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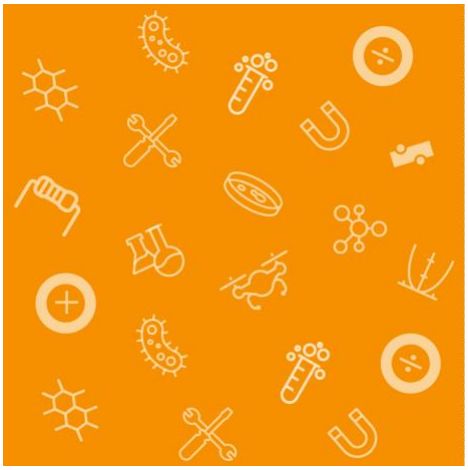

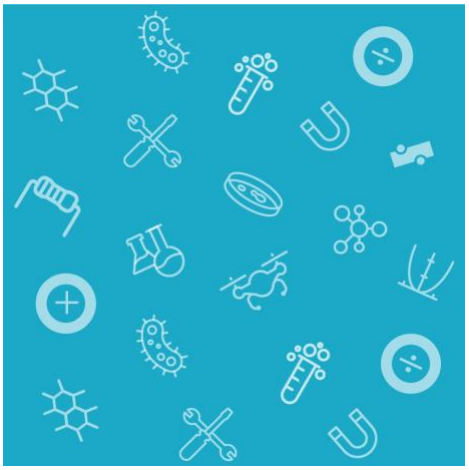

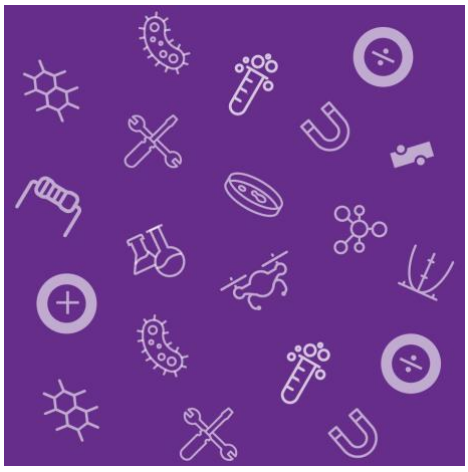


ARMY EDUCATIONAL OUTREACH PROGRAM

Summative Evaluation Report

2018 Annual Program Evaluation Report
Executive Summary

August 2019

aeop
ARMY EDUCATIONAL OUTREACH PROGRAM

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Report AEOP_08223019 has been prepared for the AEOP Cooperative Agreement and the U.S. Army by NC State University College of Education on behalf of Battelle Memorial Institute (Lead Organization) under award W911 SR-15-2-0001.

2| Table of Contents

3 | 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-undergraduate 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, providing a management structure that collectively markets the portfolio among members, leveraging available resources, and providing expertise to ensure the programs provide the greatest return on investment in achieving the Army's STEM priorities and objectives toward a STEM literate citizenry, STEM savvy educators, and sustainable infrastructure.

AEOP Priorities

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.

In FY18, AEOP initiatives served 30,311 participants (see Table 1), a slight (9%) decrease from FY17 when 32,947 participants were served. However, there was an increase (12%) in the number of adults (9,774) that participated in FY18 AEOP activities, compared to FY17. These adults included 1,919 DoD S&Es and other adults serving in mentor roles for research apprenticeships (CQL, REAP, SEAP, and URAP), judges for competitions (eCM, JSS, and JSHS), and presenters in STEM enrichment activities (GEMS and Unite) as well as in Army/DoD STEM showcases at competitions (eCM and JSHS).

Costs associated with the implementation of the FY18 AEOP portfolio of programs are detailed in Table 2. The portfolio is broken into four categories of programming: competitions, STEM enrichment programs, apprenticeships, and STEM educator programs. As in previous years, the apprenticeship programs and the STEM educator program (RESET) had the highest costs per participant while the competitions were the least costly of the AEOPs on a per student basis. The cost of AEOP competitions (eCM, JSS, and JSHS) in FY17 ranged from $159 per student (eCM) to $609 per student (JSHS). The cost of STEM enrichment programs (CII, GEMS, Unite) ranged from $233 per student for CII, typically a 1-week summer STEM experience, to $1,766 for Unite, a 4-6-week summer STEM experience for students from historically underserved and under-represented groups. Apprenticeship program (CQL, HSAP, REAP, SEAP, URAP) costs ranged from $2,889 per apprentice (REAP) to $7,463 per

apprentice (CQL), with cost variations reflecting the duration of the program and academic level of apprentices. RESET is currently the only STEM educator program in the AEOP and cost $7,098 per participant in 2018.

