	❍	❍
Research & Engineering Apprenticeship Program (REAP)	❍	❍
High School Apprenticeship Program (HSAP)	❍	❍
College Qualified Leaders (CQL)	❍	❍
Undergraduate Research Apprenticeship Program (URAP)	❍	❍
Science Mathematics, and Research for Transformation (SMART) College Scholarship	❍	❍
National Defense Science & Engineering Graduate (NDSEG) Fellowship	❍	❍

I discussed AEOP with my student(s) but did not discuss any specific program	❍	❍

Q23 How USEFUL were each of the following in your efforts to expose your student(s) to Department of Defense (DoD) STEM careers during REAP?

	Did not experience	Not at all	A little	Somewhat	Very much
Academy of Applied Science website	❍	❍	❍	❍	❍
Army Educational Outreach Program (AEOP) website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure and/or presentation	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab coats, etc.)	❍	❍	❍	❍	❍
Program administrator or site coordinator	❍	❍	❍	❍	❍
Invited speakers or "career" events	❍	❍	❍	❍	❍
Participation in REAP	❍	❍	❍	❍	❍

Q24 Rate how much you agree or disagree with each of the following statements about Department of Defense (DoD) researchers and research:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
DoD researchers advance science and engineering fields	❍	❍	❍	❍	❍
DoD researchers develop new, cutting edge technologies	❍	❍	❍	❍	❍
DoD researchers support non-defense related advancements in science and technology	❍	❍	❍	❍	❍
DoD researchers solve real-world problems	❍	❍	❍	❍	❍
DoD research is valuable to society	❍	❍	❍	❍	❍

Q25 How often did YOUR STUDENT(S) have opportunities do each of the following in REAP?

	Not at all	At least once	A few times	Most days	Every day
Learn new science, technology, engineering, or mathematics (STEM) topics	❍	❍	❍	❍	❍
Apply STEM knowledge to real life situations	❍	❍	❍	❍	❍
Learn about cutting-edge STEM research	❍	❍	❍	❍	❍
Learn about different STEM careers	❍	❍	❍	❍	❍

Interact with STEM professionals	❍	❍	❍	❍	❍
Practice using laboratory or field techniques, procedures, and tools	❍	❍	❍	❍	❍
Participate in hands-on STEM activities	❍	❍	❍	❍	❍
Work as part of a team	❍	❍	❍	❍	❍
Communicate with other students about STEM	❍	❍	❍	❍	❍
Draw conclusions from an investigation	❍	❍	❍	❍	❍
Build (or simulate) something	❍	❍	❍	❍	❍
Pose questions or problems to investigate	❍	❍	❍	❍	❍
Design an investigation	❍	❍	❍	❍	❍
Carry out an investigation	❍	❍	❍	❍	❍
Analyze and interpret data or information	❍	❍	❍	❍	❍
Come up with creative explanations or solutions	❍	❍	❍	❍	❍

Q26 Which category best describes the focus of your student(s)' REAP experience?

- ❍ Science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics

Q27 AS A RESULT OF THE REAP EXPERIENCE, how much did your student(s) GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Knowledge of a STEM topic or field in depth	❍	❍	❍	❍	❍
Knowledge of research conducted in a STEM topic or field	❍	❍	❍	❍	❍
Knowledge of research processes, ethics, and rules for conduct in STEM	❍	❍	❍	❍	❍
Knowledge of how professionals work on real problems in STEM	❍	❍	❍	❍	❍
Knowledge of what everyday research work is like in STEM	❍	❍	❍	❍	❍

Q28 AS A RESULT OF THE REAP EXPERIENCE, how much did your student(s) GAIN in the following areas? **Only presented to respondents who selected "science" in Q26**

	No gain	A little gain	Some gain	Large gain	Extreme gain
Asking questions based on observations of real-world phenomena	❍	❍	❍	❍	❍

Asking a question (about a phenomenon) that can be answered with one or more investigations	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	❍	❍	❍	❍	❍
Making a model to represent the key features and functions of an observed phenomenon	❍	❍	❍	❍	❍
Deciding what type of data to collect in order to answer a question	❍	❍	❍	❍	❍
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	❍	❍	❍	❍	❍
Identifying the limitations of data collected in an investigation	❍	❍	❍	❍	❍
Carrying out procedures for an investigation and recording data accurately	❍	❍	❍	❍	❍
Testing how changing one variable affects another variable, in order to understand relationships between variables	❍	❍	❍	❍	❍
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	❍	❍	❍	❍	❍
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	❍	❍	❍	❍	❍
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics or computers to analyze numeric data	❍	❍	❍	❍	❍
Supporting a proposed explanation (for a phenomenon) with data from investigations	❍	❍	❍	❍	❍
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	❍	❍	❍	❍	❍
Using data or interpretations from other researchers or investigations to improve an explanation	❍	❍	❍	❍	❍
Asking questions to understand the data and interpretations others use to support their explanations	❍	❍	❍	❍	❍
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	❍	❍	❍	❍	❍
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	❍	❍	❍	❍	❍
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	❍	❍	❍	❍	❍
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	❍	❍	❍	❍	❍
Integrating information from multiple sources to support your explanations of phenomena	❍	❍	❍	❍	❍

Communicating information about your investigations and explanations in different formats (orally, written, graphically, mathematically, etc.)	❍	❍	❍	❍	❍

Q29 AS A RESULT OF THE REAP EXPERIENCE, how much did your student(s) GAIN in the following areas? **Only presented to respondents who selected "science" in Q26**

	No gain	A little gain	Some gain	Large gain	Extreme gain
Identifying real-world problems based on social, technological, or environmental issues	❍	❍	❍	❍	❍
Defining a problem that can be solved by developing a new or improved object, process, or system	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	❍	❍	❍	❍	❍
Making a model that represents the key features or functions of a solution to a problem	❍	❍	❍	❍	❍
Deciding what type of data to collect in order to test if a solution functions as intended	❍	❍	❍	❍	❍
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	❍	❍	❍	❍	❍
Identifying the limitations of the data collected in an investigation	❍	❍	❍	❍	❍
Carrying out procedures for an investigation and recording data accurately	❍	❍	❍	❍	❍
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	❍	❍	❍	❍	❍
Using computer-based models to investigate cause and effect relationships of a simulated solution	❍	❍	❍	❍	❍
Considering alternative interpretations of data when deciding if a solution functions as intended	❍	❍	❍	❍	❍
Displaying numeric data in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics or computers to analyze numeric data	❍	❍	❍	❍	❍
Supporting a proposed solution (for a problem) with data from investigations	❍	❍	❍	❍	❍
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	❍	❍	❍	❍	❍
Using data or interpretations from other researchers or investigations to improve a solution	❍	❍	❍	❍	❍
Asking questions to understand the data and interpretations others use to support their solutions	❍	❍	❍	❍	❍
Using data from investigations to defend an argument that conveys how a solution meets design criteria	❍	❍	❍	❍	❍

Deciding what additional data or information may be needed to find the best solution to a problem	❍	❍	❍	❍	❍
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	❍	❍	❍	❍	❍
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	❍	❍	❍	❍	❍
Integrating information from multiple sources to support your solution to a problem	❍	❍	❍	❍	❍
Communicating information about your design processes and/or solutions in different formats (orally, written, graphically, mathematically, etc.)	❍	❍	❍	❍	❍

Q30 AS A RESULT OF THE REAP EXPERIENCE, how much did your student(s) GAIN (on average) in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Learning to work independently	❍	❍	❍	❍	❍
Setting goals and reflecting on performance	❍	❍	❍	❍	❍
Sticking with a task until it is completed	❍	❍	❍	❍	❍
Making changes when things do not go as planned	❍	❍	❍	❍	❍
Patience for the slow pace of research	❍	❍	❍	❍	❍
Working collaboratively with a team	❍	❍	❍	❍	❍
Communicating effectively with others	❍	❍	❍	❍	❍
Including others' perspectives when making decisions	❍	❍	❍	❍	❍
Sense of being part of a learning community	❍	❍	❍	❍	❍
Sense of contributing to a body of knowledge	❍	❍	❍	❍	❍
Building relationships with professionals in a field	❍	❍	❍	❍	❍
Connecting a topic or field and their personal values	❍	❍	❍	❍	❍

Q31 Which of the following statements describe YOUR STUDENT(S) after participating in the REAP program?

