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Army Educational Outreach Program

Unite

2017 Annual Program Evaluation Report

PART 2: Evaluation Findings

February 2018

aeop
ARMY EDUCATIONAL OUTREACH PROGRAM

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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-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.

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.

This report documents the evaluation of one of the AEOP elements, Unite. 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 CA consortium.

Program Overview

Unite, an initiative in the AEOP portfolio, is a pre-collegiate, academic, summer program for rising 9th through 12th grade students from groups historically underserved in science, technology, engineering, and mathematics (STEM). Managed by the Technology Student Association (TSA), the program is designed to encourage and help prepare students to pursue college-level studies and, ultimately, careers in STEM fields. UNITE sites are typically funded for two years, pending performance. New sites for FY17 (Miami Dade College, Wolfson Campus; Morgan State University; Savannah State University; and Xavier University of Louisiana) were awarded one year funding

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 sites to design their program to meet the unique

needs of their students. Unite leverages university partnerships and their existing summer programs to collectively develop academically prepared students for post-secondary STEM studies. 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.

The 18 host sites, which included 13 HBCUs/MSIs, received applications from 782 students, 358 of whom were enrolled in the program, indicating that substantially more qualified students applied than there were available participation slots for the 2017 Unite program. Unite received more applications in FY17 than in FY16 when 685 applications were received. The placement rate was slightly higher (43%) in FY17 than in FY16 (41%).

Adult participants in Unite included university faculty and students, local teachers, and industry STEM professionals who played important roles as "mentors" to Unite students. In FY17, there were 402 adult participants (285 in FY16). This number included 38 Army S&Es, a substantial increase from FY16 when 18 Army S&Es participated in Unite. Likewise, the number of K-12 teachers participating in Unite increased to 65 in FY17, up from 37 in FY16.

Table 1 contains an overview of demographic data for Unite participants. These data indicate that Unite successfully served students from groups that are historically underserved underserved in STEM fields.[1] In particular, about two-thirds (68%) of students identified themselves as Black or African American and nearly half (46%) of participants were female. More than half (69%) of students attended urban schools. 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.

[1] 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 underserved in STEM; students with disabilities; students with English as a second language; first-generation college students; students in rural, frontier, or other Federal targeted outreach schools; females in certain STEM fields.

Table 1. 2017 Unite Student Participant Profile		
Demographic Category		
Respondent Gender (n = 176)		
Female	81	46%
Male	94	53%
Choose not to report	1	1%
Respondent Race/Ethnicity (n = 176)		
Asian	12	7%
Black or African American	120	68%
Hispanic or Latino	17	10%
Native American or Alaska Native	5	3%
Native Hawaiian or Other Pacific Islander	0	0%
White	16	9%
Other race or ethnicity	4	2%
Choose not to report	2	1%
School setting (n=176)		
Urban (city)	121	69%
Suburban	33	19%
Rural (country)	17	10%
Frontier or tribal School	0	0%
DoDDS/DoDEA School	0	0%
Home school	5	3%
Online school	0	0%
Receives free or reduced-price lunch (n = 176)		
Yes	108	61%
No	55	31%
Choose not to report	13	8%
English as 1st Language (n = 176)		
Yes	156	89%
No	19	11%
Choose not to report	1	<1%
Parent Graduated College (n = 176)		
Yes	107	61%
No	55	31%
Choose not to report	14	8%

Table 2. 2017 Unite Participation						
Unite Site	**HS Students**	**University Faculty**	**K-12 Teachers**	**Undergrad Grad Students**	**Army DoD S&Es**	**Other**
Alabama State University (AL)	11	2	5	5	11	6
Fayetteville State University (NC)	20	---	2	0	19	6
Florida Agricultural and Mechanical University (FL)	24	11	---	22	---	2
Harris-Stowe State University (MO)	18	1	1	4	1	14
Jackson State University (MS)	15	3	1	1		5
Marshall University (WV)	23	27	2	6	---	4
Miami Dade College, Wolfson Campus	14	3	1	---	---	2
Michigan Technological University (MI)	15	10	---	44	---	10
Morgan State University (WV)	18	4	2	9	---	---
New Jersey Institute of Technology (NJ)	20	---	4	2	1	---
Savannah State University	15	2	19	---	---	9
Texas Southern University (TX)	41	10	3	4	1	2
University of Colorado, Colorado Springs (CO)	17	1	1	2	---	---
University of Nevada, Las Vegas (NV)	18	2	2	4	---	1
University of New Mexico (NM)	16	14	5	20	3	11
University of Pennsylvania (PA)	15	---	1	4	2	---
Virginia Tech (VA)	23	2	9	5	---	---
Xavier University of Louisiana (LA)	35	---	7	---	---	3
TOTAL	**358**	**92**	**65**	**132**	**38**	**75**

The total cost of the 2017 Unite program was $662,000. The average cost per student is $1,849. In alignment with practices of similar AEOP initiatives, Unite provides participants with a stipend of $100 per week. Table 3 summarizes these and other 2017 Unite program costs.

Table 2. 2017 Unite Program Costs	
2017 Unite – Cost Per Participant	
Administrative costs (includes salaries, fringe)	$128,533
Unite site award payments	$500,148
Other operational costs	$33,319
Total Cost	$662,000
Cost per Student Participant	$1,849

4 | Evidence - Based Program Change

The AEOP identified three key priorities for the portfolio which were evaluated in FY17:

1. Increase outreach to populations that are historically underserved and under-represented in STEM;
2. Increase participants' awareness of Army/DoD STEM careers; and
3. Increase participants' awareness of other AEOP opportunities.

TSA pursued the following objectives for the FY17 administration of the Unite program in light of the key AEOP priorities, the FY16 Unite evaluation study, and site visits conducted by TSA and the LO:

I. Provide oversight (through distribution of program requirements and marketing materials, and via phone conversations, email correspondence, and site visits) to sites to ensure that UNITE program requirements are met.

a. Provided and reiterated program requirements to site directors using the FY17 program proposal document, in phone conversations, via email, during site visits, and in feedback post evaluation visits.
b. Contacted AEOP strategic partners in locations where Unite programs are held, primarily for recruiting underserved and underrepresented students, but in some cases to seek STEM professional resources (Unite program speakers or mentors).

II. Communicate with Army and UNITE site directors to facilitate opportunities for Army/DoD/STEM professionals to serve as resources for sites.

a. Following any resource request from a site director, contacted RDECOM for assistance in locating an Army resource lead in the general location of the Unite site.
b. Investigated AEOP partner and strategic partner leads for STEM professional resources.

III. Foster communication among site directors in an effort to share best practices and improve programs.

a. Hosted a conference call with all site directors in winter 2016-2017. The size of the Unite site director group and date/time challenges required two separate calls, using the same agenda; the conference calls were held on consecutive days in December.

III. Maintain/increase communication about UNITE to the public.

a. On multiple occasions, reminded site directors of the value of photos/videos/stories and encouraged them to submit these items to Unite administrator, as well as to feature Unite through their institution social media.
b. Released Unite information to the public via a TSA press release, and Facebook and Twitter posts during the school year.
c. Collaborated with Widmeyer and Metriks to promote Unite news.
d. Reminded site evaluators of, and included in the site evaluation report template instructions, a request for photos in reports submitted by site evaluators to the Unite administrator.

5 | Evaluation At-A-Glance

Purdue University, in collaboration with TSA, conducted a comprehensive evaluation of Unite. The Unite logic model below presents a summary of the expected outputs and outcomes for HSAP in relation to the AEOP and Unite-specific priorities. This logic model provided guidance for the overall Unite evaluation strategy.

Inputs	Activities	Outputs	Outcomes (Short term)	Impact (Long Term)
• Army sponsorship • TSA providing oversight of site programming • Operations conducted by 18 universities • Students participating in 18 Unite programs • STEM professionals and educators serving as Unite instructors • Stipends for students to support meals and travel • Centralized branding and comprehensive marketing • Centralized evaluation	• Students engage in hands-on programs focused on rigorous classroom instruction that prepared students for admissions into engineering tracks in college • STEM professionals and educators facilitate hands-on learning experiences for students • Program activities expose students to AEOP programs and/or STEM careers in the Army or DoD	• Number and diversity of student participants engaged in programs • Number and diversity of STEM professionals and educators serving as instructors 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 • Students, instructors, site coordinators, and TSA contributing to evaluation	• Increased participant STEM competencies (confidence, knowledge, skills, and/or abilities to do STEM) • Increased interest in future STEM engagement • 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 Unite programs	• Increased student participation in other AEOP opportunities and Army/DoD-sponsored scholarship/ fellowship programs • Increased student pursuit of STEM coursework in secondary and post-secondary schooling • Increased student pursuit of STEM degrees • Increased student pursuit of STEM careers • Increased student pursuit of Army/DoD STEM careers • Continuous improvement and sustainability of Unite

The evaluation included information from multiple participant groups about Unite 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 Unite program objectives.

The assessment strategy for Unite included student and adult/mentor questionnaires, participant 21st Century Skills Assessment (pre/post), one site visit, one student focus group, one mentor focus group, and the Annual Program Report (APR) prepared by TSA using data from all Unite sites. Tables 4-8 outline the

information collected in student and instructor questionnaires and focus groups, as well as information from the APR that is relevant to this evaluation report.

Key Evaluation Questions

- What aspects of Unite motivate participation?
- What aspects of Unite structure and processes are working well?
- What aspects of Unite could be improved?
- Did participation in Unite:
  - Increase apprentices' STEM competencies?
  - Increase apprentices' interest in future STEM engagement?
  - Increase apprentices' awareness of and interest in other AEOP opportunities?
  - Increase apprentices' awareness of and interest in Army/DoD STEM research and careers?

Table 4. 2017 Apprentice Questionnaires

Category	Description
Profile	**Demographics:** Participant gender, age, grade level, race/ethnicity, and socioeconomic status indicators
	Education Intentions: Degree level, confidence to achieve educational goals, field sought
AEOP Goal 1	**Capturing the Student Experience:** In-school vs. In-program experience
	STEM Competencies: Gains in Knowledge of STEM, Science & Engineering Practices; contribution of AEOP
	Transferrable Competencies: Gains in 21st Century Skills
	STEM Identity: Gains in STEM identity, intentions to participate in STEM, and STEM-oriented education and career aspirations; contribution of AEOP
	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 (students respond to a subset)
	Comprehensive Marketing Strategy: 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 5. 2017 Mentor Questionnaires	
Category	**Description**
Profile	**Demographics:** Participant gender, race/ethnicity, occupation, past participation
Satisfaction & Suggestions	Awareness of HSAP, satisfaction with and suggestions for improving HSAP programs, benefits to participants
AEOP Goal 1	**Capturing the Student 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 students to AEOPs, impact of AEOP resources on efforts; contribution of AEOP in changing student AEOP metrics
	Army/DoD STEM: attitudes toward Army/DoD STEM research and careers, efforts to expose students to Army/DoD STEM research/careers, impact of AEOP resources on efforts; contribution of AEOP in changing student Army/DoD career metrics
AEOP Goal 2 and 3	**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
Satisfaction & Suggestions	Benefits to participants, suggestions for improving programs, overall satisfaction

Table 6. 2017Apprentice Interviews	
Category	**Description**
Satisfaction & Suggestions	Awareness of HSAP, motivating factors for participation, awareness of implications of research topics, satisfaction with and suggestions for improving HSAP 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 7. 2017 Mentor Interviews	
Category	**Description**
Satisfaction & Suggestions	Perceived value of HSAP, benefits to participants suggestions for improving HSAP 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 HSAP

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. Focus group protocols are provided in Appendix B (students) and Appendix C (mentors); the student questionnaire is provided in Appendix D and the mentor questionnaire

is provided in Appendix E. The new assessment of student 21st Century Skills was piloted in 2017 and the tool is included in Appendix F. Major trends in data and analyses are reported herein.