Two programs, GEMS and Unite, had slightly lower costs per student participant in FY18 as compared to FY17. All other programs experienced slight increases in cost per student in FY18 as compared to FY17.

Table 1. 2018 AEOP Participation by Youth and Adults

		Youth	Adults
CII	Camp Invention Initiative	1,805	153
CQL	College Qualified Leaders	214	216
eCM	eCYBERMISSION	20,004	3,469
GEMS	Gains in the Education of Mathematics & Science	3,341	595
HSAP	High School Apprenticeship Program	48	53
JSHS	Junior Science & Humanities Symposium	3,069	4,199
JSS	Junior Solar Sprint	1,081	328
REAP	Research & Engineering Apprenticeship Program	139	117
RESET*	Research Experiences for STEM Educators and Teachers	0	25
SEAP	Science & Engineering Apprentice Program	114	150
Unite	Unite	429	401
URAP	Undergraduate Research Apprenticeship Program	67	68
	Total 2018 AEOP Participants	**30,311**	**9,774**

*Note – RESET participants are teachers, therefore has no youth participants.

Table 2. 2018 AEOP Costs				
	Program Type	**Program Cost**	**Cost Per Participant**	**Average Stipend Per Participant**
CII	STEM Enrichment Program (grades K-6)	$419,750	$233	NA
CQL	STEM Apprenticeship Program (undergraduate/graduate)	$1,747,201	$8,164	$7,463
eCM	STEM Competition (grades 6-9)	$3,189,980	$159	NA
GEMS	STEM Enrichment Program (grades 5-12)	$1,447,889	$433	$268*
HSAP	STEM Apprenticeship Program (grades 9-12)	$202,436	$4,217	$2,996
JSHS	STEM Competition (grades 9-12)	$1,871,919	$609	NA
JSS	STEM Competition (grades 5-8)	$184,552	$171	NA
REAP	STEM Apprenticeship Program (grades 9-12)	$398,640	$2,889	$2,147
RESET	STEM Educator Program	$141,964	$7,098	$3,993
SEAP	STEM Apprenticeship Program (grades 9-12)	$437,550	$3,838	$3,106
Unite	STEM Enrichment Program (grades 9-12)	$757,752	$1,766	NA
URAP	STEM Apprenticeship Program (undergraduate)	$409,561	$6,113	$4,419

* Average stipend for GEMS program includes stipends for student participants (3,341), NPMs (151), and RTs (68)

Collaboration with other organizations and the involvement of adult participants who serve as mentors, judges, team advisors, and in various other roles are key assets of the AEOP (Table 3). In particular, AEOP initiatives are distinguished from other STEM outreach programs by the AEOP's ability to leverage Army and DoD S&Es and Army and DoD laboratories in its programs. The 9,875 adults who served as mentors, judges, presenters, and other volunteers within AEOP apprenticeships, competitions, and STEM programs across the country represented DoD/Army laboratories, K-12 schools, and college/universities. In 2018, 1,984 adult participants were Army/DoD S&Es and 238 were college or university S&Es. Of these, 604 served as mentors to student apprentices in CQL, HSAP, REAP, SEAP, and URAP. Another 1,081 Army/DoD S&Es participated in eCM as judges and in other roles (i.e. Cyberguides and ambassadors), 366 participated in GEMS, 139 served as judges and presenters in JSHS, 5 as mentors for teachers in RESET, and 27 as presenters in Unite. This is a decrease in Army/DoD S&E participation as compared to FY17 when 2,137 Army and DoD S&Es participated in AEOPs. Four of the 12 AEOP initiatives (GEMS, SEAP, RESET and CQL) took place at Army laboratories. HSAP and URAP apprentices

were placed in 74 Army-funded laboratories at colleges and universities around the country, with 121 college/university S&Es serving as mentors to HSAP and URAP apprentices.

The AEOP also actively engaged K-12 participants both nationally and internationally (from DoDEA schools) in FY18 programs. Youth and teachers from 3,656 K-12 schools (1,518 with Title I status) participated in AEOPs in 2018. K-12 teachers are frequently a source of information about AEOPs for their students and are especially critical to the success of the eCM, JSS, and JSHS competitions, often engaging entire classrooms of students in the programs and serving as team advisors or mentors. In 2018, 791 K-12 teachers participated in eCM, 299 in JSS, and 804 in JSHS.

Colleges and universities are also key collaborators for AEOP programming. College and university S&Es, students, and other staff actively participated in AEOP initiatives such as HSAP, URAP, Unite, and GEMS in 2018. Colleges and universities across the U.S. acted as host sites for JSHS regional symposia (46), the Unite summer program (19), and the HSAP (33) and URAP (48) apprenticeship programs. The total number of colleges, universities, and laboratories are not totaled in Table 3 due to the fact that many of these partners engage with more than one AEOP program.

