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ARMY EDUCATIONAL OUTREACH PROGRAM

Unite

2018 Annual Program Evaluation Report
Findings

June 2019

aeop ARMY EDUCATIONAL OUTREACH PROGRAM

UNITE

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1 | AEOP Consortium Contacts

U.S. Army Contacts

Matthew Willis, Ph.D.
Director, Laboratory Management
Office of the Deputy Assistant Secretary of the Army for Research and Technology
matthew.p.willis.civ@mail.mil

Andrea Simmons
Army Educational Outreach Program (AEOP) Director
Office of the Deputy Assistant Secretary of the Army for Research and Technology
andrea.e.simmons.ctr@mail.mil

AEOP Cooperative Agreement Manager

Christina Weber
AEOP Cooperative Agreement Manager
U.S. Army Combat Capabilites Development Command (CCDC)
christina.l.weber.civ@mail.mil

Battelle Memorial Institute – Lead Organization

David Burns
Project Director, AEOP CA
Director of STEM Innovation Networks
burnsd@battelle.org

Unite Program Administrators

Hillary Lee
Unite Program Director
Technology Student Association
hlee@tsaweb.org

Roseanne White, Ph.D.
Principal Investigator
Technology Student Association
rwhite@tsaweb.org

Evaluation Team Contacts – NC State University

Carla C. Johnson, Ed.D.
Evaluation Director, AEOP CA
carlacjohnson@ncsu.edu

Toni A. Sondergeld, Ph.D.
Assistant Director, AEOP CA
tonisondergeld@metriks.com

Janet B. Walton, Ph.D.
Assistant Director, AEOP CA
jwalton2@ncsu.edu

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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.

In 2018, 19 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.

Unite included 19 host sites, which were comprised of 10 HBCUs/MSIs. Unite received applications from 731 students, 429 of whom were enrolled in the program. This represents a 17% increase in enrollment over 2017 when 358 students were enrolled. The placement rate was also higher in FY18 (59%) than in FY17 (43%) and 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 FY18, 401 adults participated in varying roles. This number included 27 Army S&Es, a decrease from FY17 when 38 Army S&Es participated but an increase as compared to FY16 when 18 Army S&Es participated in Unite. A total of 152 educators (including university faculty) participated in the program. The number of K-12 teachers participating in 2018 (49), decreased as compared to FY17 when 65 K-12 teachers participated, but increased relative to FY16 when 37 K-12 teachers participated in Unite.

Table 1 contains an overview of demographic data for the 429 Unite participants who registered through Cvent. A large majority of FY18 Unite students (88%) met the AEOP definition of underserved.[1] In particular, over a third (43%) of students identified themselves as Black or African American. This is a decrease from the 68% of students who identified as Black or African American in FY17. More than half of FY18 Unite participants (62%) were female, an increase over the FY17 when 46% of participants were

[1] AEOP's definition of underserved (U2) includes **at least two** of the following: Underserved populations include low-income students (FARMS); students belonging to race and ethnic minorities that are historically underrepresented in STEM (HUR) (i.e., Alaska Natives, Native Americans, Blacks or African Americans, Hispanics, Native Hawaiians and other Pacific Islanders); students with disabilities (ADA); students with English as a second language (ELLs); first-generation college students (1stGEN); students in rural, frontier, or other Federal targeted outreach schools (GEO); and females in certain STEM fields (Gender) (e.g., physical science, computer science, mathematics, or engineering).

female. A majority of students (71%) indicated that they receive free or reduced-price lunch, a commonly used indicator of family income, an increase as compared to FY17 when 61% of students reported receiving free or reduced price lunch. Over half of students (51%) reported that they did not have a parent or guardian who graduated from college, an increase from 31% in FY17. Table 2 provides the number of students who participated at each Unite site.

