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# **Army Educational Outreach Program**

Unite



## **2017 Annual Program Evaluation Report**

## PART 1: Executive Summary



February 2018



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## 2 | Executive Summary

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 participants 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.

This report documents the evaluation of Unite, one of the AEOP initiatives. The Unite program is administered on behalf of the Army by the Technology Student Association (TSA). The evaluation study was performed by Purdue University in cooperation with Battelle, the Lead Organization (LO) in the AEOP Cooperative Agreement (CA) consortium.

In 2017, 18 college/university sites were funded through Unite/AEOP. Although Unite site programs differ from one another, they all must meet universal requirements. This results in a general consistency in student experiences and outcomes, with the flexibility for each site to design its own program to meet the unique needs of enrolled students. All Unite programs are designed to meet the following objectives:

- 1. Effectively show participants the real-world applications of math and science;
- 2. Raise participant confidence in the ability to participate in engineering activities;
- 3. Inspire participants to consider engineering majors in college;
- 4. Remove social barriers and negative attitudes about engineering;
- 5. Promote collaboration and problem-solving in a team environment;
- 6. Expose participants to STEM careers in the Army and DoD; and,
- 7. Increase the number of STEM graduates to fill the projected shortfall of scientists and engineers in national and Department of Defense (DoD) careers.

Table 1. 2017 Fast Facts	
Description of program	STEM Enrichment Activity: Pre-collegiate,
	engineering summer program at university host
	sites, targeting high school students from groups
	historically underserved in STEM areas



Participant Population (who is eligible for program)	rising 9 <sup>th</sup> -12 <sup>th</sup> grade students
Number of Registered Applicants	782
Number of Registered Participants	358
Number of Underserved registered participants	358
Placement Rate (# reg part/# reg apps)	45%
Number of Adults	402
Number of Army S&Es	38
Number of Army/DoD Research Laboratories	2
Number of K–12 Teachers (including preservice)	65 K-12; 92 university
Number of K-12 Schools (Home, Private, Public,	149
DoDEA)	
Number of K–12 Schools — Title I	110
Number of Colleges/Universities	18
Number of Other Collaborating Organizations	20
Total Cost	\$662,000
Cost Per Student Participant	\$1,849

### **Summary of Findings**

The FY17 evaluation of Unite 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 below.

2017 Unite Evaluation Findings	
Participant Profiles	
	Unite received applications from 12% more students in FY17 as compared to FY16. Overall enrollment increased by 21% as compared to FY16 (in FY17 358 students were enrolled in Unite programs; in FY16 282 students were enrolled). The placement rate for students grew from 41% in FY16 to 43% in FY17.
Unite received more applications than in previous years and served increasing numbers of students from groups underserved in STEM.	Unite enrollment for students from groups historically underserved in STEM continued at strong rates in FY17. As in FY16, nearly half (46%) of participants were female, and 68% identified themselves as Black or African American (this is an increase over FY16 when 57% of participants identified themselves as Black or African American). A majority of students (61%) indicated that they did receive free or reduced-price lunch, a commonly used indicator of family income, indicating that Unite is reaching low-income students, and 31% of participants indicated their parents did not graduate from college. Table 2 provides the participation data by site.