Table 3. Number of 2018 Collaborating Schools, Laboratories, Army/DoD S&Es, and Other Organizations								
Program	K-12 Schools		Colleges/ Universities (represented by participants or serving as host sites)		Army and DoD Research Labs/ Army Agencies	Army-Funded University Labs	Army and DoD Scientists & Engineers (S&Es)	Other Collaborating Organizations
	Total	Title I	Total	HBCU/ MIs				
Camp Invention (CII)	22	21	NA	NA	12	NA	NA	NA
College Qualified Leaders (CQL)	NA	NA	113	7	13	NA	216	NA
eCYBERMISSION (eCM)	572	278	26	6	29	NA	1,081	12
Gains in the Education of Mathematics and Science (GEMS)	1,165	409	67	2	18	NA	366	11
High School Apprenticeship Program (HSAP)	45	15	33	13	NA	33	NA	NA
Junior Science and Humanities Symposium (JSHS)	1,005	240	119	7	48	NA	139	76
Junior Solar Sprint (JSS)	373	96	NA	NA	NA	NA	0	4
Research and Engineering Apprenticeship Program (REAP)	167	119	53	31	NA	NA	NA	NA
Research Experiences for STEM Educators (RESET)	20	7	1	0	4	NA	5	5

Science and Engineering Apprentice Program (SEAP)	76	38	NA	NA	11	NA	150	NA
Unite	211	84	19	10	4	NA	27	38
University Research Apprenticeship Program (URAP)	NA	NA	48	22	NA	41	NA	NA
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**1,984**	**NA**

4 | Summary of Findings and Recommendations

The 2018 AEOP evaluation collected data about participants, their perceptions of program processes, resources, and activities, and indicators of achievement related to outcomes aligned with AEOP and program objectives. A summary of findings is provided in Tables 4 and 5.

Table 4. 2018 Summary of Findings - Near Term

Priority 1: STEM Literate Citizenry *Broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industry Base.*	
Finding #1	**Decline in overall student participation and some program participation but increase in adult mentors/teachers/volunteers.** In FY18, participation in AEOPs decreased overall by 9% from FY17, resuming the downward trend in enrollments since 2014 that was reversed in FY17 (41,802 in FY14; 38,039 in FY15; 30,972 in FY16; 32,947 in FY17; and 30,334 in FY18). Seven programs experienced increases in enrollment in FY18 as compared to FY17 (CII, 21%; GEMS, 15%; JSS, 17%; REAP, 15%; SEAP, 1%; Unite, 17%; URAP, 12%). These slight increases were largely offset by the substantial enrollment decreases in JSHS (82% decrease: 5,577 in FY17; 3,069 in FY18) and eCM (6% decrease: 21,277 in FY17; 20,002 in FY18). CQL and HSAP also experienced enrollment declines in FY18 (CQL, 6%; HSAP, 13%). Adult participants increased 12% in FY18 to 9,774.
Finding #2	**Slight decline in participation for apprenticeship programs.** Despite overall growth in participation in three apprenticeship programs, REAP, SEAP, and URAP, overall enrollment declined by 2% as compared to FY17 due to the enrollment decreases in CQL and HSAP noted above.
Finding #3	**Slight decline in number of applications to participate in AEOPs with accompanying overall increase in placement rates in FY18.** The number of applications received in FY18 (39,325) decreased by 18% as compared to the number of applications in FY17 (48,419) but increased by 5% over FY16 applications. The overall placement rate across AEOPs, however, increased to 77% in FY18, up from 68% in FY17. This increase in placement rate is due to the decreased number of applications received since, as noted above, overall enrollment for AEOP declined in FY18 as compared to FY17. Three apprenticeship programs experienced decreased placement rates as compared to prior years: CQL - 37% in FY18, 41% FY17, and 51% in FY16; REAP - 15% in FY18, 17% in FY17, and 25% in FY16; URAP – 20% in FY18, 9% in FY17, and 29% in FY16. Placement rates in the other apprenticeship programs remained unchanged from FY17 levels (HSAP,