Study Sample

Student and adult data for questionnaire participation are provided in Tables 9 and 10. Table 9 outlines questionnaire response rate and margin of error at the 95% confidence level (a measure of how representative the sample is of the population) for both students and adults. The student response rate for 2017 (65%) is higher than in 2016 (58%) and 2015 (56%) and falls within an acceptable margin of error. The margin of error for adult surveys is larger than generally acceptable, indicating that the samples may not be representative of their respective populations, although the adult response rate (17%) is higher than in 2016 when it was 15% and 2015 when it was 21%. Caution is warranted when interpreting the adult data, as the responses may not be representative of the overall adult population participating in the Unite program. Table 10 indicates the number of students and adult mentors who participated in Unite by site as well as the number of survey respondents.

Table 9. 2017 Unite Questionnaire Participation

Participant Group	Respondents (Sample)	Total Participants (Population)	Participation Rate	Margin of Error @ 95% Confidence[2]
Students	233	358	65.1%	±3.8%
Adults	69	402	17.2%	±10.75%

One student focus group and 1 mentor focus group were conducted during the site visit. At this site, Unite was combined with a residential Outward Bound program that served both Unite and non-Unite students. Two students participated in the focus groups. One student was male and one was female, and one was of Black/African American ethnicity while the other was of Hispanic/Latino ethnicity. Five adults, two females and three males, participated in the mentor focus group. Of these, 1 was of Black/African American ethnicity and 4 were White. Focus groups were not intended to yield generalizable findings;

[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% confi1dence is calculated to be 5%, if the question was 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.

rather they were intended to provide additional evidence of, explanation for, or illustrations of student questionnaire data. They add to the overall narrative of Unite's efforts and impact, and highlight areas for future exploration in programming and evaluation.

Table 10. 2017 Unite Site Survey Respondent Numbers				
2017 Unite Site	**Students**		**Mentors**	
	No. of Participants	**No. of Survey Respondents**	**No. of Participants**	**No. of Survey Respondents**
Alabama State University (AL)	11	11	12	4
Fayetteville State University (NC)	20	19	8	3
Florida Agricultural and Mechanical University (FL)	24	18	33	8
Harris-Stowe State University (MO)	18	0	6	3
Jackson State University (MS)	15	19	5	3
Marshall University (WV)	23	19	35	2
Miami Dade College, Wolfson Campus (FL)	14	5	4	1
Michigan Technological University (MI)	15	14	47	5
Morgan State University (GA)	18	17	15	7
New Jersey Institute of Technology (NJ)	20	0	6	1
Savannah State University	15	15	21	4
Texas Southern University (TX)	41	14	17	8
University of Colorado, Colorado Springs (CO)	17	19	4	3
University of Nevada, Las Vegas (NV)	18	0	8	0
University of New Mexico (NM)	16	13	37	3
University of Pennsylvania (PA)	15	14	5	2
Virginia Tech (VA)	23	0	16	0
Xavier University of Louisiana (LA)	35	32	10	10
TOTAL	**358**	**233**	**289**	**69**

Respondent Profiles

Apprentice Demographics

Demographic data for Unite students who responded to the questionnaire are summarized in Tables 11 and 12. Slightly more females (52%) completed the survey than males (47%). Two-thirds of responding students identified with the race/ethnicity category of Black or African American. This was more than any other single race/ethnicity category. Hispanic or Latino students and White students were represented equally with nearly 10% each in terms of questionnaire respondents.

Unite students responding to the questionnaire are demographically similar to the overall population of 2017 Unite students. In both the overall population and the sample, just over half of respondents were female and about two-thirds identified themselves as Black or African American. Likewise, about half of students reported attending urban schools. Slightly fewer students (64% of the sample versus 71% of enrolled students who provided this information) reported receiving free or reduced-price lunch.

Table 11. 2017 Unite Student Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 233)		
Female	109	51.93%
Male	121	46.78%
Choose not to report	3	1.29%
Respondent Race/Ethnicity (n = 233)		
Asian	17	7.30%
Black or African American	156	66.95%
Hispanic or Latino	22	9.44%
Native American or Alaska Native	7	3.00%
Native Hawaiian or Other Pacific Islander	1	0.43%
White	22	9.44%
Other race or ethnicity, (specify):†	5	2.15%
Choose not to report	3	1.29%
Respondent Grade Level (n = 233)		
9th	37	15.88%
10th	79	33.91%
11th	78	33.48%
12th	36	15.45%
College Freshman	2	0.86%
Other	1	0.43
Choose not to report	0	0.00%
Respondent Eligible for Free/Reduced-Price Lunch (n = 233)		
Yes	148	63.52%
No	74	31.76%
Choose not to report	11	4.72%

†Other = Trinidadian; Arab; Hispanic and African American; Mixed (black and white); Black and white

Table 12. 2017 Unite Student Respondent School Information		
Demographic Category	**Questionnaire Respondents**	
Respondent School Location (n = 236)		
Urban (city)	119	50.4%
Suburban	33	14.0%
Rural (country)	17	7.2%
Home School	5	2.1%
Choose not to report	62	26.3%

Few students reported participating in any AEOPs other than Unite (see Table 13). While approximately 19% of students reported previously participating in Unite, only 1-2 participants reported having previously participated in Camp Invention, eCYBERMISSION, and/or GEMS. Over a third of students (37%) reported participating in "other" STEM Programs.

Table 13. Student Participation in AEOP Programs (n=174)

	Response Percent	Response Total
Camp Invention	1.14 %	2
eCYBERMISSION	1.14 %	2
Junior Solar Sprint (JSS)	0.00 %	0
Gains in the Education of Mathematics and Science (GEMS)	0.57 %	1
Unite	18.97 %	33
Junior Science & Humanities Symposium (JSHS)	0.00 %	0
Science & Engineering Apprenticeship Program (SEAP)	0.00 %	0
Research & Engineering Apprenticeship Program (REAP)	0.00 %	0
High School Apprenticeship Program (HSAP)	0.00 %	0
College Qualified Leaders (CQL)	0.00 %	0
Undergraduate Research Apprenticeship Program (URAP)	0.00 %	0
Science Mathematics & Research for Transformation	0.00 %	0
I've never participated in any AEOP programs	51.72 %	90
Other STEM Program	36.78 %	64

Mentor Demographics

Demographic data were also collected for adult mentors who responded to the questionnaire (see Table 14). Slightly more than half mentors were female (57%). Of the responding mentors, 61% identified as

Black or African American, 22% as White, 13% as Asian, and 4% as Hispanic or Latino. Mentor occupations were diverse with 28% scientists, engineers, or mathematicians in training, 26% university educators, 17% teachers, 14% other school staff, and 4% scientists, engineers, or mathematics professionals.

Table 14. 2017 Unite Mentor Respondent Profile

Demographic Category	Questionnaire Respondents	
Respondent Gender (n = 69)		
Female	39	56.52%
Male	30	43.48%
Respondent Race/Ethnicity (n =69)		
Asian	9	13.04%
Black or African American	42	60.87%
Hispanic or Latino	3	4.35%
Native American or Alaska Native	0	0.00%
Native Hawaiian or Other Pacific Islander	0	0.00%
White	15	21.74%
Other race or ethnicity	0	0.00%
Choose not to report	0	0.00%
Respondent Occupation (n = 69)		
Teacher	12	17.39%
Other school staff	10	14.49%
University educator	18	26.09%
Scientist, Engineer, or Mathematician in training	19	27.54%
Scientist, Engineer, or Mathematics professional	3	4.35%
Other, (specify) [†]	7	10.14%
Respondent Role in Unite (n = 69)		
Instructor (typically a University or Army Scientist or Engineer)	29	42.03%
Classroom Assistant	22	31.88%
Resource Teacher	4	5.80%
Other, (specify) [††]	14	20.29%

[†]Other = Mentor/Chaperone; Academic Advisor; Student; Resident assistant; Program Director; Educational Advisor (2)

[††] Other = teacher; Program Coordinator; Instructor and PI for the grant; Program Organizer and Instructor; Director (3); Academic Advisor; Resident Assistant/Mentor; Resident Assistant; site director; Staff; Director-Professor; Research Mentor

6 | Actionable Program Evaluation

The 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 4-8.

A focus of the Actionable Program Evaluation is efforts toward the long-term goal of Unite 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. Unite sites reach out to students from underserved populations. Thus, it is important to consider how Unite is marketed and ultimately recruits student participants, the factors that motivate students to participate in Unite, participant perceptions of and satisfaction with activities, what value participants place on program activities, and what recommendations participants have for program improvement. The following sections report perceptions of students and mentors that pertain to current programmatic efforts and inform evidence-based improvements to help Unite achieve outcomes related to AEOP programs and objectives with a specific focus on helping Unite continue to expand participation from and support STEM education for students from underserved groups.

Marketing and Recruiting to Underserved Populations

Many Unite sites employed multi-pronged efforts to market programs to and recruit students from schools identified as serving large populations of traditionally underserved students. The TSA used a variety of marketing strategies including:

- Maintained online presence through news release, student feature, and Alumni Spotlights
- Disseminated information using Facebook (1 post) and Twitter (6 Tweets) social media platforms
- AEOP brochures were provided to site directors prior to their recruiting period – for use with targeted schools.
- On multiple occasions, reminded site directors of the value of photos/videos/stories and encourage them to submit these items to Unite administrator, as well as feature Unite through their institution social media.
- Released Unite information to the public via a TSA press release, and Facebook and Twitter posts during the school year.
- Collaborated with Widmeyer and Metriks to promote Unite news.
- Reminded site evaluators of, and included in the site evaluation report template instructions, a request for photos in reports submitted by site evaluators to the Unite administrator.
- Contacted AEOP strategic partners in locations where Unite programs are held, primarily for recruiting students from underserved groups, but in some cases to seek STEM professional resources (Unite program speakers or mentors).

To understand which recruitment methods were most effective, students were asked to identify all of the ways they had learned about AEOP (see Table 15). The sources of information most frequently chosen were a family member (25%), school or university newsletter, email, or website (22%), someone who works with the program (22%), and someone who works at the school or university the student attends (21%). Another 18% of students reported learning about AEOP from a community group or program. Only 4% became aware of AEOP from the AEOP website, and no students reported learning about AEOP from social media.