	Just over half (57%) of Unite students attended urban schools, a decrease compared to FY16 when nearly three-quarters of Unite students (72%) attended urban schools, a school context that tends to serve higher proportions of underserved students. It is noteworthy, however, that over a quarter of students (26%) did not provide a response to this item on the questionnaire in FY17.
Actionable Program Evaluation	
Unite participants learn about AEOP from a variety of sources, but continue to report that personal connections are a primary source of information.	Students most frequently learned about the AEOP from a family member (25%), followed by a school or university communication (22%), someone who works with the program (22%), or someone who works at the school or university they attend (21%).
Students are motivated to participate in Unite by a variety of factors, with learning opportunities and interest in STEM being primary motivators for participation.	Students were most frequently motivated to participate in Unite by the desire to learn something new or interesting (70%) and interest in STEM (68%). Other motivators included having fun (47%), building college applications or résumés (44%), and figuring out education or career goals (44%).
Unite students learned about STEM jobs and careers during Unite and, to a lesser extent, DoD STEM jobs and careers.	All Unite students reported learning about at least one STEM job or career, and 70% learned about 5 or more. Most (89%) students reported learning about at least one DoD STEM job or career, and nearly a third (32%) had learned about 5 or more. Students indicated that the most impactful resources for learning about DoD careers were their participation in Unite (77%), invited speaker or career events (73%), and Unite mentors (70%).
	Unite students credited their increased interest in pursuing STEM careers to Unite program features such as the career information and exposure they experienced, their exposure to new STEM topics, and hands-on STEM experiences.
Unite students engaged in meaningful team-based, hands- on STEM learning experiences to a greater extent than they typically engaged in these types of experiences in school.	Students reported consistently engaging in STEM activities such as working collaboratively as part of a team (73%), and analyzing data or information and drawing conclusions (56%) on a regular basis during their Unite experiences.
	Students engaged in STEM practices more frequently in Unite than in their typical school experiences.
Unite mentors used a variety of strategies to support student learning and development during Unite.	A majority of Unite mentors reported using strategies to establish the relevance of learning activities, support the diverse needs of students as learners, support student development of collaboration and interpersonal skills, support student engagement in "authentic" STEM activities, and support student STEM education and career pathways.
Students and mentors expressed high levels of overall	Students reported high levels of satisfaction with features of the Unite program. The features with which the largest proportion of students expressed being



satisfaction with Unite and identified key benefits and strengths of Unite.	"somewhat" or "very much" satisfied were the variety of STEM topics available to them in Unite (86%), stipends (payment) (85%), and field trips or laboratory tours (85%).
	The benefits of Unite most frequently cited by students included acquiring STEM knowledge and skills and the career information they received during Unite.
	Student suggestions for improvements to Unite included providing more field trips and/or speakers and more hands-on experiences.
	Mentors reported high levels of satisfaction with features of the Unite program. The Features with which the largest proportion of mentors expressed being "somewhat" or "very much" satisfied were the physical location of Unite activities (90%), support for instruction or mentorship during program activities (90%), and field trips or laboratory tours (83%).
	Mentor suggestions for improvements to Unite included increasing funding (particularly for residential experiences, meals, and student transportation) and increasing the number of field trips and/or speakers.
Outcomes Evaluation	
Unite students reported gains in student STEM knowledge and competencies.	Unite students reported gains in their STEM knowledge in a variety of areas, including large majorities (88%-89%) who reported at least "medium" gains in areas such as their in-depth knowledge of a STEM topic, knowledge of research conducted in a STEM topic or field, and knowledge of how scientists and engineers work on real problems in STEM.
	Unite students reported gains in a variety of STEM competencies. Large majorities (84%-86%) reported at least "medium" gains in competencies such as impacts on students' in-depth knowledge of a STEM topic (89%), knowledge of research conducted in a STEM topic or field (88%), and knowledge of how scientists and engineers work on real problems in STEM (88%).
Unite students demonstrated observable gains in 21 <sup>st</sup> Century Skills. Further, students reported perceived growth in skills.	Students in Unite demonstrated significant gains in their 21 <sup>st</sup> Century Skills on the four-point scale as assessed by their mentors in the domains of Creativity & Innovation (0.68 gain), Critical Thinking and Problem Solving (0.37 gain), Communication, Collaboration, Social and Cross-Cultural Skills (0.30 gain), Flexibility, Adaptability, Initiative, & Self-Direction (0.33 gain), and Productivity, Accountability, Leadership, & Responsibility (0.25 gain).
	Over three-quarters of students reported medium or large gains in all 21 <sup>st</sup> Century Skills, including working well with students from all backgrounds (91%) and including others' perspectives when making decisions (90%).
Unite impacted student STEM identities and the likelihood that students would engage in STEM activities in the future.	Over three-quarters of students reported that they had experienced medium or large gains in each area of STEM identity about which they were asked, including feeling prepared for more challenging STEM activities (88%), thinking creatively about a STEM project or activity (87%), and deciding on a path to pursue a STEM career (79%).