Table 1. 2018 Unite Student Participant Profile		
Demographic Category		
Respondent Gender (n = 429)		
Female	162	38%
Male	266	62%
Choose not to report	1	<1%
Respondent Race/Ethnicity (n = 429)		
Asian	6	3%
Black or African American	173	43%
Hispanic or Latino	106	26%
Native American or Alaska Native	16	4%
Native Hawaiian or Other Pacific Islander	16	4%
White	78	19%
Other race or ethnicity	8	2%
Choose not to report	10	3%
School Location (n=429)		
Urban (city)	216	48%
Suburban	91	22%
Rural (country)	113	28%
Frontier or tribal School	1	<1%
DoDDS/DoDEA School	1	<1%
Home school	6	2%
Online school	1	<1%
Free or Reduced Price Lunch Recipient (n = 429)		
Yes	305	71%
No	100	23%
Choose not to report	24	6%
English is First Language (n = 429)		
Yes	348	81%
No	79	18%
Choose not to report	2	<1%
One parent/guardian graduated from college (n = 429)		
Yes	189	44%
No	220	51%
Choose not to report	20	5%
U2 Classification (n = 429)		
Yes	379	88%
No	50	12%

Table 2. 2018 Unite Student Participation by Site	
Unite Site	**Participating Students**
Alabama State University (AL)	20
Fayetteville State University (NC)	19
Florida State University (FL)	25
Harris-Stowe State University (MO)	25
Jackson State University (MS)	20
Marshall University (WV)	18
Michigan Technological University (MI)	17
Montana Tech (MT)	50
Morgan State University (WV)	13
New Jersey Institute of Technology (NJ)	23
Savannah State University (GA)	15
Texas Southern University (TX)	34
University of Colorado, Colorado Springs (CO)	22
University of Iowa (IA)	27
University of Nevada, Las Vegas (NV)	16
University of New Mexico (NM)	16
University of Pennsylvania (PA)	16
University of Puerto Rico (PR)	23
Virginia Tech (VA)	30
TOTAL	429

Table 3 summarizes 2018 Unite program costs. The overall cost of Unite for FY18 was $757,752 with the per student cost of $1,766.

Table 3. 2018 Unite Program Costs	
Administrative/Overhead/Indirect costs	$125,848
Travel	$14,896
Host Site Awards	$602,283
Other costs	$14,725
Total Cost	**$757,752**
Cost per Student Participant	**$1,766**

4 | 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 Unite 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 19 universities • Students participating in 19 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, mentors' assessment of participants' 21st Century Skills Assessment (pre/post), and the Annual Program Report

(APR) prepared by TSA. Tables 4-6 outline the information collected in student and mentor questionnaires, and 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. 2018 Student 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. 2018 Mentor Questionnaires	
Category	**Description**
Profile	**Demographics:** Participant gender, race/ethnicity, occupation, past participation
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: Efforts to expose students to AEOPs, impact of AEOP resources on efforts; contribution of AEOP in changing student AEOP metrics
	Army/DoD STEM: 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:** Use of mentoring/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. 2018 Annual Program Report	
Category	**Description**
Program	Description of course content, activities, and academic level (high school or college)
AEOP Goal 1 & 2 Program Efforts	**Underserved Populations:** Mechanisms for marketing to and recruitment of students from underserved populations
	Army STEM: Army/DoD STEM Careers – Exposure to Army STEM research and careers; Participation of Army engineers and/or Army research facilities in career day activities
	Mentor Capacity: Local Educators - University faculty and student involvement, teacher involvement

The Unite evaluation included examination of participant outcomes and other areas that would inform program continuous improvement. A focus of the evaluation is on 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. Thus, it is important to consider the factors that motivate students to participate in Unite, participants' perceptions of and satisfaction with activities, what value participants place on program activities, and what recommendations participants have for program improvement. The evaluation also collected data about participant perspectives on program processes, resources, and activities for the purpose of recommending improvements as the program moves forward.

Findings are presented in alignment with the three AEOP priorities. The findings presented herein include several components related to AEOP and program objectives, including 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, careers), attitudes toward research, and their knowledge of

and interest in participating in additional AEOP opportunities.[2] STEM competencies are necessary for a STEM-literate citizenry and 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 measured students' self-reported gains in STEM competencies and engagement in opportunities intended to develop what are considered to be critical STEM skills in the 21st Century—collaboration and teamwork.

Detailed information about methods and instrumentation, sampling and data collection, and analysis are described in the appendices. 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. The student questionnaire is provided in Appendix B and the mentor questionnaire is provided in Appendix C. The tool used by mentors to assess students' 21st Century Skills is included in Appendix D. Major trends in data and analyses are reported herein.