Table 15. How Students Learned About AEOP (n=174)

	Response Percent	Response Total
Army Educational Outreach Program (AEOP) Website	4.02 %	7
AEOP on Facebook, Twitter, Instagram, or other social media	0.00 %	0
School or university newsletter, email, or website	22.41 %	39
Past participant of program	7.47 %	13
Friend	13.79 %	24
Family Member	25.29 %	44
Someone who works at the school or university I attend	20.69 %	36
Someone who works with the program	21.84 %	38
Someone who works with the Department of Defense (Army, Navy, Air Force, etc.)	1.15 %	2
Community group or program	17.82 %	31
Choose Not to Report	4.60 %	8

Student focus groups participants were also asked how they heard about Unite. One of the students reporting hearing about Unite through her school and the other student reported that he heard about Unite from a friend, saying "I really think that [my friend] opened me up to a new road ahead."

Table 16 displays mentors' reports of how they learned about AEOP. Being a past participant of Unite (33%) was the most frequently cited source of information. Other frequently reported sources of information about AEOP were someone who works with the program (26%), someone who works at the school or university they attend (23%), and a school or university newsletter, email, or website (21%). Less frequently chosen responses included the AEOP website (14%), AEOP on social media (2%), a friend (2%), and a community group or program (2%).

Table 16. How Mentors Learned About AEOP (n=43)

	Response Percent	Response Total
Army Educational Outreach Program (AEOP) Website	13.95 %	6
AEOP on Facebook, Twitter, Instagram, or other social media	2.33 %	1
School or university newsletter, email, or website	20.93 %	9
Past participant of program	32.56 %	14
Friend	2.33 %	1
Family Member	0.00 %	0
Someone who works at the school or university I attend	23.26 %	10
Someone who works with the program	25.58 %	11
Someone who works with the Department of Defense (Army, Navy, Air Force, etc.)	0.00 %	0
Community group or program	2.33 %	1
Choose Not to Report	4.65 %	2

Factors Motivating Participation

Students responded to an item about the factors that motivated their participation in Unite (see Table 17). The two motivators most frequently chosen by students were the desire to learn something new or interesting (70%) and interest in STEM (68%). Less than half of students selected any of the other motivators for participating in Unite.

Table 17. Factors Motivating Students to Participate in Unite (n=174)

	Response Percent	Response Total
Teacher or professor encouragement	20.69 %	36
An academic requirement or school grade	6.90 %	12
Desire to learn something new or interesting	70.11 %	122
The mentor(s)	9.77 %	17
Building college application or résumé	43.68 %	76
Networking opportunities	23.56 %	41
Interest in science, technology, engineering, or	67.82 %	118
Interest in STEM careers with the Army	16.67 %	29
Having fun	47.13 %	82
Earning stipends or awards for doing STEM	20.69 %	36
Opportunity to do something with friends	15.52 %	27
Opportunity to use advanced laboratory technology	29.89 %	52
Desire to expand laboratory or research skills	36.21 %	63
Learning in ways that are not possible in school	41.38 %	72
Serving the community or country	14.94 %	26
Exploring a unique work environment	32.76 %	57
Figuring out education or career goals	44.25 %	77
Seeing how school learning applies to real life	30.46 %	53
Recommendations of past participants	7.47 %	13
Choose Not to Report	2.87 %	5

The Unite Experience

Increasing the number of underserved students who pursue STEM careers is a Unite goal. As such, it is important to know how many jobs/careers (both STEM and DoD STEM) the students learned about through Unite. Table 18 displays student responses for the past three years. In 2017, all responding students reported learning about at least one STEM job/career, and most (70%) reported learning about 5 or more. Fewer students reported learning about at least one DoD STEM job/career (89%), and slightly less than a third (32%) reported learning about 5 or more STEM jobs/careers in the DoD.

Table 18. Number of STEM Jobs/Careers Students Learned About During Unite in 2017 (n = 233)		
	STEM Jobs/Careers	**DoD STEM Jobs/Careers**
None	0%	11%
1	1%	10%
2	6%	18%
3	12%	18%
4	11%	11%
5 or more	70%	32%

Students were asked to report on the impact of various resources on their awareness of DoD STEM careers (see Table 19). Participation in Unite (77%), invited speakers or career events (73%), and students' Unite mentors (70%) were reported most often as being somewhat or very much impactful. More than half of students reported not having experienced the TSA website (60%) and AEOP on social media (59%).

Students were also asked about the frequency with which they engaged in various STEM practices during Unite (see Table 20). For example, over half of students who completed the questionnaire indicated working collaboratively as part of a team (73%) and analyzing data or information and drawing conclusions (56%) most days or every day of their Unite experience. Mentors were also asked to indicate the frequency with which students engaged in these activities, and their responses were similar although they tended to report somewhat higher frequency of engagement in STEM practices than did students.

Table 19. Impact of Resources on Student Awareness of DoD Careers (n=233)

	Did not experience	**Not at all**	**A little**	**Somewhat**	**Very much**	**Response Total**
Technology Student Association (TSA) website	48.9%	10.7%	15.5%	15.5%	9.4%	
	114	25	36	36	22	**233**
Army Educational Outreach Program (AEOP) website	24.0%	4.3%	14.2%	24.9%	32.6%	
	56	10	33	58	76	**233**
AEOP on Facebook, Twitter, Pinterest or other social media	46.8%	12.4%	14.6%	16.7%	9.4%	
	109	29	34	39	22	**233**

AEOP brochure	29.2%	6.4%	20.6%	21.9%	21.9%	
	68	15	48	51	51	**233**
My Unite mentor(s)	13.7%	2.6%	13.3%	18.9%	51.5%	
	32	6	31	44	120	**233**
Invited speakers or "career" events during Unite	12.9%	3.0%	11.6%	22.7%	49.8%	
	30	7	27	53	116	**233**
Participation in Unite	9.4%	3.0%	10.7%	20.6%	56.2%	
	22	7	25	48	131	**233**

Table 20. Student STEM Engagement in Unite (n=233)

	Not at all	At least once	A few times	Most days	Every day	Response Total
Work with a STEM researcher or company on a real-world STEM research project.	21.0%	18.0%	21.5%	23.2%	16.3%	
	49	42	50	54	38	**233**
Work with a STEM researcher on a research project topic assigned by my mentor or teacher.	18.0%	18.5%	20.2%	25.8%	17.6%	
	42	43	47	60	41	**233**
Design my own research or investigation based on my own	21.9%	19.3%	25.8%	16.3%	16.7%	
	51	45	60	38	39	**233**
Present my STEM research to a panel of judges from industry or the	47.6%	19.3%	17.6%	10.7%	4.7%	
	111	45	41	25	11	**233**
Interact with STEM researchers.	11.6%	14.6%	28.3%	20.2%	25.3%	
	27	34	66	47	59	**233**
Use laboratory procedures and tools.	10.7%	12.4%	29.2%	27.0%	20.6%	
	25	29	68	63	48	**233**

Identify questions or problems to investigate.	9.4%	12.9%	30.0%	24.5%	23.2%	
	22	30	70	57	54	**233**
Design and carry out an investigation.	15.9%	14.6%	20.6%	27.5%	21.5%	
	37	34	48	64	50	**233**
Analyze data or information and draw conclusions.	7.7%	12.4%	24.0%	31.8%	24.0%	
	18	29	56	74	56	**233**
Work collaboratively as part of a team.	4.3%	6.4%	15.9%	34.3%	39.1%	
	10	15	37	80	91	**233**
Build or make a computer model.	36.5%	20.6%	15.0%	16.7%	11.2%	
	85	48	35	39	26	**233**
Solve real world problems.	15.0%	16.7%	19.7%	21.5%	27.0%	
	35	39	46	50	63	**233**

A composite score[3] was calculated for the Engaging in STEM Practices in Unite items.[4] 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. Composite scores were used to test whether there were differences in student experiences by subgroups – gender and race/ethnicity. No significant differences by gender or race/ethnicity were found in terms of Engaging in STEM Practices in Unite.

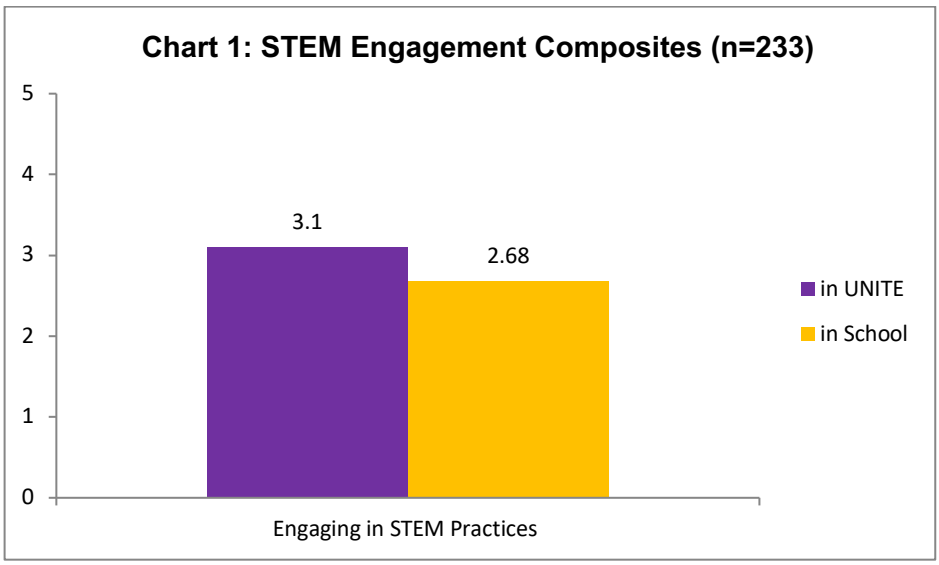
To examine how the Unite experience compares to students' typical school experiences, students were also asked how often they engaged in the same activities in school. These items were also combined into a composite variable.[5] Chart 1 shows that student-reported STEM Engagement scores were significantly higher for their engagement in STEM practices in Unite as compared to their engagement in STEM practices in school (large effect of d = 0.96 standard deviations).[6] This suggests that Unite offers students more intensive STEM learning experiences than they would generally receive in school.

[3] 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.

[4] The Cronbach's alpha reliability for the 11 STEM Engagement in Unite items was 0.934.

[5] The Cronbach's alpha reliability for the 11 STEM Engagement in School items was 0.940.

[6] Dependent Samples t-test for STEM Engagement: t(232)=7.28, p<.001.



The Role of Mentors

Mentors play a critical role in the Unite program. Mentors design and facilitate learning activities, deliver content through instruction, supervise and support collaboration and teamwork, provide one-on-one support to students, chaperone students, advise students on educational and career paths, and generally serve as STEM role models for Unite students. Adult respondents to the mentor questionnaire reported working between 0 and 40 students, with an average of 21 students per mentor.

Mentors were asked whether or not they used a number of strategies when working with students (see Tables 21-25). These strategies comprised five main areas of effective mentoring:[7]

1. Establishing the relevance of learning activities;
2. Supporting the diverse needs of students as learners;

[7] Mentoring strategies examined in the evaluation were best practices identified in various articles including:

Maltese, A. V., & Tai, R. H. (2011). Pipeline persistence: Examining the association of educational experiences with earned degrees in STEM among US students. *Science Education*, *95*(5), 877-907.