	Disagree - This did not happen	Disagree - This happened but not because of REAP	Agree - REAP contributed	Agree - REAP was primary reason
More confident in STEM knowledge, skills, and abilities	❍	❍	❍	❍
More interested in participating in STEM activities outside of school requirements	❍	❍	❍	❍
More aware of other AEOPs	❍	❍	❍	❍
More interested in participating in other AEOPs	❍	❍	❍	❍

More interested in taking STEM classes in school	❍	❍	❍	❍
More interested in attending college	❍	❍	❍	❍
More interested in earning a STEM degree in college	❍	❍	❍	❍
More interested in pursuing a STEM career	❍	❍	❍	❍
More aware of Department of Defense (DoD) STEM research and careers	❍	❍	❍	❍
Greater appreciation of DoD STEM research and careers	❍	❍	❍	❍
More interested in pursuing a STEM career with the DoD	❍	❍	❍	❍

Q32 What are the three most important strengths of REAP?

Strength #1

Strength #2

Strength #3

Q33 What are the three ways REAP should be improved for future participants?

Improvement #1

Improvement #2

Improvement #3

Q34 Tell us about your overall satisfaction with your REAP experience.

REAP Research and Engineering Apprenticeship Program

ARMY EDUCATIONAL OUTREACH PROGRAM

REAP Mentor Data Summary

What is your gender?		
	Freq.	**%**
Male	25	64%
Female	14	36%
Choose not to report	0	0%
Total	**39**	**100%**

What is your race or ethnicity?		
	Freq.	**%**
Hispanic or Latino	1	3%
Asian	10	26%
Black or African American	9	23%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	19	49%
Other race or ethnicity, (specify):	0	0%
Choose not to report	0	0%
Total	**39**	**100%**

Which of the following BEST describes your current occupation? (select ONE)		
	Freq.	**%**
Teacher	0	0%
Other school staff	2	5%
University educator	26	67%
Scientist, Engineer, or Mathematician in training (undergraduate or graduate student, etc.)	2	5%
Scientist, Engineer, or Mathematics professional	7	18%
Other, (specify):	2	5%
Total	**39**	**100%**

Note. Other = "Student" (n = 2).

Which of the following BEST describes your organization? (select ONE)		
	Freq.	%
No organization	1	3%
School or district (K-12)	1	3%
State educational agency	1	3%
Institution of higher education (vocational school, junior college, college, or university)	36	92%
Industry	0	0%
Department of Defense or other government agency	0	0%
Non-profit	0	0%
Other, (specify):	0	0%
Total	39	100%

Which of the following best describes your primary area of research?						
	Freq.	%			Freq.	%
Physical science (physics, chemistry, astronomy, materials science)	12	31%		Technology	1	3%
Biological science	10	26%		Engineering	6	15%
Earth, atmospheric, or oceanic science	0	0%		Mathematics or statistics	5	13%
Agricultural science	0	0%		Medical, health, or behavioral science	2	5%
Environmental science	2	5%		Social science (psychology, sociology, anthropology, etc.)	0	0%
Computer science	1	3%		Other, (specify)	0	0%
				Total	39	100%

At which of the following REAP sites did you participate? (Select ONE)						
	Freq.	%			Freq.	%
Alabama State University	3	8%		Texas Tech University	2	5%
Arizona State University	3	8%		University of Alabama-Huntsville	0	0%
Ball State University	0	0%		University of Arkansas at Pine Bluff	3	8%
Clark Atlanta University	0	0%		University of California-Berkeley	1	3%
Colorado State University	2	5%		University of Central Florida	2	5%
Delaware State University	1	3%		University of Colorado-Boulder	1	3%
Georgia State University	0	0%		University of Houston	1	3%

Jackson State University	3	8%		University of Iowa	0	0%
LeMoyne	0	0%		University of Maryland-Baltimore	2	5%
Loyola University-Chicago	0	0%		University of Massachusetts-Lowell	2	5%
Michigan Technological University	0	0%		University of Missouri	0	0%
Montana State University	1	3%		University of New Hampshire	0	0%
New Jersey Technical Institute	0	0%		University of Puerto Rico	1	3%
New Mexico State	1	3%		University of Puerto Rico-Hu Macao	1	3%
North Carolina A&T State University	0	0%		University of South Florida	3	8%
North Carolina Central University	0	0%		University of Texas-El Paso	2	5%
Oakland University	0	0%		University of Utah	1	3%
South Dakota School of Mines & Technology	0	0%		University of Washington	3	8%
Texas Southern	0	0%		Xavier University of Louisiana	0	0%
				Other, (specify):	0	0%
				Total	**39**	**100%**

Which of the following BEST describes your role during REAP?

	Freq.	%
Research Mentor	33	85%
Research Team Member but not a Principal Investigator (PI)	3	8%
Other, (specify)	3	8%
Total	**39**	**100%**

Note. Other = "PI", "Administrative Assistant", and "Program Director".

How many REAP students did you work with this year?

# of Students	Freq.	%
1	13	36%
2	18	50%
3	2	6%
4	2	6%
5	1	3%
Total	**36**	**100%**

How did you learn about REAP? (Check all that apply) (n = 39)						
	Freq.	%			Freq.	%
Academy of Applied Science website	9	23%		A student	2	5%
Army Educational Outreach Program (AEOP) website	8	21%		A colleague	10	26%
Facebook, Twitter, Pinterest, or other social media	0	0%		A supervisor or superior	8	21%
State or national educator conference	1	3%		REAP site host/director	6	15%
STEM conference	0	0%		Workplace communications	3	8%
School, university, or professional organization newsletter, email, or website	1	3%		Someone who works at an Army laboratory	1	3%
A news story or other media coverage	0	0%		Someone who works with the Department of Defense	2	5%
Past REAP participant	4	10%		Other, (specify):	2	5%

Note. Other = "Dr. Stephen Bayne, Associate Professor", and "Got an email from Irene O'Mara".