	9%; SEAP, 13%). Other programs showed growth in placement rates, however. JSHS served 72% of applicants in FY18 as compared to 65% in FY17; Unite placed 59% of applicants in FY18 as compared to 45% in FY17; and URAP placed 20% of applicants as compared with 9% in FY17. The placement rate for GEMS remained unchanged from FY17 (61%).
Finding #4	**AEOPs continued to serve underserved populations.** The AEOPs continued to prioritize the participation of students from traditionally underserved groups, per the AEOP definition: *AEOP's definition of underserved includes at least two of the following: low-income students; students belonging to race and ethnic minorities that are historically underrepresented in STEM; students with disabilities; students with English as a second language; first-generation college students; students in rural, frontier, or other federally targeted outreach schools; females in certain STEM fields.* Overall, 45.5% of AEOP youth participants were classified as underrepresented. This number ranged from as high as 96% in REAP and as low as 18% in URAP. Programs with half or more of their youth participants classified as U2 students were HSAP, eCM, Unite, and REAP. While each individual underserved demographic category was found among youth participants, none held 50% or more of the overall participants. The closest to half were females (49%), school location (38%), and racial/ethnic minority (33%). Programs still have room to grow their inclusion of U2 populations across the AEOP.
Finding #5	**Participants reported engaging in STEM practices significantly more in their AEOP programs as compared to in their typical school experiences for each program.** Evaluation findings indicated that AEOPs consistently provided opportunities for participants to engage in authentic STEM activities that are significantly more intensive than those they experience in their typical school settings.
Finding #6	**Participants reported increased STEM competencies, STEM skills, STEM knowledge, STEM practices, and confidence in STEM after participating in AEOPs.** • Participants from all programs reported gains in their STEM knowledge after participating in AEOPs. Most programs averaged between "some" and "large" gains. However, the overall eCM regional participants experienced smaller gains than any other program, reporting only "a little gain" in STEM knowledge, STEM practices, and STEM identity. • Likewise, students and apprentices in all programs reported gains in their STEM competencies, however FY18 gains were slightly lower than those reported in FY17 for all programs except for GEMS and HSAP, which reported slightly higher average gains as compared to FY17. • Participants in each program also reported gains in their 21st Century Skills, however, most programs reported slightly lower gains in FY18 compared to FY17 except for REAP and SEAP which reported slightly greater gains. • Participants in all programs reported some level of gains in their STEM identities,

	however, only CQL, JSS, and REAP reported larger gains in FY18 compared to FY17. • For all programs except eCM and JSHS, more than half of participants agreed their AEOP program contributed to their increased confidence and interest in each area about which they were asked. Confidence in STEM knowledge, skills, and abilities was ranked consistently highest, with a range of 65% (eCM) to 100% (HSAP) agreement.
Finding #7	**Participants demonstrated increased attainment toward mastery of the 21st Century Skills across their participation in the AEOPs.** Participants from apprenticeship programs (CQL, SEAP, REAP, URAP, HSAP) and STEM programs and competitions (Unite and eCM mini-grant) demonstrated growth in all areas of the 21st Century Skills Assessment from baseline (first days of program) to end of program as assessed by their mentors or teachers. Participants showed the largest growth in the skill sets of Creativity and Innovation as well as Critical Thinking and Problem Solving. Participants from SEAP and REAP generally had the lowest pre-assessment scores and also demonstrated large amounts of growth. While CQL students demonstrated growth in most domains, these students came in at a higher pre-assessment level and had slightly less room for growth. Participants demonstrated growth in Creativity & Innovation; Critical Thinking & Problem Solving (all programs except SEAP and CQL); Communication, Collaboration, and Social and Cross-Cultural Skills; Information, Media, & Technological Literacy (all programs except CQL); Flexibility, Adaptability, Initiative, & Self-Direction (all programs except CQL); Productivity, Accountability, Leadership, & Responsibility (all programs except HSAP).
Finding #8	**Participants reported positive attitudes toward Army/DoD STEM Research.** A majority of participants across programs agreed that Army/DoD research and researchers advance science and engineering fields (range of 48%-97%), develop new cutting-edge technologies (range of 52%-93%), that DoD researchers solve real-world problems (range of 56%-97%), and that DoD research is valuable to society (range of 56%-95%). These responses are similar to those from 2017. The highest rates of agreement (averaging 90% or higher) continues to be from participants at programs hosted at DoD research laboratories (CQL and SEAP) and DoD-sponsored college/university laboratories (HSAP and URAP). Competition programs (eCM, JSHS, and JSS) had the lowest rates of agreement averaging below three-quarters (53%-73%), with eCM regional participants being significantly lower than other programs ranging from 48-56% agreement.
Finding #9	**Evaluation findings indicated that the AEOP exposed participants to STEM careers generally and to Army and DoD STEM careers, and participating in AEOPs increased their interest in pursuing STEM careers.** In all programs except eCM, JSS, and URAP -- a majority of participants (32%-91%) reported learning about 3 or more STEM careers