Ornstein, A. (2006). The frequency of hands-on experimentation and student attitudes toward science: A statistically significant relation (2005-51-Ornstein). *Journal of Science Education and Technology*, *15*(3-4), 285-297.

Sadler, P. M., Sonnert, G., Hazari, Z., & Tai, R. (2012). Stability and volatility of STEM career interest in high school: A gender study. *Science Education*, *96*(3), 411-427.

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.

When asked about their use of strategies to help make learning activities relevant to students, more than half of mentors reported using all strategies listed. Large majorities of mentors reported becoming familiar with students' backgrounds and interests (96%), giving students real-life problems to investigate or solve (91%), giving students real-life problems to investigate or solve (90%), and helping students become aware of the role(s) that STEM plays in their everyday lives (88%). Fewer mentors reported selecting readings or activities that related to students' backgrounds (61%).

Table 21. Mentors Using Strategies to Establish Relevance of Learning Activities (n=69)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Become familiar with my student(s) background and interests at the beginning of the Unite experience	91.3%	8.7%	
	63	6	**69**
Giving students real-life problems to investigate or solve	89.9%	10.1%	
	62	7	**69**
Selecting readings or activities that relate to students' backgrounds	60.9%	39.1%	
	42	27	**69**
Encouraging students to suggest new readings, activities, or projects	81.2%	18.8%	
	56	13	**69**
Helping students become aware of the role(s) that STEM plays in their everyday lives	88.4%	11.6%	
	61	8	**69**
Helping students understand how STEM can help them improve their own community	85.5%	14.5%	
	59	10	**69**
Asking students to relate real-life events or activities to topics covered in Unite	87.0%	13.0%	
	60	9	**69**

Mentors also reported supporting the diverse needs of students as learners through the use of various strategies. Table 22 shows that 94% of respondents indicated using a variety of teaching and/or mentoring activities to meet the needs of all students, and a similarly large proportion (91%) reported treating all students the same way regardless of gender or race/ethnicity. Approximately three-quarters or more of

mentors reported implementing all other strategies on the questionnaire related to supporting the diverse needs of students as learners.

Table 22. Mentors Using Strategies to Support Diverse Needs of Students as Learners (n=69)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Identify the different learning styles that my student (s) may have at the beginning of the Unite experience	78.3%	21.7%	
	54	15	**69**
Interact with students and other personnel the same way regardless of their background	91.3%	8.7%	
	63	6	**69**
Use a variety of teaching and/or mentoring activities to meet the needs of all students	94.2%	5.8%	
	65	4	**69**
Integrating ideas from education literature to teach/mentor students from groups underrepresented in STEM	81.2%	18.8%	
	56	13	**69**
Providing extra readings, activities, or learning support for students who lack essential background knowledge or skills	75.4%	24.6%	
	52	17	**69**
Directing students to other individuals or programs for additional support as needed	85.5%	14.5%	
	59	10	**69**
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	73.9%	26.1%	
	51	18	**69**

To support development of students' collaboration and interpersonal skills, mentors most frequently reported implementing strategies such as having students work on collaborative activities or projects as a member of a team (97%) and having student(s) listen to the ideas of others with an open mind (97%). As seen in Table 23, a large majority of mentors (81%-88%) also reported utilizing the other strategies listed to support student development of collaboration and interpersonal skills.

Table 23. Mentors Using Strategies to Support Student Development of Collaboration and Interpersonal Skills (n=69)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Having my student(s) tell other people about their backgrounds and interests	81.2%	18.8%	
	56	13	**69**
Having my student(s) explain difficult ideas to others	88.4%	11.6%	
	61	8	**69**
Having my student(s) listen to the ideas of others with an open mind	97.1%	2.9%	
	67	2	**69**
Having my student(s) exchange ideas with others whose backgrounds or viewpoints are different from their own	88.4%	11.6%	
	61	8	**69**
Having my student(s) give and receive constructive feedback with others	85.5%	14.5%	
	59	10	**69**
Having students work on collaborative activities or projects as a member of a team	97.1%	2.9%	
	67	2	**69**
Allowing my student(s) to resolve conflicts and reach agreement within their team	85.5%	14.5%	
	59	10	**69**

While more than half of mentors reported using each of the strategies to support student engagement in "authentic" STEM activities (see Table 24), nearly all mentors indicated they used strategies such as encouraging students to seek support from other team members (99%), encouraging students to learn collaboratively (team projects, team meetings, journal clubs, etc.) (97%), allowing students to work independently to improve their self-management abilities (96%), and providing students with constructive feedback to improve their STEM competencies (93%). Fewer mentors reported having students search for and review technical research to support their work (70%), and demonstrating laboratory/field techniques, procedures, and tools for their student(s) (77%).

Table 24. Mentors Using Strategies to Support Student Engagement in "Authentic" STEM Activities (n=69)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Teaching (or assigning readings) about specific STEM subject matter	81.2%	18.8%	
	56	13	**69**
Having my students search for and review technical research to support their work	69.6%	30.4%	
	48	21	**69**
Demonstrating laboratory/field techniques, procedures, and tools for my student(s)	76.8%	23.2%	
	53	16	**69**
Supervising my students while they practice STEM research skills	84.1%	15.9%	
	58	11	**69**
Providing my students with constructive feedback to improve their STEM competencies	92.8%	7.2%	
	64	5	**69**
Allowing students to work independently to improve their self-management abilities	95.7%	4.3%	
	66	3	**69**
Encouraging students to learn collaboratively (team projects, team meetings, journal clubs, etc.)	97.1%	2.9%	
	67	2	**69**
Encouraging students to seek support from other team members	98.6%	1.4%	
	68	1	**69**

Mentors were also asked to report on strategies they used to support students' STEM education and career pathways (see Table 25). Respondents reported using these strategies less frequently than the other mentoring strategies. For example, less than 50% of mentors reported helping student(s) with their resume, application, personal statement, and/or interview preparations. Nearly all mentors did, however, report asking students about their educational and career goals (97%) and provided guidance about educational pathways that will prepare their student(s) for a STEM career (96%). Mentors were more likely to introduce and discuss STEM careers and opportunities that were not related to AEOP or the DoD with their students. For example, approximately three-quarters of mentors reported discussing STEM career opportunities in industry or academia (74%) with their students, however fewer mentors reported recommending AEOPs that align with students' goals (68%) and discussing STEM career opportunities within the DoD or other government agencies (68%) with their students.

Table 25. Mentors Using Strategies to Support Student STEM Education and Career Pathways (n=69)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Asking my student(s) about their educational and/or career goals	97.1%	2.9%	
	67	2	69
Recommending extracurricular programs that align with students' goals	82.6%	17.4%	
	57	12	69
Recommending Army Educational Outreach Programs that align with students' goals	68.1%	31.9%	
	47	22	69
Providing guidance about educational pathways that will prepare my student(s) for a STEM career	95.7%	4.3%	
	66	3	69
Discussing STEM career opportunities within the DoD or other government agencies	68.1%	31.9%	
	47	22	69
Discussing STEM career opportunities in private industry or academia	73.9%	26.1%	
	51	18	69
Discussing the economic, political, ethical, and/or social context of a STEM career	65.2%	34.8%	
	45	24	69
Recommending student and professional organizations in STEM to my student(s)	76.8%	23.2%	
	53	16	69
Helping students build a professional network in a STEM field	62.3%	37.7%	
	43	26	69
Helping my student(s) with their resume, application, personal statement, and/or interview preparations	44.9%	55.1%	
	31	38	69

Establishing and maintaining a pipeline of AEOPs is an AEOP priority. Thus, mentors were asked which of the AEOP programs they explicitly discussed with their students during Unite (see Table 26). 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. In addition, over half (57%) of mentors reported discussing AEOP with students, but without reference to any particular program.

Table 26. Mentors Explicitly Discussing AEOPs with Students (n=69)

	Yes - I discussed this program with my student(s)	No - I did not discuss this program with my student(s)	Response Total
Gains in the Education of Mathematics and Science (GEMS)	23.2%	76.8%	
	16	53	**69**
Unite	68.1%	31.9%	
	47	22	**69**
Junior Science & Humanities Symposium (JSHS)	26.1%	73.9%	
	18	51	**69**
Science & Engineering Apprenticeship Program (SEAP)	36.2%	63.8%	
	25	44	**69**
Research & Engineering Apprenticeship Program (REAP)	62.3%	37.7%	
	43	26	**69**
High School Apprenticeship Program (HSAP)	29.0%	71.0%	
	20	49	**69**
College Qualified Leaders (CQL)	20.3%	79.7%	
	14	55	**69**
GEMS Near Peer Mentor Program	15.9%	84.1%	
	11	58	**69**
Undergraduate Research Apprenticeship Program (URAP)	26.1%	73.9%	
	18	51	**69**
	31.9%	68.1%	

Science Mathematics, and Research for Transformation (SMART) College Scholarship	22	47	**69**
National Defense Science & Engineering Graduate (NDSEG) Fellowship	23.2%	76.8%	
	16	53	**69**
I discussed AEOP with my student(s) but did not discuss any specific program	56.5%	43.5%	
	39	30	**69**

In accordance with the AEOP goal of creating a pipeline of AEOP initiatives, mentors were asked how to report on the usefulness of various resources in exposing students to AEOPs (see Table 27). Since mentors reported discussing few specific AEOPs with their students, it is not surprising that only three resources were widely reported (by more than half of respondents) as "very much" useful: participation in Unite (86%), the Unite program administrator or site coordinator (70%), and invited speakers or "career" events (70%). Half of the mentors reported not having experienced AEOP on social media (51%) and nearly half (46%) had not experienced the TSA website.

Table 27. Usefulness of Resources for Exposing Students to AEOPs (n=69)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	46.4%	2.9%	11.6%	14.5%	24.6%	
	32	2	8	10	17	**69**
Army Educational Outreach Program (AEOP) website	21.7%	4.3%	7.2%	20.3%	46.4%	
	15	3	5	14	32	**69**
AEOP on Facebook, Twitter, Pinterest or other social media	50.7%	5.8%	10.1%	15.9%	17.4%	
	35	4	7	11	12	**69**
AEOP brochure	17.4%	4.3%	10.1%	20.3%	47.8%	
	12	3	7	14	33	**69**
Unite Program administrator or site coordinator	15.9%	1.4%	2.9%	10.1%	69.6%	
	11	1	2	7	48	**69**
Invited speakers or "career" events	20.3%	0.0%	1.4%	8.7%	69.6%	
	14	0	1	6	48	**69**
Participation in Unite	7.2%	0.0%	0.0%	7.2%	85.5%	
	5	0	0	5	59	**69**

Mentors were asked to rate how useful the same resources were for exposing students to DoD STEM careers (see Table 28). Responses showed a similar pattern to the previous item, with mentors most likely to indicate that participation in Unite was "very much" useful (74%), followed by invited speakers or "career" events (59%), and program managers or site coordinators (51%). Interestingly, a larger proportion of mentors reported not having experienced the AEOP website (30%) and the AEOP brochure (25%) for this item than the prior item.