How many times have YOU PARTICIPATED in any of the following Army Educational Outreach Programs in any capacity? If you have not heard of an AEOP, select "Never heard of it." If you have heard of an AEOP but never participated, select "Never."								
	0	1	2	3	4	n	Avg.	SD
Camp Invention	20 (54%)	17 (46%)	0 (0%)	0 (0%)	0 (0%)	37	**1.00**	0.00
eCYBERMISSION	20 (54%)	15 (41%)	2 (5%)	0 (0%)	0 (0%)	37	**1.12**	0.33
Junior Solar Sprint (JSS)	19 (51%)	17 (46%)	0 (0%)	1 (3%)	0 (0%)	37	**1.11**	0.47
West Point Bridge Design Contest (WPBDC)	20 (54%)	16 (43%)	1 (3%)	0 (0%)	0 (0%)	37	**1.06**	0.24
Junior Science & Humanities Symposium (JSHS)	19 (53%)	16 (44%)	1 (3%)	0 (0%)	0 (0%)	36	**1.06**	0.24
Gains in the Education of Mathematics and Science (GEMS)	16 (44%)	19 (53%)	1 (3%)	0 (0%)	0 (0%)	36	**1.05**	0.22
GEMS Near Peers	20 (54%)	16 (43%)	0 (0%)	0 (0%)	1 (3%)	37	**1.18**	0.73
UNITE	13 (35%)	20 (54%)	0 (0%)	2 (5%)	2 (5%)	37	**1.42**	0.97
Science & Engineering Apprenticeship Program (REAP)	10 (28%)	23 (64%)	0 (0%)	2 (6%)	1 (3%)	36	**1.27**	0.78
Research & Engineering Apprenticeship Program (REAP)	2 (5%)	3 (8%)	10 (26%)	4 (11%)	19 (50%)	38	**3.08**	1.08
High School Apprenticeship Program (HSAP)	13 (35%)	23 (62%)	1 (3%)	0 (0%)	0 (0%)	37	**1.04**	0.20
College Qualified Leaders (CQL)	18 (49%)	18 (49%)	0 (0%)	1 (3%)	0 (0%)	37	**1.11**	0.46
Undergraduate Research Apprenticeship Program (URAP)	12 (32%)	19 (51%)	2 (5%)	2 (5%)	2 (5%)	37	**1.48**	0.96

Science Mathematics, and Research for Transformation (SMART) College Scholarship	10 (27%)	20 (54%)	4 (11%)	3 (8%)	0 (0%)	37	**1.37**	0.69
National Defense Science & Engineering Graduate (NDSEG) Fellowship	11 (30%)	23 (62%)	1 (3%)	1 (3%)	1 (3%)	37	**1.23**	0.71

Note. Response scale: 0 = "Never heard of it," 1 = "Never," 2 = "Once," 3= "Twice," 4 = "Three or more times".

Which of the following were used for the purpose of recruiting your student(s) for apprenticeships? (select ALL that apply) (n = 38)

	Freq.	%			Freq.	%
Applications from Academy of Applied Science or the AEOP	17	45%		Communication(s) generated by a university or faculty (newsletter, email blast, website)	14	37%
Personal acquaintance(s) (friend, family, neighbor, etc.)	7	18%		Career fair(s)	2	5%
Colleague(s) in my workplace	10	26%		Education conference(s) or event(s)	6	16%
K-12 school teacher(s) outside of my workplace	18	47%		STEM conference(s) or event(s)	3	8%
University faculty outside of my workplace	3	8%		Organization(s) serving underserved or underrepresented populations	4	11%
Informational materials sent to K-12 schools or Universities outside of my workplace	12	32%		Student contacted mentor	7	18%
Communication(s) generated by a K-12 school or teacher (newsletter, email blast, website)	10	26%		I do not know how student(s) was recruited for apprenticeship	8	21%
				Other, Specify:	4	11%

Note. Other = "Personal contacts with Engineering Teachers at area high schools", "SLEWs Program gave out our fliers to their participants", "local news media", and "Student recruiter".

How SATISFIED were you with each of the following REAP features?

	0	1	2	3	4	n	Avg.	SD
Application or registration process	7 (18%)	1 (3%)	5 (13%)	8 (21%)	17 (45%)	38	**3.32**	0.87
Other administrative tasks	4 (11%)	3 (8%)	3 (8%)	11 (29%)	17 (45%)	38	**3.24**	0.96
Communications from Academy of Applied Science	6 (16%)	1 (3%)	5 (13%)	5 (13%)	21 (55%)	38	**3.44**	0.88
Communications from [REAP site]	5 (13%)	1 (3%)	1 (3%)	6 (16%)	25 (66%)	38	**3.67**	0.69
Support for instruction or mentorship during program activities	4 (11%)	1 (3%)	4 (11%)	7 (18%)	22 (58%)	38	**3.47**	0.83
Participation stipends (payment)	3 (8%)	4 (11%)	2 (5%)	5 (14%)	23 (62%)	37	**3.38**	1.04

Research abstract preparation requirements	5 (13%)	1 (3%)	2 (5%)	12 (32%)	18 (47%)	38	**3.42**	0.75

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

The list below describes mentoring strategies that are effective ways to establish the relevance of learning activities for students. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

		Yes – I used this strategy		No – I did not use this strategy	
	n	Freq.	%	Freq.	%
Finding out about students' backgrounds and interests at the beginning of the program	38	36	95%	2	5%
Giving students real-life problems to investigate or solve	38	30	79%	8	21%
Asking students to relate outside events or activities to topics covered in the program	38	30	79%	8	21%
Selecting readings or activities that relate to students' backgrounds	38	30	79%	8	21%
Encouraging students to suggest new readings, activities, or projects	37	24	65%	13	35%
Making explicit provisions for students who wish to carry out independent studies	38	24	63%	14	37%
Helping students become aware of the roles STEM plays in their everyday lives	38	32	84%	6	16%
Helping students understand how STEM can help them improve their communities	38	28	74%	10	26%
Other, (specify):	7	4	57%	3	43%

Note. Other = "Demonstrating how skills learned in my research lab are pertinent to other careers/fields", "Pubmed reviews on subjects of interest", "Completing an real experiment", and "Engaging directly with peers, and students from underrepresented groups".

The list below describes mentoring strategies that are effective ways to support the diverse needs of students as learners. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

		Yes – I used this strategy		No – I did not use this strategy	
	n	Freq.	%	Freq.	%
Finding out about students' learning styles at the beginning of the program	38	27	71%	11	29%
Interacting with all students in the same way regardless of their gender or race and ethnicity	38	35	92%	3	8%
Using gender neutral language	38	32	84%	6	16%
Using diverse teaching/mentoring activities to address a broad spectrum of students	38	32	84%	6	16%

Integrating ideas from the literature on pedagogical activities for women and underrepresented students	38	23	61%	15	39%
Providing extra readings, activities, or other support for students who lack essential background knowledge or skills	38	30	79%	8	21%
Directing students to other individuals or programs if I can only provide limited support	38	25	66%	13	34%
Other, (specify):	11	5	45%	6	55%

Note. Other = "participation in summer seminars", "pair them up with other students", "lab meetings and journal club", and "Providing flexible scheduling and work-hours requirements, to accommodate busy schedule of high school student".

The list below describes mentoring strategies that are effective ways to support students' development of collaboration and interpersonal skills. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

		Yes – I used this strategy		No – I did not use this strategy	
	n	Freq.	%	Freq.	%
Having students tell others about their backgrounds and interests	38	33	87%	5	13%
Having students explain difficult ideas to others	37	30	81%	7	19%
Having students exchange ideas with others whose backgrounds or viewpoints are different from their own	38	26	68%	12	32%
Having students participate in giving and receiving feedback	38	34	89%	4	11%
Having students work on collaborative activities or projects as a member of a team	38	36	95%	2	5%
Having students listen to the ideas of others with an open mind	38	34	89%	4	11%
Having students pay attention to the feelings of all team members	38	27	71%	11	29%
Having students develop ways to resolve conflict and reach agreement among the team	38	19	50%	19	50%
Other, (specify):	7	2	29%	5	71%

Note. Other = "lab meeting participation".