	during their AEOP participation. eCM regional participants were the lowest, reporting only 37% learned about 3 or more STEM jobs/careers during their program. Less than 50% of students in eCM, JSHS, JSS, HSAP, REAP, and URAP learned about 3 or more DoD STEM careers. However, majority of students (range of 60%-86%) in CQL, eCM National, GEMS, SEAP, and Unite had learned about 3 or more DoD STEM careers. Only 17% of eCM regional participants reported learning about 3 or more DoD STEM jobs/careers in FY18. In FY18 a greater percentage of participants in CQL, eCM, GEMS, JSHS, REAP, and SEAP learned about DoD STEM careers as compared to FY17. As in previous years, comparisons of participants participating in AEOPs held at Army research laboratories (CQL, GEMS, and SEAP), with participants at Army-sponsored university labs (HSAP and URAP), and non-Army affiliated settings (eCM Regional, JSHS, REAP, and Unite) reveal that, overall, participants in programs hosted at Army sites learned about more DoD STEM careers. Between 34% and 86% of participants indicated that their AEOP participation resulted in an increased interest in DoD STEM careers. More than half of responding apprentices reported interest in DoD STEM careers in FY18 (range of 56%-86%), findings slightly lower than those for FY17 (range of 66%-87%). eCM reported the least interest in a STEM career (39%) and awareness of DoD STEM careers (47%), as well as appreciation of Army/DoD STEM research (52%) and interest in pursuing a STEM career with the DoD (34%). SEAP was the only program to show an upward trend from FY17 (75%) to FY18 (86%).
Priority 2: STEM Savvy Educators *Support and empower educators with unique Army research and technology resources.*	
Finding #1	**Adult participants (i.e. mentors, S&E's, Team Advisors, teachers) reported use of effective mentoring strategies in varying degrees across the AEOPs in FY17.** Strategies to engage students in authentic STEM activities (range of 76%-100%) and to support the development of collaboration and interpersonal skills (78%-96%) were used most frequently, while strategies to support participants STEM educational and career pathways (range of 50%-88%) were used the least. In addition, a majority of all adults (range of 71%-93%) reported using strategies to establish the relevance of learning activities and support the needs of diverse students as learners (65%-93%). There is still room for improvement in this area, to move toward all mentors using the effective

	strategies with student participants.
Finding #2	**In FY18, participants continued to be satisfied with the support received from their mentors/S&Es/Team Advisors/teachers.** Most apprentices and students in all programs reported high levels of satisfaction with their mentors and the quality of instruction they received (range of 56%-90%). Levels of satisfaction with mentorship were somewhat higher than those reported in FY17 for CQL, GEMS, HSAP, and REAP, however levels of satisfaction with mentors in Unite and URAP were lower than in FY17.
Priority 3: Sustainable Infrastructure *Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army.*	
Finding #1	**The primary means of learning about AEOPs and associated opportunities in FY18 continues to be personal connections, school/university connections, past participants, or someone connected directly with AEOPs.** A continued strength of AEOP is the expansive network of connections to local communities that serves as a continued means of recruitment for the program, suggesting that program alumnae often act as informal ambassadors for these programs. Overwhelmingly, participants and mentors reported that AEOP social media, AEOP website, and other materials were much less frequently used as a means for introducing them to the program.
Finding #2	**Despite limited past participation and awareness of participants and mentors of AEOP opportunities, FY18 participants reported interest in participating in AEOP initiatives in the future.** Very few participants had ever participated in any AEOP other than the one in which they were currently enrolled with the exception of the 21% of REAP apprentices who reported they had participated in Unite, and the 37% of SEAP participants who reported having participated in GEMS in the past. These findings suggest there is a relatively robust pipeline relationship between the Unite and REAP and GEMS and SEAP programs. Findings suggest that youth participants and mentors across the AEOP have limited awareness of AEOP programs other than those in which they are currently participating. Participants primarily expressed interest in repeating participation in the AEOP in which they were currently enrolled (range of 56%-91%), but also expressed interest in participating in other AEOPs. The most interest was expressed in SMART with five programs having more than half of their participants interested: eCM (51%), Unite (52%), SEAP (63%), HSAP (63%), and CQL (72%).

Finding #3	**Participation in the AEOP evaluation has room for improvement.** Participation in the evaluation questionnaire declined for all programs for both youth and adult participants with the exception of eCM team advisors (9% in FY17, 32% in FY18) and Unite students (65% in FY17, 69% in FY18) and mentors (17% in FY17, 26% in FY18). In regard to the 21st Century Assessment, CQL, HSAP, REAP, SEAP, and URAP (all apprenticeship programs) had less than 20 participants in the assessment. Unite and eCM had over 200 participants each in the assessment, by comparison.