Table 28. Usefulness of Resources in Exposing Students to DoD STEM Careers (n=69)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	50.7%	2.9%	7.2%	13.0%	26.1%	
	35	2	5	9	18	**69**
Army Educational Outreach Program (AEOP) website	30.4%	1.4%	11.6%	11.6%	44.9%	
	21	1	8	8	31	**69**
AEOP on Facebook, Twitter, Pinterest or other social media	47.8%	4.3%	11.6%	14.5%	21.7%	
	33	3	8	10	15	**69**
AEOP brochure	24.6%	2.9%	8.7%	17.4%	46.4%	
	17	2	6	12	32	**69**
Unite Program administrator or site coordinator	26.1%	0.0%	5.8%	17.4%	50.7%	
	18	0	4	12	35	**69**
Invited speakers or "career" events	26.1%	0.0%	2.9%	11.6%	59.4%	
	18	0	2	8	41	**69**
Participation in Unite	14.5%	0.0%	4.3%	7.2%	73.9%	
	10	0	3	5	51	**69**

Satisfaction with Unite

Students and mentors were asked how satisfied they were with a number of features of the Unite program (Tables 29 and 30). Table 29 displays student responses and suggests that students were quite satisfied with Unite features. More than 80% of student respondents indicating they were at least somewhat satisfied with each of the listed program features. Students were most satisfied with the variety of STEM topics available to them in Unite (86%), stipends (payment) (85%), and field trips or laboratory tours (85%). Very few students indicated that they were "not at all" satisfied with any program feature.

Table 29. Student Satisfaction with Unite Program Features (n=233)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Applying or registering for the program	4.3%	1.3%	11.6%	23.6%	59.2%	
	10	3	27	55	138	**233**
Communicating with your Unite host site organizers	3.0%	1.3%	12.9%	25.3%	57.5%	
	7	3	30	59	134	**233**
The physical location(s) of Unite activities	2.6%	1.7%	13.3%	21.0%	61.4%	
	6	4	31	49	143	**233**
The variety of STEM topics available to you in Unite	2.1%	0.9%	10.7%	25.3%	60.9%	
	5	2	25	59	142	**233**
Teaching or mentoring provided during Unite activities	3.0%	2.6%	11.2%	21.0%	62.2%	
	7	6	26	49	145	**233**
Stipends (payment)	7.3%	1.7%	5.6%	15.0%	70.4%	
	17	4	13	35	164	**233**
Educational materials (e.g., workbooks, online resources, etc.) used during program activities	3.4%	2.6%	12.9%	24.5%	56.7%	
	8	6	30	57	132	**233**
Invited speakers or "career" events	3.0%	3.0%	10.3%	21.9%	61.8%	
	7	7	24	51	144	**233**
Field trips or laboratory tours	5.2%	2.1%	7.7%	17.6%	67.4%	
	12	5	18	41	157	**233**

An open-ended item on the questionnaire asked students to comment on their overall satisfaction with the Unite experience. Of the 194 students who provided a response to this item, a large majority (86%) had only positive comments. Many of these responses were simple affirmations of their program experiences such as "I loved the program" and "I am 1000% happy with this month of the Unite program and would do it again next year." Other students who provided more detail about their satisfaction with features of the Unite program focused on their learning experiences, college information, career information, and the opportunity to meet new people. For example,

The UNITE program has helped me learn more about the different STEM careers and what to expect if you choose to pursue one. The courses provided by UNITE helped me create an academic plan and covered topics around how to be a professional. I enjoyed the hands-on activities since it introduced the different careers within STEM and whether if it is right for you. Additionally, the departments who took part in the program such as NASA and the USAFA gave me the opportunity to connect with professionals, building upon my knowledge of STEM. (Unite Student)

My overall Unite experience was very good and I got meet very good people, not only my peers but also guest speakers and mentors. The people around me are very friendly and comfortable to be around. Also I think the best things next to the experiments in STEM are the field trips because you learn a lot and very different things. I learned things in this program that I don't think I would have learned at all. So I appreciate this program because it me learned how I need to better myself and what other things I can do with myself. (Unite Student)

I loved it. It was the perfect mix of learning and fun. Also, it was amazing to meet so many people also interested in similar topics. Over all it has helped me narrow down my career choices as it showed me what interests and skills I have in various forms of engineering. (Unite Student)

Of the remaining 28 responses (14%), all but one student also had positive comments, however these students also included some caveats. The one student who responded negatively indicated that he had experienced little learning during the program. The other students offered a wide range of caveats, including requests for different or more food, requests for more diverse career information, comments about lack of organization or unclear scheduling, and complaints about their teachers. For example,

I am very satisfied with the academic perspective of the program. It is a great program and I got a ton of opportunities I wouldn't get on my own…[but] Breakfast. I'm sorry, but we are growing teenagers. We can't last four hours (probably more for some since they haven't eaten since dinner the night before) on a single Chewy granola bar and a mushy apple. It would just be nice to have real food. (Unite Student)

I am somewhat satisfied with my Unite experience. I would have enjoyed my experience more if I was [exposed] more to other careers than in the engineering field. (Unite Student)

Overall it was a fantastic experience. I wish that this program becomes more organized. At the moment, activities and lectures are made ready after the students arrive. They should be made ready before hand, so that there is no waste of time. For example: distribution of materials for a project should be done before hand. It should be arranged on the tables before the students' arrival time. The schedule was not being maintained. Lectures ran for longer than scheduled times, activities were half done and completed the next day. This needs to change. There needs to be

coordination and communication between teachers. Overall, the program was well created. Thank you! (Unite Student)

Students were also asked to list three benefits of participating in Unite. A number of benefits were identified by the 213 students who provided a response to this item. The most frequently cited benefits were acquiring STEM knowledge and skills (mentioned in 103 comments) and career information (mentioned in 97 comments). Other benefits students mentioned relatively frequently included having new real-world experiences (mentioned 50 times), meeting people and networking (mentioned 44 times), the opportunity to work in teams and enhance teamwork skills (mentioned 43 times), improvements to their communication and/or social skills (mentioned 36 times), developing problem-solving and critical thinking skills (mentioned 30 times) and acquiring workplace skills including focusing on a task (mentioned 24 times) and perseverance (mentioned 14 times). Students also valued the college information they received (mentioned 23 times) and the opportunities to prepare for the ACT and/or SAT (mentioned 23 times).

Another open-ended questionnaire item asked students to list three ways that the program could be improved. Of the 187 students who provided at least one improvement, the most frequently mentioned improvements were requests for more field trips and/or speakers (mentioned in 54 comments) and requests for more hands-on experiences (mentioned in 45 comments). Other relatively frequently mentioned improvements were providing more choice in courses or activities (mentioned in 30 responses), changes to the type or amount of food provided (mentioned in 23 responses), requests to make the program longer (mentioned in 20 responses), request for speakers from a larger variety of fields (mentioned in 19 responses), and changes to coursework (including comments about the focus of coursework and the amount of homework) (mentioned in 13 responses). Smaller numbers of comments (3-12 each) focused on specific requests for field trips to universities or college classes, providing more opportunities for independent work, providing more technology and/or computer access, and comments on the behavior or work ethic of other students in the program. For example, student suggestions included the following:

Unite can do more field trips and guest speakers. (Unite Student)

More speakers that are not just ENGINEERS!!! (Unite Student)

Cover all parts of STEM not just tech, engineering. (Unite Student)

The program could be better if there were more classes to choose from. (Unite Student)

More hands-on projects like the drones. (Unite Student)

More independent labs. (Unite Student)

Teach us more on the technology side. (Unite Student)

Lower tolerance for disrespectful participants. (Unite Student)

Most mentors also reported being satisfied with all Unite features (see Table 30). In particular, more than half indicated they were "somewhat" or "very much" satisfied with all program components they experienced and very few reported being "not at all" satisfied with any Unite program feature. Features receiving the highest endorsement ("somewhat" or "very much" satisfied) by mentors were the physical location of Unite activities (90%), support for instruction or mentorship during program activities (90%), and field trips or laboratory tours (83%).

Table 30. Mentor Satisfaction with Unite Program Features (n=69)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Application or registration process	15.9%	0.0%	4.3%	21.7%	58.0%	
	11	0	3	15	40	**69**
Communicating with Technology Student Association (TSA)	37.7%	1.4%	0.0%	10.1%	50.7%	
	26	1	0	7	35	**69**
Communicating with Unite site coordinators	18.8%	1.4%	1.4%	11.6%	66.7%	
	13	1	1	8	46	**69**
The physical location(s) of Unite's activities	8.7%	1.4%	0.0%	13.0%	76.8%	
	6	1	0	9	53	**69**
Support for instruction or mentorship during program activities	8.7%	0.0%	1.4%	14.5%	75.4%	
	6	0	1	10	52	**69**
Stipends (payment)	15.9%	4.3%	4.3%	14.5%	60.9%	
	11	3	3	10	42	**69**
Invited speakers or "career" events	21.7%	0.0%	1.4%	8.7%	68.1%	
	15	0	1	6	47	**69**
Field trips or laboratory tours	14.5%	0.0%	2.9%	8.7%	73.9%	
	10	0	2	6	51	**69**

The mentor questionnaire also included open-ended items asking for their opinions about the program. Of the 42 mentors who provided a response to this item, 37 (88%) had only positive comments about the program, while 4 had positive comments tempered by some caveats, and 1 had no positive comments. While many mentors offered simple expressions of satisfaction such as "very satisfied" and "went very well. Highly recommend it," some mentors offered more information about their satisfaction with

particular Unite features. Mentors' positive comments focused on students' academic growth and exposure to college and career information. For example,

> *This year my UNITE experience was excellent! The curriculum that was designed strongly supported the goals of the program and there was clear growth and development in the participants from the beginning of the program to the end of the program. We incorporated several enrichment components that allowed students to explore their creativity, build teamwork and effective communication skills, improve their math and problem-solving abilities, and gain valuable knowledge about STEM careers. I'm very satisfied with the UNITE program this year.* (Unite Mentor)

> *My experience has been great! I believe these programs have exposed many students to STEM careers. In addition, the programs have helped them make decisions about their future endeavors.* (Unite Mentor)

The 4 mentors (10%) who offered caveats each cited a different concern, including concerns about student behavior, a lack of functioning equipment, issues with time sheets, requests for additional funding, concerns about student transportation, and comments about the length of the program. For example,

> *Students learned much more than STEM concepts. They learned social skills, networking, presentation and collaboration in groups. However, because they knew they were receiving a $400 (all or nothing) stipend at the conclusion of the program, many students behaved in such a way that 'walked the line' between unacceptable and tolerable. Had there been some form of reprimand available to perhaps cut a percentage out of their stipend as a result of poor personal behavior at the program that could have assisted.* (Unite Mentor)

> *Overall it seems like a program with much potential. I was not satisfied with a lack of functioning equipment at this site - that did limit the amount of information that could be adequately covered. Trying to teach students about technology without certain forms of media is a slight challenge.* (Unite Mentor)

> *I think it went well this year. The cohort we found this year were all super excited about the classes they got to take. Not sure if we could maintain that cohort if they had to return next year. 2 years, and 4 weeks are hard commitments for most students to make. Older kids have jobs in the summer and can't be off for 4 weeks, but can drive themselves, so we didn't need to transport them. Younger kids could be off for 4 weeks (no jobs yet), but need transportation, which your funds won't cover.* (Unite Mentor)