The list below describes mentoring strategies that are effective ways to support students' engagement in "authentic" STEM activities. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

		Yes – I used this strategy		No – I did not use this strategy	
	n	Freq.	%	Freq.	%
Teaching (or assigning readings) about specific STEM subject matter	38	30	79%	8	21%
Having students access and critically review technical texts or media to support their work	38	25	66%	13	34%

Demonstrating the use of laboratory or field techniques, procedures, and tools students are expected to use	38	36	95%	2	5%
Helping students practice STEM skills with supervision	38	34	89%	4	11%
Giving constructive feedback to improve students' STEM competencies	38	33	87%	5	13%
Allowing students to work independently as appropriate for their self-management abilities and STEM competencies	38	37	97%	1	3%
Encouraging students to seek support from other team members	38	33	87%	5	13%
Encouraging opportunities in which students could learn from others (team projects, team meetings, journal clubs)	38	33	87%	5	13%
Other, (specify):	7	3	43%	4	57%

Note. Other = "Requiring students to present and solve problems in class".

The list below describes mentoring strategies that are effective ways to support students' STEM educational and career pathways. The list also includes items that reflect AEOP and Army priorities. From the list below, please indicate which strategies you used when working with your student(s) in REAP.

		Yes – I used this strategy		No – I did not use this strategy	
	n	Freq.	%	Freq.	%
Asking about students' educational and career interests	38	38	100%	0	0%
Recommending extracurricular programs that align with students' educational goals	38	24	63%	14	37%
Recommending Army Educational Outreach Programs that align with students' educational goals	38	24	63%	14	37%
Providing guidance about educational pathways that would prepare students for a STEM career	38	35	92%	3	8%
Sharing personal experiences, attitudes, and values pertaining to STEM	38	37	97%	1	3%
Discussing STEM career opportunities with the DoD or other government agencies	38	24	63%	14	37%
Discussing STEM career opportunities outside of the DoD or other government agencies (private industry, academia)	38	24	63%	14	37%
Discussing non-technical aspects of a STEM career (economic, political, ethical, and/or social issues)	38	25	66%	13	34%
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	37	23	62%	14	38%
Recommending student and professional organizations in STEM	37	17	46%	20	54%
Helping students build effective STEM networks	38	22	58%	16	42%
Critically reviewing students' résumé, application, or interview preparations	38	20	53%	18	47%
Other, (specify):	6	1	17%	5	83%

Note. Other = "remind them to ask for reference letters".

How USEFUL were each of the following in your efforts to expose student(s) to Army Educational Outreach Programs (AEOPs) during REAP?	0	1	2	3	4	n	Avg.	SD
Academy of Applied Science website	10 (26%)	0 (0%)	3 (8%)	6 (16%)	19 (50%)	38	**3.57**	0.69
Army Educational Outreach Program (AEOP) website	10 (27%)	1 (3%)	3 (8%)	7 (19%)	16 (43%)	37	**3.41**	0.84
AEOP social media	23 (62%)	2 (5%)	1 (3%)	8 (22%)	3 (8%)	37	**2.86**	0.95
AEOP brochure and/or presentation	11 (29%)	1 (3%)	4 (11%)	8 (21%)	14 (37%)	38	**3.30**	0.87
AEOP instructional supplies (Rite in the Rain notebook, Lab coats, etc.)	10 (26%)	1 (3%)	6 (16%)	6 (16%)	15 (39%)	38	**3.25**	0.93
Program administrator or site coordinator	10 (28%)	1 (3%)	1 (3%)	7 (19%)	17 (47%)	36	**3.54**	0.76
Invited speakers or "career" events	22 (58%)	5 (13%)	2 (5%)	3 (8%)	6 (16%)	38	**2.63**	1.31
Participation in REAP	5 (14%)	0 (0%)	1 (3%)	3 (8%)	28 (76%)	37	**3.84**	0.45

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

Which of the following AEOPs did you EXPLICITLY DISCUSS with your student(s) during REAP?		Yes - I discussed this program with my student(s)		No - I did not discuss this program with my student(s)	
	n	Freq.	%	Freq.	%
Camp Invention	36	5	14%	31	86%
eCYBERMISSION	35	5	14%	30	86%
Junior Solar Sprint (JSS)	35	4	11%	31	89%
West Point Bridge Design Contest (WPBDC)	35	3	9%	32	91%
Junior Science & Humanities Symposium (JSHS)	35	5	14%	30	86%
Gains in the Education of Mathematics and Science (GEMS)	36	7	19%	29	81%
GEMS Near Peers	35	5	14%	30	86%
UNITE	35	9	26%	26	74%
Science & Engineering Apprenticeship Program (SEAP)	35	9	26%	26	74%
Research & Engineering Apprenticeship Program (REAP)	36	27	75%	9	25%
High School Apprenticeship Program (HSAP)	37	12	32%	25	68%
College Qualified Leaders (CQL)	36	4	11%	32	89%
Undergraduate Research Apprenticeship Program (URAP)	36	13	36%	23	64%

Science Mathematics, and Research for Transformation (SMART) College Scholarship	36	12	33%	24	67%
National Defense Science & Engineering Graduate (NDSEG) Fellowship	36	6	17%	30	83%
I discussed AEOP with my student(s) but did not discuss any specific program	33	15	45%	18	55%

How USEFUL were each of the following in your efforts to expose your student(s) to Department of Defense (DoD) STEM careers during REAP?

	0	1	2	3	4	n	Avg.	SD
Academy of Applied Science website	12 (32%)	0 (0%)	3 (8%)	7 (18%)	16 (42%)	38	**3.50**	0.71
Army Educational Outreach Program (AEOP) website	14 (38%)	0 (0%)	4 (11%)	6 (16%)	13 (35%)	37	**3.39**	0.78
AEOP social media	24 (67%)	4 (11%)	0 (0%)	4 (11%)	4 (11%)	36	**2.67**	1.30
AEOP brochure and/or presentation	9 (25%)	1 (3%)	5 (14%)	8 (22%)	13 (36%)	36	**3.22**	0.89
AEOP instructional supplies (Rite in the Rain notebook, Lab coats, etc.)	13 (35%)	1 (3%)	5 (14%)	5 (14%)	13 (35%)	37	**3.25**	0.94
Program administrator or site coordinator	13 (36%)	1 (3%)	1 (3%)	6 (17%)	15 (42%)	36	**3.52**	0.79
Invited speakers or "career" events	25 (69%)	2 (6%)	1 (3%)	3 (8%)	5 (14%)	36	**3.00**	1.18
Participation in REAP	8 (21%)	1 (3%)	1 (3%)	3 (8%)	25 (66%)	38	**3.73**	0.69

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

Rate how much you agree or disagree with each of the following statements about Department of Defense (DoD) researchers and research:

	1	2	3	4	5	n	Avg.	SD
DoD researchers advance science and engineering fields	3 (8%)	1 (3%)	4 (11%)	9 (24%)	21 (55%)	38	**4.16**	1.22
DoD researchers develop new, cutting edge technologies	3 (8%)	1 (3%)	2 (5%)	11 (29%)	21 (55%)	38	**4.21**	1.19
DoD researchers support non-defense related advancements in science and technology	3 (8%)	2 (5%)	4 (11%)	12 (32%)	17 (45%)	38	**4.00**	1.23
DoD researchers solve real-world problems	3 (8%)	0 (0%)	3 (8%)	15 (39%)	17 (45%)	38	**4.13**	1.12
DoD research is valuable to society	3 (8%)	0 (0%)	3 (8%)	11 (29%)	21 (55%)	38	**4.24**	1.15

Note. Response scale: 1 = "Strongly Disagree," 2 = "Disagree," 3 = "Neither Agree nor Disagree," 4 = "Agree," 5 = "Strongly Agree".