Table 5. 2018 Summary of Findings - Mid to Long Term	
Priority 1: STEM Literate Citizenry *Broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industry Base.*	
Finding #1	**AEOP alumni indicated interest in pursuing STEM degrees and careers.** a majority of alumni participating in the survey indicated they were at least somewhat interested in earning a STEM degree (89%) and pursuing a STEM career (90%).
Finding #2	**Alumni are engaged in pursuing STEM opportunities and careers.** Nearly half (43%) of AEOP alumni reported that they were currently talking a STEM elective course. Nearly a third (27%) are currently pursuing a STEM career, and 14% are already working in a STEM career.
Finding #3	**AEOP Alumni participate in other STEM-related activities.** Three-quarters or more of alumni reported sometimes or frequently engaging in activities such as learning about new things in STEM (80%) and solving math/science puzzles (78%). Further, half or more of alumni reported engaging in STEM sometimes or frequently by reading/watching STEM non-fiction (55%) and talking with friends/family about STEM (66%).
Finding #4	**Alumni hold positive views toward STEM generally and Army/DoD STEM specifically.** AEOP alumni have extremely positive perceptions toward STEM in general, with more than 90% of participants agreeing with the following items: there are STEM careers that are a good fit with their interests (91%); they feel successful in STEM classes (91%); they can use STEM to help improve their community (93%); and they enjoy solving real-world problems (94%). Furthermore, nearly all alumni indicated feeling Army/DoD research is valuable to society (95%), advances STEM fields (93%), solves real-world problems (92%), and develops new, cutting edge technologies (92%).

Finding #5	**Alumni report interest in STEM careers generally, as well as with the Army/DoD specifically.** A large majority of alumni reported being interested in pursuing a STEM career (88%) in general. Approximately two-thirds indicated they were aware of Army/DoD STEM careers (63%), and 71% of alumni indicated they would be interested in learning more about Army/DoD STEM careers. More than half (58%) of alumni indicated that they were interested in pursuing an Army/DoD STEM career.
Finding #6	**AEOP Alumni reported completing STEM coursework and being enrolled in STEM degree programs.** Large proportions of AEOP alumni reported completing STEM coursework in high school. One third to two-thirds of alumni indicated they had completed higher level STEM classes such as AP Math (32%), Calculus (38%), AP Science (41%), Chemistry (73%), and Physics (53%). Among the more than 40% of AEOP alumni indicated that they were enrolled in post-secondary education, 40% reported that they were pursuing some form of STEM degree or certificate. Of those enrolled in STEM degree programs, alumni were most likely to be enrolled in engineering-focused programs (12%) followed by, physical science (4%), technology/computer science (4%), life science (3%), and medicine (1%).
Priority 2: STEM Savvy Educators *Support and empower educators with unique Army research and technology resources.*	
Finding #1	**Participants reported very positive impacts of their mentors and agreed mentoring is a valuable aspect of AEOPs.** Most alumni felt their mentoring experience was very positive (80%), enhanced their learning (79%), and was a valuable aspect of their AEOP (81%). Many alumni also believed their AEOP mentor helped influence their future academic career decisions (74%), and helped them learn about Army/DoD careers (65%). While the reported mentoring relationships appeared to be strong, only half indicated they have stayed in touch with their AEOP mentor after the program (51%).
Priority 3: Sustainable Infrastructure *Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army.*	
Finding #1	**Alumni reported strong interest in participating in other AEOPs, though less than 60% indicated they were familiar with other AEOPs.** While only slightly more than half of alumni (53%) indicated that they were familiar with other AEOP programs, 77% reported being interested in participating in other AEOPs.

What AEOP Participants are saying…..

*"The work [in **CQL**] was impactful, interesting, and pushed me to be a better engineer. And almost all of my satisfaction was a result of my mentors and the work environment they created for me. They made sure I was progressing, understanding what I was doing, and overall having an enjoyable experience. Because of them, I will definitely consider working for the DoD and hope to apply for a SMART Scholarship."* (CQL Apprentice)

*"[**CQL** Apprentices] actually see that the DoD does a lot of really, really good world class science that impacts people's lives all over the world, not just the soldiers…As they go on, whether they become involved with DoD or not, when they're out there working in science in another area, they have a respect. They may come back and collaborate and do projects with the DoD because they have that experience. That's all very, very positive."* (CQL Mentor)

*"I believe **eCYBERMISSION** was a great experience, not only helping me learn about STEM, but also making me a better team player, as well as helping me solve real world problems. I know more about the world around me and can hopefully one day use my newfound knowledge to make something important."* (eCM-R Student)

*"**eCYBERMISSION** continues to be the highlight of science for my 6th - 9th graders. They show tremendous growth during the experience and from year to year as they grow through the program. It is the single best way I've found to develop independent workers."* (eCM Team Advisor)

*"Being in **GEMS** was an amazing experience. I was introduced to new STEM careers and technology. For example, we made some circuits, got to experience VR, and we were able to lean about moral dilemmas…I am glad that I choose to go to GEMS for a week I wish it would be longer!"* (GEMS Student)
"

"*I love teaching students in **GEMS**. Not only do I see how their perspective on STEM changes towards a positive one, but I can truly see kids grow in their interests over the years."* (GEMS Mentor)