The 1 mentor who expressed dissatisfaction with Unite commented on student behavior. It is noteworthy that this mentor's comments suggest that he or she was part of a program in which Unite

students were included as a part of another campus outreach program that included non-Unite students. This mentor said:

> *The 4 Unite students held back the other students who paid to participate in the program. Not a single Unite student had any enthusiasm and actually brought down the morale and learning experience for the other students. If I had the option to exclude them from our classes, I would. The only reason they showed up every day was so that they would receive the stipend they were promised. Overall, it was a waste of my time and theirs.* (Unite Mentor)

Mentors also commented upon the strengths of Unite in response to an open-ended questionnaire item asking them to list three strengths of the program. Various strengths were cited by the 54 mentors who provided at least one strength of the program. The most frequently mentioned strengths were increases in students' STEM knowledge and learning (mentioned 19 times) and the opportunity for students to have STEM and/or hands-on experiences (mentioned 13 times). Mentors also valued the career information provided to students (mentioned 11 times), the opportunity for students to network with professionals (mentioned 8 times) and with other students (mentioned 6 times), and the participation of students from underserved and underrepresented groups (mentioned 8 times). Other strengths mentioned in 6 or fewer comments included teamwork, promoting an interest in STEM, college experiences, field trips, and stipends. Mentors in focus groups also commented on the value of Unite for students, echoing the themes above, but also added that participating in Unite was personally satisfying for them as professionals. For example,

> *It's an opportunity not just to help students with their academic development, but their personal development, as well. We serve these kids, and being able to do so is gratifying.* (Unite Mentor)

Mentors were also asked in an open-ended questionnaire item to list three ways in which Unite could be improved for future participants. The 43 mentors who provided at least one suggestion mentioned a wide variety of improvements. The most frequently cited improvement were suggestions to increase funding (mentioned in 18 comments), with a particular emphasis on funding to provide students with residential experiences, funding for meals, and funding for student transportation. Other improvements (mentioned in 3-10 comments) included recommendations to increase the number of speakers and field trips, enroll more students, provide more teachers or instructors, and to provide a shorter program (for example, provide two 2-week programs rather than one 4-week program).

Overall, the Actionable Program Evaluation indicates that Unite actively engages students in authentic STEM experiences while providing them with information and experiences that influence their aspirations for the future. Students and mentors alike reported high levels of satisfaction with the program.

The Unite program actively engaged students in STEM practices at higher levels than in their typical school experiences, suggesting that Unite provides students with a unique learning opportunity.

Students enrolled in Unite learned about STEM jobs or careers, including those in the DoD. While large proportions of mentors used a wide range of mentoring strategies, the majority of mentors did not discuss most programs for which students currently are or will soon be eligible.

The evaluation of Unite included measurement of several outcomes relating to AEOP and program objectives, including Unite's impacts on students' STEM competencies (e.g., knowledge and skills), STEM identity and confidence, interest in and intent for future STEM engagement (e.g., further education and careers), attitudes toward research, and knowledge of and interest in participating in additional AEOP opportunities.[8]

STEM competencies are necessary for a STEM-literate citizenry. These competencies include foundational knowledge, skills, and abilities in STEM, as well as the confidence to apply them appropriately. STEM competencies are important not only 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 Unite included students' self-reported gains in STEM competencies and engagement in opportunities intended to develop skills such as collaboration, teamwork, and communication, which are considered to be critical STEM skills in the 21st century. The FY17 also introduced a mentor observation rubric for students' 21st Century Skills, enabling mentors to assess students' skills both at the beginning and at the end of their Unite experiences.

21st Century Skills Assessment

A new component of the evaluation in FY17 for Unite was a pilot of the 21st Century Skills Assessment (Johnson & Sondergeld, 2016). Mentors assessed each participant in a pre/post manner. The first

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[8] 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.

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 website at: http://www.ed.gov/about/inits/ed/competitiveness/acc-mathscience/index.html.

assessment was completed in the first days of the program (pre). The second assessment was completed at the end of the program (post). The assessment was used to determine the growth toward mastery for participants during their time in the Unite program. Mentors rated each participant's skills in six domains of 21st Century Skills: The assessment tool can be found in the Appendix (Section 3 of this report).

1. Creativity and Innovation
2. Critical Thinking and Problem Solving
3. Communication, Collaboration, Social, and Cross-Cultural Skills
4. Information, Media, & Technological Literacy
5. Flexibility, Adaptability, Initiative, and Self-Direction
6. Productivity, Accountability, Leadership, and Responsibility

Mentors were asked in the pilot to assess their participants in each of the domains that they felt applied to the work they had completed with them over the course of the program. As a result, between 28 and 47 apprentices were assessed for 24 skills related to each of the six areas. Table 34 presents an overall summary of the findings for each of the six domains of 21st Century Skills. These are presented graphically in Figure 2. Table 35 presents findings for each of the 24 specific skills associated with the six areas of 21st Century Skills.

There were significant increases in participants skills from the beginning (pre-) to the end (post-) of their Unite experiences ($p<.001$) for five of the six areas of 21st Century Skills (see Table 31). Information, Media, and Technological Literacy was the only skill set in which participants did not demonstrate significant growth ($p>.05$). This lack of observable growth is most likely due to the fact that pre-ratings were extremely high (2.71 – approaching Demonstrates Mastery level) leaving little room to grow in this area (ceiling effect). Participants experienced the most growth in the skills associated with Creativity and Innovation. On average, participants' initial ratings were slightly above the Progressing level while their final, post-Unite, ratings approaching Demonstrates Mastery level (2.50 or higher).

Table 31. Overall 21st Century Skill Set Assessment Pre-Post Findings

Skill Set	*n*	Assessment Time		Pre-Post Change	*t*-stat
		Pre - *M*(*SD*)	Post - *M*(*SD*)		
Creativity & Innovation	45	2.29(.57)	2.97(.34)	+0.68	6.47***
Critical Thinking & Problem Solving	28	2.12(.49)	2.49(.42)	+0.37	5.30***
Communication, Collaboration, Social, & Cross-Cultural	47	2.29(.43)	2.68(.29)	+0.3	5.92***
Information, Media, & Technological Literacy	35	2.71(.46)	2.72(.41)	+0.01	0.252
Flexibility, Adaptability, Initiative, & Self-Direction	45	2.32(.54)	2.65(.41)	+0.33	5.06***
Productivity, Accountability, Leadership, & Responsibility	44	2.27(.41)	2.52(.34)	+0.25	5.36***

NOTE. Statistical significance levels provided in table by asterisks with *$p<.05$, **$p<.01$, ***$p<.001$

Figure 2. 21st Century Skill Set Pre-Post Comparison with Criteria Indicators

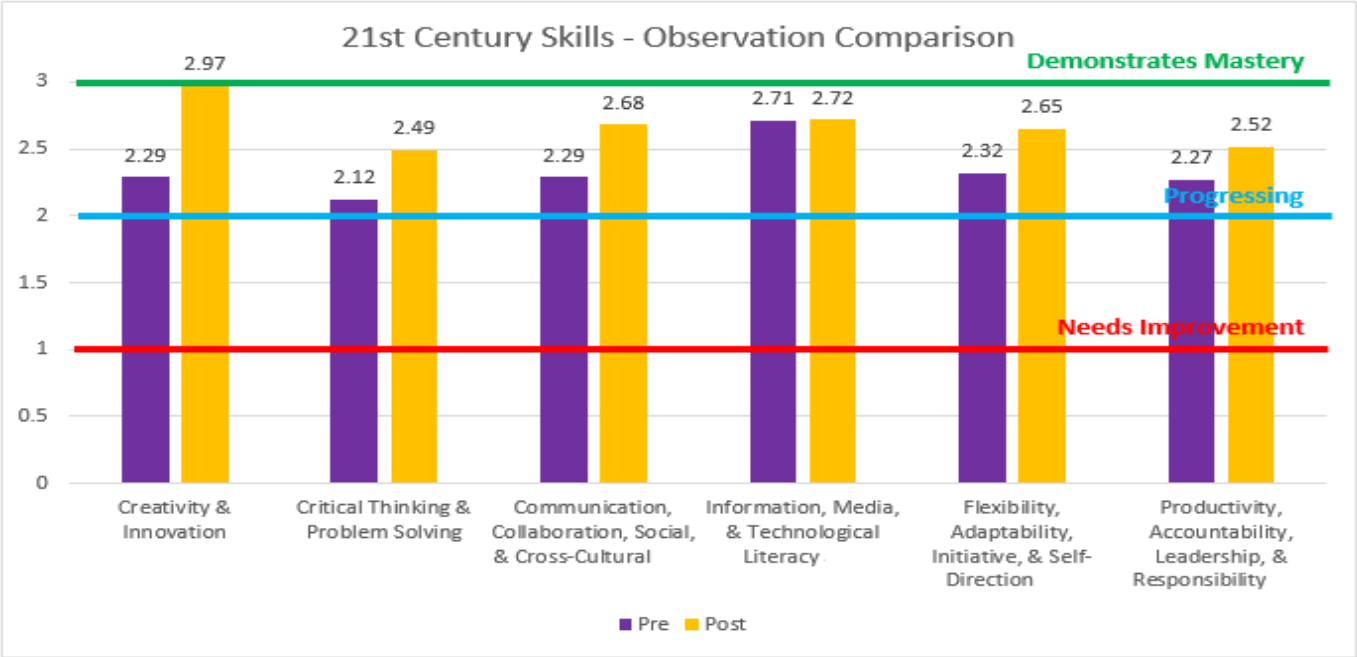

Table 32 displays findings for each of the 24 specific skills associated with the six areas of 21st Century Skills. All but one of the 24 specific skills observed showed an increase from pre- to post- ratings (95.8%), and more than three-quarters of the specific skills observed (79.2%) increased significantly from pre- to post- assessment. While participants improved in all 21st Century Skills over time, skills associated with creativity, communication, and critical thinking showed the largest increases from pre- to post- observations.