How often did YOUR STUDENT(S) have opportunities do each of the following in REAP?

	1	2	3	4	5	n	Avg.	SD
Learn new science, technology, engineering, or mathematics (STEM) topics	0 (0%)	2 (5%)	3 (8%)	10 (26%)	23 (61%)	38	**4.42**	0.86
Apply STEM knowledge to real life situations	0 (0%)	2 (5%)	7 (18%)	11 (29%)	18 (47%)	38	**4.18**	0.93
Learn about cutting-edge STEM research	0 (0%)	2 (5%)	5 (13%)	13 (34%)	18 (47%)	38	**4.24**	0.88
Learn about different STEM careers	0 (0%)	1 (3%)	18 (47%)	12 (32%)	7 (18%)	38	**3.66**	0.81
Interact with STEM professionals	1 (3%)	3 (8%)	7 (18%)	7 (18%)	20 (53%)	38	**4.11**	1.13
Practice using laboratory or field techniques, procedures, and tools	0 (0%)	1 (3%)	4 (11%)	4 (11%)	29 (76%)	38	**4.61**	0.79
Participate in hands-on STEM activities	0 (0%)	1 (3%)	4 (11%)	2 (5%)	31 (82%)	38	**4.66**	0.78
Work as part of a team	0 (0%)	1 (3%)	3 (8%)	7 (18%)	27 (71%)	38	**4.58**	0.76
Communicate with other students about STEM	0 (0%)	3 (8%)	7 (18%)	13 (34%)	15 (39%)	38	**4.05**	0.96
Pose questions or problems to investigate	0 (0%)	3 (8%)	6 (16%)	11 (29%)	18 (47%)	38	**4.16**	0.97
Design an investigation	3 (8%)	4 (11%)	10 (26%)	11 (29%)	10 (26%)	38	**3.55**	1.22
Carry out an investigation	1 (3%)	4 (11%)	4 (11%)	13 (34%)	16 (42%)	38	**4.03**	1.10
Analyze and interpret data or information	0 (0%)	6 (16%)	3 (8%)	12 (32%)	17 (45%)	38	**4.05**	1.09
Draw conclusions from an investigation	0 (0%)	3 (8%)	6 (16%)	14 (37%)	15 (39%)	38	**4.08**	0.94
Come up with creative explanations or solutions	0 (0%)	4 (11%)	5 (13%)	16 (42%)	13 (34%)	38	**4.00**	0.96

Note. Response scale: 1 = "Not at all," 2 = "At least once," 3 = "A few times," 4 = "Most days," 5 = "Every day".

Which category best describes the focus of your student's REAP project?

	Freq.	%
Science	28	74%
Technology	1	3%
Engineering	8	21%
Mathematics	1	3%
Total	**38**	**100%**

AS A RESULT OF THE REAP EXPERIENCE, how much did your student(s) GAIN in the following areas?

	1	2	3	4	5	n	Avg.	SD
Knowledge of a STEM topic or field in depth	0 (0%)	0 (0%)	6 (16%)	18 (47%)	14 (37%)	38	**4.21**	0.70
Knowledge of research conducted in a STEM topic or field	0 (0%)	0 (0%)	4 (11%)	15 (39%)	19 (50%)	38	**4.39**	0.68

Knowledge of research processes, ethics, and rules for conduct in STEM	0 (0%)	0 (0%)	4 (11%)	19 (50%)	15 (39%)	38	**4.29**	0.65
Knowledge of how professionals work on real problems in STEM	0 (0%)	0 (0%)	5 (13%)	13 (34%)	20 (53%)	38	**4.39**	0.72
Knowledge of what everyday research work is like in STEM	0 (0%)	0 (0%)	4 (11%)	11 (29%)	23 (61%)	38	**4.50**	0.69

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF THE REAP EXPERIENCE, how much did your student(s) GAIN in the following areas?

	1	2	3	4	5	n	Avg.	SD
Asking questions based on observations of real-world phenomena	0 (0%)	1 (4%)	7 (25%)	14 (50%)	6 (21%)	28	**3.89**	0.79
Asking a question (about a phenomenon) that can be answered with one or more investigations	0 (0%)	1 (4%)	9 (32%)	10 (36%)	8 (29%)	28	**3.89**	0.88
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	0 (0%)	1 (4%)	5 (18%)	15 (54%)	7 (25%)	28	**4.00**	0.77
Making a model to represent the key features and functions of an observed phenomenon	2 (7%)	3 (11%)	9 (32%)	11 (39%)	3 (11%)	28	**3.36**	1.06
Deciding what type of data to collect in order to answer a question	1 (4%)	1 (4%)	9 (32%)	9 (32%)	8 (29%)	28	**3.79**	1.03
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	0 (0%)	2 (7%)	6 (22%)	11 (41%)	8 (30%)	27	**3.93**	0.92
Identifying the limitations of data collected in an investigation	1 (4%)	3 (11%)	7 (25%)	11 (39%)	6 (21%)	28	**3.64**	1.06
Carrying out procedures for an investigation and recording data accurately	0 (0%)	2 (7%)	6 (21%)	7 (25%)	13 (46%)	28	**4.11**	0.99
Testing how changing one variable affects another variable, in order to understand relationships between variables	1 (4%)	4 (14%)	6 (21%)	11 (39%)	6 (21%)	28	**3.61**	1.10
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	7 (25%)	4 (14%)	7 (25%)	4 (14%)	6 (21%)	28	**2.93**	1.49
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	1 (4%)	6 (21%)	6 (21%)	12 (43%)	3 (11%)	28	**3.36**	1.06
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	2 (7%)	2 (7%)	6 (21%)	8 (29%)	10 (36%)	28	**3.79**	1.23

Using mathematics or computers to analyze numeric data	5 (18%)	3 (11%)	6 (21%)	4 (14%)	10 (36%)	28	**3.39**	1.52
Supporting a proposed explanation (for a phenomenon) with data from investigations	2 (7%)	3 (11%)	7 (25%)	8 (29%)	8 (29%)	28	**3.61**	1.23
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	1 (4%)	2 (7%)	5 (18%)	12 (43%)	8 (29%)	28	**3.86**	1.04
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	2 (7%)	1 (4%)	10 (36%)	10 (36%)	5 (18%)	28	**3.54**	1.07
Using data or interpretations from other researchers or investigations to improve an explanation	4 (14%)	1 (4%)	5 (18%)	12 (43%)	6 (21%)	28	**3.54**	1.29
Asking questions to understand the data and interpretations others use to support their explanations	4 (15%)	1 (4%)	6 (22%)	10 (37%)	6 (22%)	27	**3.48**	1.31
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	3 (11%)	2 (7%)	8 (30%)	9 (33%)	5 (19%)	27	**3.41**	1.22
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	3 (11%)	2 (7%)	5 (18%)	10 (36%)	8 (29%)	28	**3.64**	1.28
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	0 (0%)	2 (7%)	10 (36%)	10 (36%)	6 (21%)	28	**3.71**	0.90
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	2 (7%)	2 (7%)	7 (25%)	10 (36%)	7 (25%)	28	**3.64**	1.16
Integrating information from multiple sources to support your explanations of phenomena	3 (11%)	2 (7%)	6 (21%)	13 (46%)	4 (14%)	28	**3.46**	1.17
Communicating information about your investigations and explanations in different formats (orally, written, graphically, mathematically, etc.)	1 (4%)	2 (7%)	5 (18%)	11 (39%)	9 (32%)	28	**3.89**	1.07

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF THE REAP EXPERIENCE, how much did your student(s) GAIN in the following areas?