	A majority of students reported that they were more likely to engage in a number of STEM activities after participating in Unite. Three-quarters or more of students reported being more likely to work on a STEM project or experiment in a university or professional setting (82%); participate in a STEM camp, club, or competition; take an elective STEM class (79%); and help with a community service project related to STEM (76%).
Most Unite students had positive attitudes about DoD researchers and research, although many had no opinion.	About three-quarters of students agreed or strongly agreed with statements such as DoD research is valuable to society (77%), DoD researchers advance science and engineering fields (74%), and DoD researchers solve real-world problems (76%). Between 20% and 22% did not register an opinion (neither agreed nor disagreed with statements), suggesting that some students may have limited exposure to DoD research and researchers during their Unite experiences.
	Most students (83%) expressed interest in participating in UNITE again, and more than half were at least somewhat interested in participating in AEOPs such as SMART (61%), REAP (60%), and SEAP (51%). Over a quarter of students had not heard about SEAP (31%), GEMS (37%), JSHS (41%), and GEMS Near Peer Mentors (46%).
Unite students reported having interest in future AEOP opportunities, but many had not heard of AEOPs for which they are eligible.	When asked about resources that had impacted their awareness of AEOPs, over three-quarters of students (77%) rated participation in Unite as at least somewhat useful in learning about AEOPs. This was followed by invited speakers or career events (73%), mentors (70%), and the AEOP website (58%). Fewer than half of students rated resources such as the AEOP brochure (44%), AEOP on social media (26%), and the TSA website (25%) as being at least somewhat useful. Nearly half had not experienced the TSA website (49%) and AEOP on social media (47%). Around a quarter of students had not experienced the AEOP brochure (29%) and the AEOP website (24%).
	While well over half of mentors discussed Unite (68%) and REAP (62%) with their students, most mentors did not specifically discuss any of the other AEOPs with students. The most frequently discussed programs were Unite (68%) and REAP (62%). Most mentors did not specifically discuss any other AEOPs with students, although 26% reported discussing JSHS and 20% reported discussing CQL with Unite students. Over half (57%) of mentors reported discussing AEOP generally, but without reference to any particular program.
	Mentors reported that participating in Unite (86%), the Unite program administrator or site coordinator (70%), and invited speakers or "career" events (70%) were the most useful resources in exposing students to AEOPs.
Students reported that Unite had substantial impacts on them overall.	A majority of students reported that Unite impacted them in a variety of areas, including their confidence in their STEM knowledge, skills, and abilities (92%); their interest in taking STEM classes in school (83%); their interest in earning a STEM degree (82%); and their awareness of Army or DoD STEM research and careers (85%).



### **Responsiveness to FY17 Evaluation Recommendations**

The primary purpose of the AEOP program evaluation is to serve as a vehicle to inform future programming and continuous improvement efforts with the goal of making progress toward the AEOP priorities. In previous years the timing of the delivery of the annual program evaluation reports has precluded the ability of programs to use the data as a formative assessment tool. However, beginning with the FY17 evaluation, the goal is for programs to be able to leverage the evaluation reports as a means to target specific areas for improvement and growth.

Evaluation recommendations from FY16 made to programs are highlighted along with a summary of efforts and outcomes reflected in the FY17 APR toward these areas.

# AEOP Priority: Broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industry Base

**FY16 Finding:** EOP objectives include expanding participation of historically underrepresented and underserved populations. In 2016 and 2017, Unite engaged a majority of female and Black or African American students, however students continue to report that personal connections are a primary source of information about AEOPs. Since emails, newsletters, and websites distributed through students' schools are also a key source of information, future marketing efforts could focus on disseminating these resources through schools more effectively.

**Unite FY17 Efforts and Outcomes:** Unite marketing strategies (including use of the AEOP website as a resource) were reviewed with site directors, and AEOP brochures were provided to them prior to their recruiting period – for use with targeted schools.

**FY16 Finding:** Evaluation findings indicate that male Unite participants believed they gained more in terms of their STEM knowledge and STEM competencies than did female participants, although both males and females reported similar gains in terms of their STEM identities. The program may wish to review its practices and content to ensure that both address the needs of female participants and that mentors in the FY17 program are aware of these findings.

**Unite FY17 Efforts and Outcomes:** Providing orientation for adult mentors (instructors, graduate assistants, etc.) was a requirement that site directors were informed of – as noted in the 2017 program proposal template. The assumption is that mentor orientation involves guidance on teaching strategies, including gender best practices.