Table 32. Overall 21st Century Skill Set Pre-Post Findings

Overall Skill Set *Item (Specific Skill Observed)*	*n*	Observation Time Pre - *M*(*SD*)	Observation Time Post - *M*(*SD*)	Pre-Post Change	*t*-stat
Creativity & Innovation					
Think creatively	44	2.25(.69)	2.73(.45)	+.47	5.04***
Work creatively with others	44	2.41(.66)	2.84(.37)	+.43	5.25***
Implement innovations	40	2.33(.57)	2.80(.41)	+.48	5.02***
Critical Thinking & Problem Solving					
Reason effectively	28	2.14(.52)	2.50(.51)	+.36	3.38**
Use systems thinking	20	2.20(.70)	2.55(.51)	+.35	2.33*
Make judgments and decisions	18	2.28(.67)	2.61(.50)	+.33	2.92**
Solve problems	27	2.15(.53)	2.48(.58)	+.33	2.79**
Communication, Collaboration, Social, & Cross-Cultural					
Communicate clearly	44	2.21(.67)	2.61(.49)	+.41	4.36***
Communicate with others	45	2.42(.50)	2.71(.46)	+.29	2.93**
Interact effectively with others	44	2.32(.47)	2.80(.41)	+.48	5.76***
Information, Media, & Technological Literacy					
Access and evaluate information	33	2.76(.44)	2.67(.54)	-.09	-1.14
Use and manage information	34	2.68(.64)	2.74(.45)	+.06	0.63
Analyze media	16	2.38(.72)	2.69(.48)	+.31	1.78*
Create media products	28	2.75(.52)	2.79(.42)	+.04	0.44
Apply technology effectively	32	2.88(.42)	2.94(.25)	+.06	1.44
Flexibility, Adaptability, Initiative, & Self-Direction					
Adapt to change	38	2.21(.53)	2.53(.56)	+.32	2.94**
Be flexible	35	2.66(.54)	2.69(.47)	+.03	0.30
Manage goals and time	35	2.26(.66)	2.77(.43)	+.51	6.00***
Work independently	42	2.41(.73)	2.74(.45)	+.33	3.53***
Be a self-directed learner	33	2.64(.70)	2.82(.46)	+.18	1.79*
Productivity, Accountability, Leadership, & Responsibility					
Manage projects	31	2.74(.51)	2.87(.34)	+13	1.68*
Produce results	34	2.53(.61)	2.77(.50)	+.24	3.19**
Guide and lead others	32	2.09(.43)	2.38(.55)	+.28	2.74**
Be responsible to others	43	2.16(.43)	2.42(.50)	+.26	3.41***

NOTE. Statistical significance levels provided in table by asterisks with *p<.05, **p<.01, ***p<.001

STEM Knowledge and Skills

Nearly all student questionnaire respondents reported gains in their STEM knowledge as a result of participating in the Unite program (see Table 31). More than 80% of students reported "medium" or "large" gains in each area of STEM knowledge about which they were asked. Items with the largest proportion of students reporting medium or large gains were 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%). Mentors reported similar impacts on students' STEM knowledge although they were more likely to report large gains than were students.

Table 33. Student Report of Impacts on STEM Knowledge (n=233)

	No gain	Small gain	Medium gain	Large gain	Response Total
In depth knowledge of a STEM topic(s)	1.7%	9.0%	36.5%	52.8%	
	4	21	85	123	**233**
Knowledge of research conducted in a STEM topic or field	1.7%	10.3%	35.2%	52.8%	
	4	24	82	123	**233**
Knowledge of research processes, ethics, and rules for conduct in STEM	5.6%	12.0%	36.9%	45.5%	
	13	28	86	106	**233**
Knowledge of how scientists and engineers work on real problems in STEM	1.7%	9.9%	29.2%	59.2%	
	4	23	68	138	**233**
Knowledge of what everyday research work is like in STEM	3.0%	9.9%	33.5%	53.6%	
	7	23	78	125	**233**

Students were asked to report on gains in their STEM competencies as a result of participating in the Unite program. Table 34 shows that more than two-thirds of students reported making "medium" or "large" gains in each area of STEM competencies listed. The areas in which the largest proportion of students reported medium or large gains were using knowledge and creativity to propose a testable solution for a problem (86%), and carrying out procedures for an experiment and recording data accurately (84%).

STEM knowledge items and STEM competencies items were combined into two respective composite variables[9] to test for differential impacts across subgroups of students. For STEM Knowledge, there were no statistically significant differences by gender or race/ethnicity. There was a significant difference in the STEM competencies composite by race/ethnicity, with minority students reporting significantly higher gains in STEM Competencies as a result of their participation in Unite compared to non-minority students (effect size is very small with d = 0.13).[10] No statistically significant differences exist by gender with regards to STEM Competencies.

Table 34. Students Reporting Gains in Their STEM Competencies (n=233)

	No gain	Small gain	Medium gain	Large gain	Response Total
Defining a problem that can be solved by developing a new or improved object, process, or system	4.3%	14.6%	39.9%	41.2%	
	10	34	93	96	**233**
Using knowledge and creativity to propose a testable solution for a problem	2.6%	11.2%	39.9%	46.4%	
	6	26	93	108	**233**
Making a model of an object or system to show its parts and how they work	4.7%	12.9%	32.2%	50.2%	
	11	30	75	117	**233**
Carrying out procedures for an experiment and recording data accurately	3.0%	12.9%	46.8%	37.3%	
	7	30	109	87	**233**
Using computer models of an object or system to investigate cause and effect relationships	12.0%	19.7%	30.9%	37.3%	
	28	46	72	87	**233**
Considering different interpretations of the data when deciding if a solution works as intended	6.4%	16.3%	38.2%	39.1%	
	15	38	89	91	**233**
Organizing data in charts or graphs to find patterns and relationships	9.4%	21.5%	39.1%	30.0%	
	22	50	91	70	**233**
	6.4%	19.3%	37.8%	36.5%	

[9] The Cronbach's alpha reliability for the 5 STEM Knowledge items was 0.909; The Cronbach's alpha reliability for the 11 STEM Competencies items was .929.

[10] Independent Samples t-test for STEM Competencies: t(231)=2.02, p=.044.

Supporting a solution for a problem with data from experiments	15	45	88	85	**233**
Defending an argument that conveys how a solution best meets design criteria	6.9%	18.0%	38.2%	36.9%	
	16	42	89	86	**233**
Integrating information from technical or scientific texts and other media to support your solution to a problem	8.2%	20.2%	37.8%	33.9%	
	19	47	88	79	**233**
Communicating information about your design experiments and solutions in different ways (through talking, writing, graphics, or math equations)	4.7%	15.5%	38.6%	41.2%	
	11	36	90	96	**233**

The impact of Unite on students' 21st Century Skills – skills including collaboration and teamwork that are necessary across a wide variety of fields – were also assessed in the questionnaire (see Table 35). More than 80% of students reported medium or large gains in all 21st Century Skills items. The areas in which the largest proportions of students reported medium or large gains were working well with students from all backgrounds (91%) and including others' perspectives when making decisions (90%). A composite score was calculated for the 6 items comprising the 21st Century Skills item.[11] No statistically significant differences were found by gender or by race/ethnicity.

Table 35. Student Report of Impacts on 21st Century Skills (n=233)

	No gain	Small gain	Medium gain	Large gain	Response Total
Sticking with a task until it is finished	2.6%	9.9%	27.0%	60.5%	
	6	23	63	141	**233**
Making changes when things do not go as planned	0.9%	9.9%	27.5%	61.8%	
	2	23	64	144	**233**
Working well with students from all backgrounds	1.7%	6.9%	27.0%	64.4%	
	4	16	63	150	**233**
	2.1%	8.2%	33.9%	55.8%	

[11] 21st Century Skills composite (6 items) has a Cronbach's alpha reliability of .897.

Including others' perspectives when making decisions	5	19	79	130	**233**
	1.3%	10.3%	30.9%	57.5%	
Communicating effectively with others	3	24	72	134	**233**
	3.0%	12.0%	27.9%	57.1%	
Viewing failure as an opportunity to learn	7	28	65	133	**233**

STEM Identity and Confidence

While deep knowledge and skills in STEM fields may encourage students to pursue STEM education and future careers, if students do not see themselves as capable of succeeding in STEM they are unlikely to pursue such educational pathways and careers.[12] In order to understand students' perspectives on their own capabilities in STEM, students were asked to respond to a questionnaire item about the impact of Unite on their STEM identities (see Table 36). More than three-quarters of students reported medium or large gains in each area of STEM identity listed. For example, 88% of students reported medium or large gains in feeling prepared for more challenging STEM activities, and 87% in thinking creatively about a STEM project or activity. A composite score for STEM Identity was created from these items[13] and was used to compare responses across subgroups. There were no statistically significant differences found in STEM Identity by gender or race/ethnicity.

Table 36. Student Report of Impacts on Student Identity (n=233)

	No gain	Small gain	Medium gain	Large gain	Response Total
Interest in a new STEM topic	6.4%	12.9%	33.5%	47.2%	
	15	30	78	110	**233**
Deciding on a path to pursue a STEM career	6.4%	14.6%	25.8%	53.2%	
	15	34	60	124	**233**
Sense of accomplishing something in STEM	3.9%	12.0%	26.6%	57.5%	
	9	28	62	134	**233**

[12] Chang, M. J., Sharkness, J., Hurtado, S. and Newman, C. B. (2014), What matters in college for retaining aspiring scientists and engineers from underserved racial groups. J. Res. Sci. Teach., 51: 555–580.
[13] The Cronbach's alpha reliability for the 7 STEM Identity items was 0.924.

Feeling prepared for more challenging STEM activities	3.4%	8.6%	34.8%	53.2%	
	8	20	81	124	**233**
Thinking creatively about a STEM project or activity	4.3%	8.6%	28.8%	58.4%	
	10	20	67	136	**233**
Desire to build relationships with mentors who work in STEM	5.6%	12.0%	31.3%	51.1%	
	13	28	73	119	**233**
Connecting a STEM topic or field to my personal values	5.2%	13.3%	24.9%	56.7%	
	12	31	58	132	**233**

Interest and Future Engagement in STEM

A key goal of the AEOP is to develop a STEM-literate citizenry. To reach this goal, students must be engaged with high quality STEM activities both in and out of school. In order to examine the impact of Unite on students' interest in future engagement in STEM, students were asked to reflect on whether the likelihood of their engaging in STEM activities outside of school changed as a result of their Unite experience (see Table 37). A majority of students reported an increased likelihood of engaging in each STEM activity with the exception of watching or reading non-fiction STEM, for which 43% reported an increased likelihood. 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%). A composite score was created from the Future STEM Engagement items.[14] These composites were used to compare subgroups of students; no statistically significant differences were found by gender or race/ethnicity.

Keeping students engaged across the portfolio of AEOP initiatives is another key AEOP goal. As such, students were asked about their interest in participating in future AEOPs (see Table 38). Students expressed particular interest in participating in Unite again, with 83% indicating they were somewhat or very much interested. More than half of the students reported being at least somewhat interested in participating in other AEOPs including SMART (61%), REAP (60%), and SEAP (51%). However, over a quarter of students reported not having heard about programs for which they are or soon will be eligible

[14] These 10 Future STEM Engagement items had a Cronbach's alpha reliability of 0.885.

such as SEAP (31%), GEMS (37%), JSHS (41%), and GEMS Near Peer Mentors (46%). It is notable that the percentage of students indicating they had not heard of these AEOPs increased from 2016 levels.

In order to understand what resources are most useful in informing Unite participants about other AEOPs, students were asked to report on how various resources impacted their awareness of AEOPs (see Table 39). 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%).