	1	2	3	4	5	n	Avg.	SD
Identifying real-world problems based on social, technological, or environmental issues	1 (10%)	0 (0%)	2 (20%)	3 (30%)	4 (40%)	10	**3.90**	1.29
Defining a problem that can be solved by developing a new or improved object, process, or system	0 (0%)	1 (10%)	2 (20%)	3 (30%)	4 (40%)	10	**4.00**	1.05

Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	0 (0%)	0 (0%)	2 (20%)	3 (30%)	5 (50%)	10	**4.30**	0.82
Making a model that represents the key features or functions of a solution to a problem	0 (0%)	2 (20%)	2 (20%)	2 (20%)	4 (40%)	10	**3.80**	1.23
Deciding what type of data to collect in order to test if a solution functions as intended	0 (0%)	0 (0%)	3 (30%)	3 (30%)	4 (40%)	10	**4.10**	0.88
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	0 (0%)	0 (0%)	3 (33%)	3 (33%)	3 (33%)	9	**4.00**	0.87
Identifying the limitations of the data collected in an investigation	0 (0%)	0 (0%)	3 (30%)	4 (40%)	3 (30%)	10	**4.00**	0.82
Carrying out procedures for an investigation and recording data accurately	0 (0%)	0 (0%)	2 (20%)	5 (50%)	3 (30%)	10	**4.10**	0.74
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	0 (0%)	0 (0%)	1 (10%)	4 (40%)	5 (50%)	10	**4.40**	0.70
Using computer-based models to investigate cause and effect relationships of a simulated solution	2 (20%)	0 (0%)	3 (30%)	1 (10%)	4 (40%)	10	**3.50**	1.58
Considering alternative interpretations of data when deciding if a solution functions as intended	0 (0%)	0 (0%)	3 (30%)	3 (30%)	4 (40%)	10	**4.10**	0.88
Displaying numeric data in charts or graphs to identify patterns and relationships	1 (10%)	0 (0%)	1 (10%)	5 (50%)	3 (30%)	10	**3.90**	1.20
Using mathematics or computers to analyze numeric data	1 (10%)	0 (0%)	1 (10%)	3 (30%)	5 (50%)	10	**4.10**	1.29
Supporting a proposed solution (for a problem) with data from investigations	0 (0%)	0 (0%)	3 (30%)	4 (40%)	3 (30%)	10	**4.00**	0.82
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	0 (0%)	0 (0%)	2 (20%)	3 (30%)	5 (50%)	10	**4.30**	0.82
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	0 (0%)	0 (0%)	3 (30%)	3 (30%)	4 (40%)	10	**4.10**	0.88
Using data or interpretations from other researchers or investigations to improve a solution	0 (0%)	0 (0%)	4 (40%)	3 (30%)	3 (30%)	10	**3.90**	0.88
Asking questions to understand the data and interpretations others use to support their solutions	0 (0%)	0 (0%)	3 (30%)	4 (40%)	3 (30%)	10	**4.00**	0.82

Using data from investigations to defend an argument that conveys how a solution meets design criteria	0 (0%)	2 (20%)	1 (10%)	4 (40%)	3 (30%)	10	**3.80**	1.14
Deciding what additional data or information may be needed to find the best solution to a problem	0 (0%)	1 (10%)	2 (20%)	4 (40%)	3 (30%)	10	**3.90**	0.99
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	0 (0%)	0 (0%)	2 (22%)	3 (33%)	4 (44%)	9	**4.22**	0.83
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	0 (0%)	0 (0%)	2 (20%)	4 (40%)	4 (40%)	10	**4.20**	0.79
Integrating information from multiple sources to support your solution to a problem	0 (0%)	0 (0%)	3 (30%)	4 (40%)	3 (30%)	10	**4.00**	0.82
Communicating information about your design processes and/or solutions in different formats (orally, written, graphically, mathematically, etc.)	0 (0%)	2 (20%)	1 (10%)	3 (30%)	4 (40%)	10	**3.90**	1.20

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF THE REAP EXPERIENCE, how much did your student(s) GAIN (on average) in the following areas?

	1	2	3	4	5	n	Avg.	SD
Learning to work independently	0 (0%)	0 (0%)	8 (21%)	7 (18%)	23 (61%)	38	**4.39**	0.82
Setting goals and reflecting on performance	0 (0%)	2 (5%)	5 (13%)	16 (42%)	15 (39%)	38	**4.16**	0.86
Sticking with a task until it is completed	0 (0%)	1 (3%)	3 (8%)	14 (37%)	20 (53%)	38	**4.39**	0.75
Making changes when things do not go as planned	0 (0%)	1 (3%)	7 (18%)	12 (32%)	18 (47%)	38	**4.24**	0.85
Patience for the slow pace of research	0 (0%)	0 (0%)	3 (8%)	15 (39%)	20 (53%)	38	**4.45**	0.65
Working collaboratively with a team	0 (0%)	1 (3%)	4 (11%)	12 (32%)	21 (55%)	38	**4.39**	0.79
Communicating effectively with others	0 (0%)	2 (5%)	2 (5%)	16 (42%)	18 (47%)	38	**4.32**	0.81
Including others' perspectives when making decisions	1 (3%)	2 (5%)	10 (26%)	11 (29%)	14 (37%)	38	**3.92**	1.05
Sense of being part of a learning community	0 (0%)	1 (3%)	4 (11%)	13 (34%)	20 (53%)	38	**4.37**	0.79
Sense of contributing to a body of knowledge	0 (0%)	1 (3%)	5 (13%)	14 (37%)	18 (47%)	38	**4.29**	0.80
Building relationships with professionals in a field	0 (0%)	1 (3%)	6 (16%)	12 (32%)	19 (50%)	38	**4.29**	0.84
Connecting a topic or field and their personal values	0 (0%)	5 (14%)	4 (11%)	13 (35%)	15 (41%)	37	**4.03**	1.04

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

Which of the following statements describe YOUR STUDENT(S) after participating in the REAP program?							
	1	**2**	**3**	**4**	**n**	**Avg.**	**SD**
More confident in STEM knowledge, skills, and abilities	0 (0%)	0 (0%)	21 (58%)	15 (42%)	36	**3.42**	0.50
More interested in participating in STEM activities outside of school requirements	0 (0%)	0 (0%)	25 (68%)	12 (32%)	37	**3.32**	0.47
More aware of other AEOPs	5 (14%)	2 (6%)	13 (36%)	16 (44%)	36	**3.11**	1.04
More interested in participating in other AEOPs	6 (17%)	1 (3%)	15 (42%)	14 (39%)	36	**3.03**	1.06
More interested in taking STEM classes in school	0 (0%)	1 (3%)	24 (65%)	12 (32%)	37	**3.30**	0.52
More interested in attending college	0 (0%)	7 (19%)	15 (42%)	14 (39%)	36	**3.19**	0.75
More interested in earning a STEM degree in college	0 (0%)	2 (5%)	24 (65%)	11 (30%)	37	**3.24**	0.55
More interested in pursuing a STEM career	0 (0%)	0 (0%)	24 (65%)	13 (35%)	37	**3.35**	0.48
More aware of Department of Defense (DoD) STEM research and careers	5 (14%)	2 (5%)	16 (43%)	14 (38%)	37	**3.05**	1.00
Greater appreciation of DoD STEM research and careers	6 (17%)	1 (3%)	16 (44%)	13 (36%)	36	**3.00**	1.04
More interested in pursuing a STEM career with the DoD	7 (19%)	3 (8%)	14 (39%)	12 (33%)	36	**2.86**	1.10

Note. Response scale: **1** = "Disagree – This did not happen," **2** = "Disagree – This happened but not because of REAP," **3** = "Agree – REAP contributed," **4** = "Agree – REAP was the primary reason".