*"The connections I had made with my mentor, the other interns, and the other people in the lab group made the summer a fulfilling experience. I learned to be more persistent, creative, and inquisitive because research does not come easily. At the end of the program, I learned more about what researchers do, made great friendships, gained a lot of respect for researchers and was able to reflect on my growth. I am glad that I applied and am highly satisfied with my **HSAP** experience!"* (HSAP Apprentice)

*"As a university professional, **HSAP** gives me an opportunity to interact on a daily basis with high school students to better understand their experiences before they become undergraduates. I am most excited about the opportunity to provide mentoring and guidance to these students as they formulate potential career pathways, and to encourage them to succeed. As one of my previous students said, 'The program and your mentoring changed my life! I had been told by many high school teachers that certain areas and subjects were 'beyond my capability',' but you showed me that I can do it. You really gave me confidence to succeed.'"* (HSAP Mentor)

*"**JSHS** was a phenomenal experience for me to share both my independent research and get to meet new people that share my same passion for science. Being able to present to many people of diverse backgrounds was an eye-opening experience."* (R-JSHS Student)

*"I've been involved in **JSHS** for the last 34 years in education and have seen how it captures the interest of students and gives them a vehicle to answer questions about the world in which they live."* (JSHS Mentor)

"*I really enjoyed my **JSS** experience. I feel that I have grown with my knowledge of mechanics. I learned more about solar panels and how they are used. Creating a car and overcoming obstacles with my teammate was a fun experience."* (JSS Regional Student)

*"I LOVE **JSS**! This was my second year and I will do it again in the future. One of the things that I really like about this opportunity is that it challenges the students to try things and then make decisions for improvements based on evidence and data. Also, this is NOT an area of STEM that I am very familiar with, so I couldn't provide answers for the students, but I could give them tips or strategies for research and problem solving. Since they didn't have a teacher that 'knew the answers' they really had to take some risks and try things. It is amazing to watch them, and I had total student engagement throughout the project. It is wonderful!"* (JSS Team Advisor)

*"[**REAP**] was very good and helped me learn more about research and careers in STEM. The mentors were very helpful and easy to work with and the other participants were also fun to be around. Overall the experience was great, and I learned a lot from my research and interacting with other people and made me learn more about careers."* (REAP Apprentice)

*"The **REAP** experience has been very productive…I believe the students gained deeper knowledge and understanding about how to engage in research. They also seemed to gain real knowledge and appreciation for working in a university laboratory. It was enjoyable to watch the mentors and mentees interact with each other. Great experience! I hope to have more students in future summer offerings."* (REAP Mentor)

*"I have had an amazing experience in the **SEAP** program! I have always been interested in pursuing a degree in the STEM field, specifically engineering, and I feel like the program gave me the*

confidence to follow through with it. When I first began the program, I was extremely worried that I didn't have the skills or intelligence to work on a real-world project. However, the more I learned, asked questions, and designed, the more self-assured I became. Now, I feel as though I have the conviction and knowledge to seek more STEM opportunities with confidence and eagerness!" (SEAP Apprentice)

*"I was very satisfied with the **SEAP** experience. The student I worked with was intelligent, well-mannered, dependable, and eager to learn. It was beneficial to me, as I could rely on the student to assist in the lab. I believe the student had a good experience being exposed to numerous projects and researchers to get a sense of the types of problems we are faced with."* (SEAP Mentor)

*"There are no words to express how blessed I feel to experience this month of challenges, accomplishments, making new friends, exploring into careers, visiting interesting places. During [**Unite**] I have gained so much like knowing the basics of engineering and working as a team. This opportunity has showed me that there is so much to be offered if I put work to and my mind into it."* (Unite Student)

*"[**Unite**] has helped many students become interested in STEM degrees and careers. Many students have been exposed to new opportunities through this program and have started on a path to obtain a STEM career."* (Unite Mentor)

*"I was extremely satisfied with my [**URAP**] apprenticeship program to say the very least. What I believe made it most worth while was my mentor... From the very beginning of the program all the way to the end, [my mentor] made sure that I not only felt comfortable with what it was I was doing, but also constantly reminded me of the significance of the work and why we were doing the things we did. [He] took the time to explain every aspect of the research to me, and made sure I knew the importance of everything I was doing, which made the experience extremely rewarding. By the end of the program I felt a great sense of accomplishment, and I would not trade the experience for anything. I thank and appreciate everyone involved in the program and am very grateful to have had this opportunity."* (URAP Apprentice)

*"I am extremely satisfied with the [**URAP]** experience. It is a great opportunity to mentor undergraduates, expose them to research, and motivate them STEM careers and graduate school. As a prior military officer, the best part is exposing students to non-uniform DoD service which 99% have never even known about, let alone considered."* (URAP Mentor)

Recommendations for FY19 Program Improvement/Growth

While the successes for AEOP detailed above are commendable, there are some areas that remain with potential for growth and/or improvement. The evaluation team therefore offers the following recommendations for FY19 and beyond.