AEOP Priority: Support and empower educators with unique Army research and technology resources



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**FY16 Finding:** The Unite program may benefit from developing resources designed to provide information to students about DoD STEM research and careers. Evaluation findings indicate that mentors and field trips/speakers are key resources for this information. Because of the variety of locations of Unite programs, field trips and speakers highlighting DoD STEM research and careers are not consistently available to all sites. Creating resources that highlight the diversity of STEM career opportunities within the DoD may be beneficial. These resources may include, for example, virtual field trips to DoD STEM research sites or a database of Army S&E's willing to interact with students remotely via video or other technological means. These resources could also be used in mentor orientation to disseminate information about specific Army/DoD STEM research and careers. Furthermore, efforts to grow the participation of Army S&E's in the Unite program may be useful.

**Unite FY17 Efforts and Outcomes:** Using virtual technology as a resource to interact with S&Es has been adopted by one Unite site in particular, with success. This is a resource that will be addressed and promoted by the Unite administrator in the future. In 2017, TSA reached out to several AEOP partners and strategic partners, as well as other groups to develop resources for speakers, field trips, etc. This effort will continue in FY18.

## AEOP Priority: Develop and implement a cohesive, coordinated and sustainable STEM education outreach infrastructure across the Army

**FY16 Finding:** Few mentors explicitly discussed AEOP opportunities other than Unite with their students and substantial numbers of students had not heard of programs for which they are or soon will be eligible for, such as GEMS, JSHS, SEAP, and GEMS Near Peer Mentors. Since students identified mentors as a key source of AEOP information, mentor lack of familiarity with other AEOP opportunities may be a barrier to disseminating this information to students. In an effort to increase and standardize the information provided to students, it may be beneficial to create resources that profile AEOP programs and the relationship they have to ongoing education, on-the-job training, and DoD/Army careers and ensure that these resources reach mentors and students. Additionally, mentor orientation activities could include information about other AEOPs and resources, and provide strategies for mentors to share this information with students.

**Unite FY17 Efforts and Outcomes:** The requirement each year, which is reiterated in documentation, email messages, and conversations with site directors, is that a Unite site will fully train mentors to provide information about AEOP opportunities to students. A standardized AEOP resource was not created by TSA or the consortium for FY17, per the recommendation above, but this could be a consideration for FY18.

**FY16 Finding:** Efforts should be undertaken to improve participation in evaluation activities, as continued low response rates for the mentor questionnaire raises questions about the representativeness



of the results. Improved program communication with the individual program sites about expectations for the Unite evaluation study may help. In addition, the evaluation instruments may need to be streamlined as response fatigue can affect participation.

**Unite FY17 Efforts and Outcomes:** Site directors were informed in documentation, via several emails messages, and in conversations of the expectation that students and mentors should respond to Purdue evaluation surveys. The Unite administrator and Purdue collaborated on changes (minor) to the FY17 surveys. The surveys, and relevant accompanying information, were distributed to all sites in a timely fashion, and reminders followed. This year, the Unite administrator recruited thirteen Unite sites to participate in the 21<sup>st</sup> Century Skills Evaluation.

### **Recommendations for FY18 Program Improvement/Growth**

Evaluation findings indicate that FY17 was overall a successful year for the Unite program. Unite increased participation 21% compared to FY16. The placement rate grew to 43% (compared to 41% in FY17). More than half (51%) of participants were female and African-American/Black (66%). All Unite students reported learning about at least one STEM job or career and 70% learned about five or more. Most (89%) reported learning about at least one DoD/STEM career specifically. Students and mentors reported high levels of satisfaction with the Unite experience. In particular, Unite students reported gains in STEM learning and also reported being actively engaged in STEM practices.

While the successes for Unite detailed above are commendable, there are some areas that have potential for growth and/or improvement. The evaluation team therefore offers the following recommendations for FY18 and beyond.

AEOP Priority: Broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industry Base

As in FY16, participants continue to report that personal connections (family member) is the primary way they learned about the program (25%). This was followed by other means of marketing: school or university communication (22%), someone who works with the program (22%), and someone who works at their school or university (21%). Unite should continue efforts to support site distribution of emails and newsletters locally.

AEOP Priority: Support and empower educators with unique Army research and technology resources



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No recommendations for FY17.

# AEOP Priority: Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army

As in FY16, most mentors reported they did not specifically discuss any other AEOPs with students (57%). However, 62% did report discussing REAP with students. Findings revealed that many students had not heard of SEAP (31%), JSHS (41%), and GEMS Near Peer Mentors (46%). It is recommended that Unite invest significant efforts in providing support for local sites to promote AEOPs widely.