Appendix D

FY14 REAP Apprentice Focus Group and Interview Protocols

2014 Army Educational Outreach Program

Student Focus Group

Facilitator: "Thank you for meeting with us today so that we can learn more about your experiences in [X] program. We'd like to suggest some basic ground rules to help the group's discussion proceed smoothly and respectfully for everyone:

- What is shared in the room stays in the room.
- Only one person speaks at a time.
- It is important for us to hear everyone's ideas and opinions. If you disagree, be respectful.
- It is important for us to hear all sides of an issue—both the positive and negative.
- Your participation is voluntary--you may choose not to answer any question, or stop participating at any time.
- We will be audio recording the session for notetaking purposes and will delete the email after the notes have been taken."

Key Questions

1. Why did you choose to participate in [X] this year?
    - How did you hear about [X]?

2. One AEOP objective is to increase your awareness of the AEOP's pipeline of STEM programs. Did you learn about other AEOPs in [X]?
    - Which ones did you learn about?
    - How did you learn about them?
    - Which AEOPs are you interested in pursuing?

3. One AEOP objective is to increase your awareness of STEM research and career opportunities within the Department of Defense. Did you learn about DoD STEM research and careers in [X]?
    - Which ones did you learn about?
    - How did you learn about them?
    - Which AEOPs are you interested in pursuing?

4. Overall, were you happy that you chose to participate in [X]?
    - How have you benefited from participating in [X]?

5. What would you suggest for improving [X] in the future?

Ending questions:

6. Have we missed anything? Tell us anything you want us to know that we didn't ask about.

2014 Army Educational Outreach Program
REAP Apprentice Interview

Key Questions

1. Why did you choose to participate in [X] this year?
    - How did you hear about [X]?

2. One AEOP objective is to increase your awareness of the AEOP's pipeline of STEM programs. Did you learn about other AEOPs in [X]?
    - Which ones did you learn about?
    - How did you learn about them?
    - Which AEOPs are you interested in pursuing?

3. One AEOP objective is to increase your awareness of STEM research and career opportunities within the Department of Defense. Did you learn about DoD STEM research and careers in [X]?
    - Which ones did you learn about?
    - How did you learn about them?
    - Which AEOPs are you interested in pursuing?

4. Overall, were you happy that you chose to participate in [X]?
    - How have you benefited from participating in [X]?

5. What would you suggest for improving [X] in the future?

Ending questions:

6. Have we missed anything? Tell us anything you want us to know that we didn't ask about.

Appendix E

FY14 REAP Mentor Focus Group Protocol

2014 Army Educational Outreach Program
Adult Focus Group

Facilitator: "Thank you for meeting with us today so that we can learn more about your experiences in [X] program. We'd like to suggest some basic ground rules to help the group's discussion proceed smoothly and respectfully for everyone:

- What is shared in the room stays in the room.
- Only one person speaks at a time--we'll call on sites, if you have something to add or wish to build on another's idea, just type 'add' in the chat window and we'll come back to you.
- It is important for us to hear everyone's ideas and opinions. If you disagree, be respectful.
- It is important for us to hear all sides of an issue—both the positive and negative.
- Your participation is voluntary--you may choose not to answer any question, or stop participating at any time.
- We will be audio recording the session for notetaking purposes and will delete the email after the notes have been taken."

Key Questions

1. What do you perceive as the value of [X]?
    - How do you think students benefit from participating?
    - How have you benefited?

2. One AEOP objective is to increase participation of underserved and underrepresented populations in STEM. What strategies have you used this year to increase the diversity of participants in [X]?
    - What strategies seem to work the best?
    - What do you need in order to achieve greater success?

3. One AEOP objective is to increase participants' awareness of the AEOP's pipeline of STEM programs. What strategies have you used this year to educate participants about other AEOP initiatives?
    - What strategies seem to work the best?
    - What do you need in order to achieve greater success?

4. One AEOP objective is to increase participants' awareness of STEM research and career opportunities within the Department of Defense. What strategies have you used this year to expose participants to DoD STEM research and careers?
    - What strategies seem to work the best?
    - What do you need in order to achieve greater success?

5. What suggestions do you have for improving [X]?

Ending questions:

6. Have we missed anything? Tell us anything you want us to know that we didn't ask about.

Appendix F

APR Template

Program Overview

Provide a one or two paragraph overview of your program.

Accomplishments

Provide the following for *each* program objective listed in the Proposed Work section of the FY14 Annual Program Plan.

1. **What were the major activities conducted to accomplish the FY14 target for the objective. Report major activities undertaken by of the program adninistrator as well as a selection of 3-5 different site-level activities.**

2. **What were the results of those activities? Specifically, what progress was made toward achieving the FY14 target for the objective?**

3. **What is the proposed FY15 target for for the objective, considering the 5-year target?**

4. **What is planned to accomplish the FY15 target for the objective?**

The following structure can be used for each program objective (replicate as needed). Information in the top two rows ("Objective" and "FY14 Target") should be copied directly from the approved FY14APP.

Objective: [STATE OBJECTIVE] (**Supports AEOP Goal** [STATE GOAL #], **Objectives** [STATE OBJECTIVE LETTERS]) **Proposed Plan:** [STATE PROPOSED PLAN]
FY14 Target: [STATE TARGET]
Major activities: [REPORT ACTIVITIES OF PROGRAM ADMISTRATOR] [REPORT SELECTED SITE-LEVEL ACTIVITIES]
Results: [REPORT RESULTS] [REPORT PROGROSS TOWARD ACHEIVEING FY14 TARGET]
FY15 Target: [STATE TARGET]
FY15 Plan: [STATE PLAN TO ACCOMPLISH FY15 TARGET]

Changes / Challenges

1. **What changes (if any) were made to the plan for meeting FY14 targets for each objective? What were the reasons for the changes?**

2. **Do any of these changes have significant impact on budget/expenditures?**

3. **What challenges or delays (if any) prevented the program from meeting FY14 targets for each objective? What actions or plans were implemented to resolve those challenges or delays?**

4. **Do any of these challenges or delays require the assistance of the Army, the Consortium, or the Lead Organization to resolve? Please specify.**

Products

1. **For all programs, list and briefly describe any products resulting from the administration of the program (program administrator or site coordinator) during FY14.**
   - **Websites and social media (provide website urls, social media handles, etc.)**
   - **Instructional materials and other educational aids or resources**
   - **Audio or video products**
   - **Guiding documents**
   - **Marketing or promotional materials**
   - **Presentations[37] (provide citations)**
   - **Publications[38] (provide citations)**
   - **Educational research or evaluation assessments**
   - **Other**

[37] Presentations include things like conference contributions (oral or poster) or presentations to the public, news media, educational agencies, and other associations. Conference booths may also be reported.

[38] Publications include things like peer reviewed articles, technical papers and reports, books or book chapters, news media releases.