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

Increase and broaden participation in selected AEOP programs. Despite some progress in growing participation numbers in FY17, AEOP programs experienced a 9% decrease in enrollment in FY18. However, participation numbers remain strong at over 30,000. It is recommended that in FY19 and beyond that programs which have the capacity to grow utilize new and innovative means to market and communicate opportunities to new audiences. As in FY17, it is suggested that programs with capacity for growth examine strategies that programs such as Unite and JSS have used to produce growth in FY17 and FY18 (over 15%). AEOPs should continue to work to grow the percentage and number of underserved students who are participating in the program. Unite, REAP and HSAP can serve as potential models for the consortium of how to achieve this in a more rapid and impactful manner.

Examine means for increasing infrastructure to grow placement rates in JSHS and apprenticeship programs. As in FY17, we are recommending exploring infrastructure growth to accommodate more participants in selected programs. NSTA presents new leadership for JSHS in FY19 and should employ strategies that have been successful with growing eCM to its' current level of over 20,000 participants.

Examine programmatic modifications to grow impact on students. Despite continued impact on providing students a more authentic, effective STEM experience than in school across the board with AEOP programs, some individual programs are having less influence on STEM knowledge, practices, and identity. Further, some programs are also struggling with integrating STEM careers and DoD STEM careers to students. For example, the regional eCM participants (~20,000) reported the lowest percentage of agreement that the program had impacted them in STEM competencies (knowledge, practices, identity) than other programs while also coming in with the lowest exposure to STEM careers, attitudes toward DoD, and future interest in FY18. As the AEOP works to align the work of the consortium with the new Federal STEM Education Strategic Plan, it is recommended that the AEOP examine program alignment with desired outcomes and develop consortium-wide resources that can be used to integrate DoD and STEM careers carte blanche into the curriculum.

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

As in FY17, continue to focus on strengthening role of adults in mentoring and instruction. In FY18, most program mentors reported 50-100% use of the various effective mentoring strategies with their participants. However, several areas were reported at less than 75% use including: strategies to support STEM educational and career pathways, strategies to support the needs of diverse learners, and strategies to establish the relevance of learning activities. In the previous two years it has been recommended that the consortium develop tools/trainings for mentors to use to support more use of the strategies for effective mentoring. It is recommended that the AEOP contract with a provider to develop an online mini-MOOC that can be accessed by mentors in AEOP (and shared across agencies if desired) to onboard mentors in a formal and best-practice manner. The MOOC is self-paced and can include resources to be used in programming.

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

Expand reach of AEOP marketing, recruitment strategies beyond current local networks. Over the past four years of the AEOP evaluation, it has become increasingly clear that the portfolio has a vibrant, grass-roots network that has served the AEOP very well in the past and currently. However, this network has resulted in lack of scale in recruitment efforts and many areas/regions have not been provided with the opportunity to participate. For example, the JSHS Kentucky regional site includes participants from a 100-mile radius historically, excluding students from the southeastern and central parts of the state. This is typical for many other JSHS sites, as well as other programs, such as those situated at Army laboratories (GEMS, CQL, SEAP) that use personal and work connections to recruit participants.

This is not to say that the current AEOP network be disregarded – it should continue to be nurtured and leveraged. It is recommended that the consortium work to develop, at a minimum, a targeted plan for outreach and participation for FY19.

Recommendations include expanding beyond the Strategic Outreach Partners to provide seed funding to organizations such as STEMx, FETC, or others to market AEOP opportunities in the frequent communications to state leaders. Additionally, states such as Indiana have the entire school directory available on their website. Perhaps Widmeyer could devote some of their effort to communicating with superintendents/principals regarding AEOP opportunities. There are also listservs that can be utilized for state teacher associations, higher education faculty organizations, rural school networks, etc.

Participation in AEOP evaluation. Garnering the appropriate level of participation in our annual AEOP evaluation has some inherent challenges. There were several programs in FY18 that had less than desired engagement in the evaluation activities. Three programs had less than 20 mentors who completed the questionnaire, for example. All apprenticeship programs had less than 20

completed and matched pre/post 21st Century Skills Assessments in FY18. It is recommended that the AEOP programs continue to communicate the importance of participation in the evaluation and provide multiple reminders across the duration of their program at strategic times to make completion of the tasks a bit easier for staff. The evaluation team will be revising the Evaluation Toolkit for programs in FY20 to provide more supports within to help accomplish this.

To view the rest of the report:

AEOP Evaluation Report Narrative Part 2