Table 37. Change in Likelihood Students Will Engage in STEM Activities Outside of School (n=233)

	Much less likely	Less likely	About the same before and after	More likely	Much more likely	Response Total
Watch or read non-fiction STEM	6.4%	9.4%	40.8%	27.0%	16.3%	
	15	22	95	63	38	**233**
Tinker (play) with a mechanical or electrical device	4.3%	5.6%	17.6%	38.2%	34.3%	
	10	13	41	89	80	**233**
Work on solving mathematical or scientific puzzles	2.6%	6.4%	30.0%	37.3%	23.6%	
	6	15	70	87	55	**233**
Use a computer to design or program something	3.4%	7.7%	22.7%	33.5%	32.6%	
	8	18	53	78	76	**233**
Talk with friends or family about STEM	2.1%	4.3%	24.9%	33.5%	35.2%	
	5	10	58	78	82	**233**
Mentor or teach other students about STEM	6.0%	5.6%	24.0%	36.9%	27.5%	
	14	13	56	86	64	**233**
Help with a community service project related to STEM	2.1%	3.4%	18.9%	45.1%	30.5%	
	5	8	44	105	71	**233**
	1.3%	5.2%	14.2%	36.1%	43.3%	

Participate in a STEM camp, club, or competition	3	12	33	84	101	**233**
Take an elective (not required) STEM class	3.0%	4.3%	15.0%	34.3%	43.3%	
	7	10	35	80	101	**233**
Work on a STEM project or experiment in a university or professional setting	3.0%	3.0%	12.4%	33.9%	47.6%	
	7	7	29	79	111	**233**

Table 38. Student Interest in Future AEOP Programs (n=233)

	I've never heard of this program	Not at all	A little	Somewhat	Very much	Response Total
Gains in the Education of Mathematics and Science (GEMS)	36.9%	5.2%	15.0%	17.2%	25.8%	
	86	12	35	40	60	**233**
Unite	3.0%	4.3%	9.9%	22.7%	60.1%	
	7	10	23	53	140	**233**
Junior Science & Humanities Symposium (JSHS)	41.2%	9.0%	13.3%	13.3%	23.2%	
	96	21	31	31	54	**233**
Science & Engineering Apprenticeship Program (SEAP)	31.3%	5.2%	12.9%	18.5%	32.2%	
	73	12	30	43	75	**233**
Research & Engineering Apprenticeship Program (REAP)	23.6%	5.6%	11.2%	20.2%	39.5%	
	55	13	26	47	92	**233**
High School Apprenticeship Program (HSAP)	36.9%	5.6%	8.6%	18.9%	30.0%	
	86	13	20	44	70	**233**
College Qualified Leaders (CQL)	42.1%	6.0%	10.3%	18.5%	23.2%	
	98	14	24	43	54	**233**
GEMS Near Peer Mentor Program	45.9%	7.3%	10.7%	15.9%	20.2%	
	107	17	25	37	47	**233**
	42.1%	7.7%	12.4%	15.5%	22.3%	

Undergraduate Research Apprenticeship Program (URAP)	98	18	29	36	52	**233**
Science Mathematics, and Research for Transformation (SMART) College Scholarship	27.9%	3.9%	7.7%	24.0%	36.5%	
	65	9	18	56	85	**233**
National Defense Science & Engineering Graduate (NDSEG) Fellowship	39.9%	5.6%	12.0%	18.5%	24.0%	
	93	13	28	43	56	**233**

Table 39. Impact of Resources on Student Awareness of AEOPs (n=233)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	48.9%	10.7%	15.5%	15.5%	9.4%	
	114	25	36	36	22	**233**
Army Educational Outreach Program (AEOP) website	24.0%	4.3%	14.2%	24.9%	32.6%	
	56	10	33	58	76	**233**
AEOP on Facebook, Twitter, Pinterest or other social media	46.8%	12.4%	14.6%	16.7%	9.4%	
	109	29	34	39	22	**233**
AEOP brochure	29.2%	6.4%	20.6%	21.9%	21.9%	
	68	15	48	51	51	**233**
My Unite mentor(s)	13.7%	2.6%	13.3%	18.9%	51.5%	
	32	6	31	44	120	**233**
Invited speakers or "career" events during Unite	12.9%	3.0%	11.6%	22.7%	49.8%	
	30	7	27	53	116	**233**
Participation in Unite	9.4%	3.0%	10.7%	20.6%	56.2%	
	22	7	25	48	131	**233**

Attitudes toward DoD Research

Positive attitudes about the importance of DoD research are an important prerequisite to students' continued interest in and potential involvement in future DoD STEM careers. To gauge students' attitudes in this area, students were asked about their opinions of what DoD researchers do and the value

of DoD research more broadly (see Table 40). Approximately three-quarters of students agreed or strongly agreed to all items in this section**,** although it is notable that between 20% and 22% did not register an opinion for each item (selected "neither agree nor disagree"), suggesting that these students may have had limited familiarity with DoD research and researchers.

Table 40. Student Opinions about DoD Researchers and Research (n=233)

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Response Total
DoD researchers advance science and engineering fields	1.7%	1.7%	22.3%	39.9%	34.3%	
	4	4	52	93	80	**233**
DoD researchers develop new, cutting edge technologies	1.7%	1.3%	21.9%	41.2%	33.9%	
	4	3	51	96	79	**233**
DoD researchers solve real-world problems	1.3%	2.1%	20.6%	38.6%	37.3%	
	3	5	48	90	87	**233**
DoD research is valuable to society	1.3%	1.7%	19.7%	39.5%	37.8%	
	3	4	46	92	88	**233**

Education and Career Aspirations

All AEOPs have a goal of broadening, deepening, and diversifying the pool of STEM talent, a goal that requires diverse students to pursue STEM educational opportunities. To evaluate this goal, students were asked about their educational aspirations after participating in Unite. Table 41 shows that nearly all students intended to finish college (42%) and that over half aspired to get more education after college (55%).

Table 41. Student Education Aspirations After Participating in Unite

Choice	Response Percent	Response Total
Graduate from high school	1.29 %	3
Go to a trade or vocational school	0.43 %	1
Go to college for a little while	2.15 %	5
Finish college (get a Bachelor's degree)	41.63 %	97
Get more education after college	54.51 %	127

Students were asked to respond to an open-ended questionnaire item asking them how their Unite activities or experience helped to increase their interest in pursuing a career in STEM. Of the 204 students who provided a response, 37 (18%) provided a simple affirmation such as "yes," indicating that they were interested in pursuing a STEM career. Seven students (3%) indicated that they already had an interest in

STEM before participating in Unite and the program had not impacted their interest. Four students (2%) indicated that they were not interested in a STEM career, while 3 students (1%) simply indicated that Unite had not helped. Few students identified specific activities that influenced their interest in STEM careers, however 69 (34%) cited that Unite had impacted their interest by providing them with information about careers and exposure to new careers. Another 26 students (13%) cited their increased knowledge of and exposure to STEM topics as a positive impact on their career interests. The hands-on experiences during Unite were cited by 18 students (9%) as having a positive impact on their career interests. Fifteen students (7%) indicated that Unite positively influenced their motivation for and/or interest in pursuing a career in STEM and another 15 (7%) credited their increased awareness of career preparation requirements while 14 students (7%) particularly valued the impact of speakers on their career interests and aspirations. For example,

> *Before Unite, I was interested in the STEM fields of study, but now I want to pursue one of them. Unite helped me become more aware of my opportunities within STEM based careers.* (Unite Student)

> *My Unite experiences have helped to increase my interest in pursuing a career in STEM disciplines, by allowing me to do further research in the college I want to go to and the job I want to be successful in. I was able to do more research about the USNA (United States Naval Academy), and I was able to learn more about naval engineers.* (Unite Student)

> *The activities we had done in each class have definitely peaked my interest in STEM careers, such as building a catapult and a car from scratch; and the speakers we received were very helpful for giving us an insight into their jobs.* (Unite Student)

> *[Unite] helped expand my mind on the different fields of engineering and what those fields actually do. Rather than just reading about it we talked to people who are in those fields.* (Unite Student)

> *I knew I wanted to go into the Army as an engineer but I didn't know how to go about doing that. The Army engineers there taught me a little bit about that and I have decided that I'm going to finish college then go into the Army.* (Unite Student)

Students participating in focus groups echoed these themes on the impact of Unite on their career interests. For example,

> *It's an amazing opportunity. It's able to help people with colleges…They can ask professionals that can help them out with research on the colleges they are interested in and what they want to major in.* (Unite Student)

Overall Impact

Students were asked about impacts of participating in Unite more broadly. Table 42 displays responses to a questionnaire item that asked students to rate the impact of Unite in various areas. Students reported that Unite had a substantial impact on them, with two-thirds or more reporting that Unite contributed to increases in all items of this section.

Table 42. Student Opinions of Unite Impacts (n=233)

	Disagree - This did not happen	Disagree - This happened but not because of Unite	Agree - Unite contributed	Agree - Unite was primary reason	Response Total
I am more confident in my STEM knowledge, skills, and abilities	0.9%	7.7%	55.4%	36.1%	
	2	18	129	84	**233**
I am more interested in participating in STEM activities outside of school requirements	3.4%	11.6%	48.1%	36.9%	
	8	27	112	86	**233**
I am more aware of other AEOPs	9.4%	6.9%	44.2%	39.5%	
	22	16	103	92	**233**
I am more interested in participating in other AEOPs	8.2%	10.3%	43.8%	37.8%	
	19	24	102	88	**233**
I am more interested in taking STEM classes in school	2.1%	14.6%	45.5%	37.8%	
	5	34	106	88	**233**
I am more interested in earning a STEM degree	3.9%	14.2%	44.6%	37.3%	
	9	33	104	87	**233**
I am more interested in pursuing a career in STEM	2.1%	17.6%	45.1%	35.2%	
	5	41	105	82	**233**
I am more aware of Army or DoD STEM research and careers	6.4%	9.0%	39.9%	44.6%	
	15	21	93	104	**233**
I have a greater appreciation of Army or DoD STEM research	11.2%	11.6%	37.8%	39.5%	
	26	27	88	92	**233**
I am more interested in pursuing a STEM career with the Army or DoD	17.2%	15.5%	38.2%	29.2%	
	40	36	89	68	**233**

Almost all students indicated being more confident in their STEM knowledge, skills, and abilities as a result of participating in Unite (92%). Similarly, 84% of students indicated that Unite contributed to their increased awareness of other AEOPs, and 82% that Unite contributed to their increased interest in participating in other AEOPs. Students also reported that Unite impacted them in areas such as their interest in STEM degrees (82%), their interest in pursuing a STEM career (80%), and their interest in pursuing a STEM career with the Army or DoD (67%). Overall Unite Impact items were combined into a composite variable[15] to test for differences among subgroups of students; no significant differences were found in terms of gender of race/ethnicity. Mentors were also asked about impacts on students in these areas; in general, their reports of impacts were similar but somewhat higher than those of the students.

[15] The Cronbach's alpha reliability for these 10 Unite Impact items was 0.880.

8 | Findings and Recommendations

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 in Table 43 below.

Table 43. 2017 Unite Evaluation Findings	
Participant Profiles	
Unite received more applications than in previous years and served increasing numbers of students from groups underserved in STEM	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 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 satisfaction with Unite and identified key benefits and strengths of Unite.	Students reported high levels of satisfaction with features of the Unite program. The features with which the largest proportion of students expressed being "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 21st Century Skills. Further, students reported perceived growth in skills.	Students in Unite demonstrated significant gains in their 21st 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 21st 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.
Unite students reported having interest in future AEOP opportunities, but many had	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%).

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 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

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 21st 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

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.