2. **In addition to the above, how many of each product resulted from the Army/AEOP-sponsored research conducted by students participating in apprenticeship programs?**
   - **Abstracts**
   - **Presentations**
   - **Publications**
   - **Patents**
   - **Other**

Participants

Recruitment and selection of participants

1. **Who is the audience(s) targeted by your program and how was the program was marketed to the audience(s)? Report major activities undertaken by of the program administrator as well as a selection of 3-5 different site-level activities toward marketing and recruitment.**

2. **What criteria were used to select participants for the program? Report any efforts of the program administrator (including guidance provided to sites) as well as a selection of 3-5 different site-level criteria.**

3. **AEOP Pipeline: Explain any efforts that were made to specifically recruit alumni of other AEOP initiatives into your program? Explain any efforts to specifically recruit alumni of your program into other AEOP initiatives?**

Participant numbers and demographic characteristics

1. **How many of each participant group enrolled in the program? How many of each group applied and/or were selected/invited to participate? Report data using the following categories and enter "NA" where not applicable.**

	Applied	Selected	Enrolled
Participant Group	**No.**	**No.**	**No.**
Elementary school students (grades K-5)			
Middle school students (grades 6-8)			
High school students (grades 9-12)			
Undergraduate students (including community college)			
Graduate students (including post-baccalaureates)			
In-service K-12 teachers			
Pre-service K-12 teachers			
College/university faculty or other personnel			
Army/DoD Scientists & Engineers			

Other volunteers (e.g., if a competition program)			

2. **For the target audience(s) listed in the previous section (replicate the table as needed), how many were enrolled in the program per program site? How many of each group applied and/or were selected/invited to participate per program site?**

[Identify Participant Group]	Applied	Selected	Enrolled
Site	**No.**	**No.**	**No.**
(List each site by name)			

3. **For the target audience(s) listed in the previous section (replicate the table as needed), what are the demographic characteristics of the applicants and enrolled participants? Report data using the following categories:**

Identify Participant Group]	Applied		Enrolled	
Demographic Category	**No.**	**%**	**No.**	**%**
Gender				
Male				
Female				
Choose not to report				
Race/ethnicity				
Native American or Alaskan Native				
Asian				
Black or African American				
Hispanic or Latino				
Native Hawaiian or Other Pacific Islander				
White				
Choose not to report				
School setting (students and teachers)				
Urban (city)				
Suburban				
Rural (country)				

Frontier or tribal School				
DoDDS/DoDEA School				
Home school				
Online school				
Choose not to report				
Receives free or reduced lunch (students only)				
Yes				
No				
Choose not to report				
English is a first language (students only)				
Yes				
No				
Choose not to report				
One parent/guardian graduated from college (students only)				
Yes				
No				
Choose not to report				
Documented disability (students only)				
Yes				
No				
Choose not to report				

4. For the target audience(s) listed in the previous section (replicate the table as needed), what are the rates of past AEOP participation of the applicants and enrolled participants? Report data using the following categories:

[Identify Participant Group]	Applied		Enrolled	
AEOP element	**No.**	%	**No.**	%
Camp Invention				
Junior Solar Sprint				
eCYBERMISSION				
West Point Bridge Design Competition				
Junior Science & Humanities Symposium				
Gains in the Education of Mathematics and Science				
UNITE				
Science and Engineering Apprentice Program				
Research and Engineering Apprenticeship Program				
High School Apprenticeship Program				
College Qualified Leaders				

Undergraduate Research Apprenticeship Program				
STEM Teachers Academy				
SMART Scholarship				
NDSEG Fellowship				

Organizations participating or served

1. How many of each organization are served by the program? Report data in the following categories:

Organizations	No.
K-12 schools	
Title 1 K-12 schools	
Colleges/universities (including community colleges)	
Army/DoD laboratories	
Other collaborating organizations (educational agencies, professional associations, external sponsors, etc.)	

2. Please list all colleges/universities served by the program.

3. Please list all Army/DoD laboratories served by the program.

4. Please list other collaborating organizations served by the program.

Other Impacts

Have the FY14 program activities impacted human and/or infrastructure resources in any additional areas beyond the primary objectives of the program? If so, please describe any activities and results of those activities, especially pertaining to the following:

- **Engagement opportunities for the public (beyond those persons typically considered program participants) to increase interest in STEM, perception of STEM's value to their lives, or their ability to participate in STEM**
- **Professional development for pre-service or in-service STEM teachers to improve their content knowledge and pedagogical skills**
- **Development and/or dissemination of instructional materials or educational resources**
- **Support for the development or advancement of STEM personnel (i.e., Army Scientists & Engineers, Army-sponsored university faculty and other personnel), programs, or other physical infrastructure**
- **Contributions having intellectual merit or broader impact to the field of informal science education and outreach**

If any of these activities are conducted through websites and/or social media, the summary of results should include the analysis of key website or social media analytics.

Funding, Budget, and Expenditures

1. Provide an overview of FY14 funding

FY14 Funding Overview	Amount
Carry-forward funding from FY13	
New funding received in FY14	
Total budget for FY14 (FY13 carry-over plus FY14 new funding)	
Total FY14 expenses (estimate for 30 Sept)	
Carry-forward funding from FY14 into FY15 (total FY14 budget minus estimate of total FY14 expenses)	

2. Funding to the cooperative agreement comes from a variety of sources (general purpose funds, laboratory specific stipend funds, and Navy and Air Force funds for JSHS, etc.). The type of funding is indicated on AEOP CA modifications. What type of funds supported your program in FY14 (include funding carried over from FY13 in your totals)?

FY14 AEOP CA Funding Type/Source	Amount
General purpose funds	
Laboratory specific stipend funds - [Indicate Laboratory and replicate row as needed so that each contributing laboratory is represented on a separate line]	
Total laboratory specific stipend funds	
Air Force/ Navy JSHS funds	
Total FY14 funding (add types of funding, should be equivalent to "Total budget for FY14" in table above)	

3. How do your actual FY14 expenditures (estimate for 30 Sept cut-off) compare with your approved FY14 budget? Report totals in the following categories:

	Approved FY14 Budget (includes FY13 carry-over and new FY14 funding)	Actual FY14 Expenditures (estimate through 30 Sept)	Carry-over from FY14 into FY15
Marketing & Outreach (include additional funding received through special AEOP Cross-Marketing RFP process)			
National Event (where applicable)			
Scholarships/awards			
Stipends			
Other direct costs (including salary & fringe); Number of FTEs =[Indicate number of FTEs including PT wage workers]			
Overhead – Indirect Rate= [Indicate Indirect Rate and to which costs the indirect applies (i.e. labor, direct costs, etc.)]			
TOTALS (should match totals provided in tables above)			

4. Calculate average cost per student and explain how the calculation was made.

Fast Facts

Complete the summary chart below. Report data using the following categories and enter "NA" where not applicable.

FY14 [Enter Program Name]	No.
Applications & Participants	
Student Applications	
Student Participants	
Student Participation Rate (no. participants/no. applications x 100)	%
Teacher Applications	
Teacher Participants	
Teacher Participation Rate	**%**
Near-Peer Mentor Applications	
Near-Peer Mentor Participants	
Near-Peer Mentor Participation Rate	**%**
Partners	
Participating Colleges/Universities (including community colleges)	
Participating Army/DoD Laboratories	
Science & Engineer Participants	
Apprenticeships, Awards & Stipends	
Apprenticeships Provided	
Scholarships/Awards Provided	
Expenses Toward Scholarships/Awards	**$**
Expenses Toward Stipends	**$**
Budget & Expenses	
FY14 Total Budget (including carry-over from FY13 and new FY14 funding)	**$**
FY14 Total Expenses (estimate through 30 Sept)	**$**
Carry-Over from FY14 to FY15	**$**
Average cost per student	**$**