Study Sample

Student and adult data for questionnaire participation are provided in Table 7, which 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 2018 (61.2%) is slightly lower than 2017 (65%), but is higher than in 2016 (58%) and 2015 (56%). Furthermore, the student response rate falls within an acceptable margin of error. The margin of error for

[2] 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 Web site at: http://www.ed.gov/about/inits/ed/competitiveness/acc-mathscience/index.html.

the adult surveys is slightly larger than generally acceptable. This indicates that the sample may not be representative of its respective population, although the adult response rate for 2018 (25.7%) is higher than 2017 (17%), 2016 (15%), and 2015 (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 8 indicates the number of students who participated in Unite by site as well as the number of survey respondents at each site.

Table 7. 2018 Unite Questionnaire Participation

Participant Group	Respondents (Sample)	Total Participants (Population)	Participation Rate	Margin of Error @ 95% Confidence[3]
Students	296	429	69.0%	±3.18%
Adults	103	401	25.7%	±8.33%

Table 8. 2018 Unite Site Questionnaire Respondent Numbers

	No. of Student Survey Respondents	No. of Mentor Survey Respondents
Alabama State University (AL)	15	1
Fayetteville State University (NC)	21	3
Florida State University (FL)	23	8
Harris-Stowe State University (MO)	15	12
Jackson State University (MS)	11	3
Marshall University (WV)	25	8
Michigan Technological University (MI)	13	1
Montana Tech (MT)	13	21
Morgan State University (MD)	0	0
New Jersey Institute of Technology (NJ)	1	8
Savannah State University (GA)	10	3
Texas Southern University (TX)	0	7

[3] "Margin of error @ 95% confidence" means that 95% of the time, the true percentage of the population who would select an answer lies within the stated margin of error. For example, if 47% of the sample selects a response and the margin of error at 95% confidence is calculated to be 5%, if 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.

University of Colorado, Colorado Springs (CO)	27	3
University of Iowa (IA)	31	1
University of Nevada, Las Vegas (NV)	5	4
University of New Mexico (NM)	16	2
University of Pennsylvania (PA)	18	6
University of Puerto Rico, Rio Piedras (PR)	22	4
Virginia Tech (VA)	30	8
TOTAL	**296**	**103**

Respondent Profiles

Apprentice Demographics

Demographic data for Unite students who responded to the questionnaire are summarized in Table 9. More males (58%) completed the survey than females (42%). Collectively, approximately two-thirds of students reported their race/ethnicity as either Black/African American (41%) or Hispanic/Latino (27%). The next most frequently reported race/ethnicity was White (16%). Nearly all Unite participants (91%) were identified as underrepresented (U2) students.[4]

Unite students responding to the questionnaire are demographically similar to the overall population of 2018 Unite students. In both the overall population and the sample, just over half of respondents were female and slightly less than half identified themselves as Black or African American. Slightly fewer students (74% of the questionnaire respondents versus 81% of enrolled students) reported that English was their first language.

Table 9. 2018 Unite Student Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 296)		
Female	172	42%
Male	123	58%
Choose not to report	1	<.5%
Respondent Race/Ethnicity (n = 296)		
Asian	10	3%

[4] Underrepresented students are classified as possessing two or more of the following demographic classifications: female in gender, non-White and non-Asian in race/ethnicity, eligible for free/reduced-price lunch, ELL, college first generation, school location of urban or rural.

Black or African American	120	41%
Hispanic or Latino	80	27%
Native American or Alaska Native	15	5%
Native Hawaiian or Other Pacific Islander	3	1%
White	47	16%
Other race or ethnicity, (specify):†	17	6%
Choose not to report	4	1%
Respondent Grade Level (n = 296)		
9th	42	14%
10th	94	32%
11th	84	28%
12th	71	24%
College Freshman	3	1%
Other	2	1%
Choose not to report	0	0%
Respondent Eligible for Free/Reduced-Price Lunch (n = 296)		
Yes	206	70%
No	81	27%
Choose not to report	9	3%
Respondent English 1st Language (n=193)		
Yes	142	74%
No	51	26%
Respondent's Parent Graduated from College (n=193)		
Yes	87	45%
No	100	52%
Choose not to report	6	3%
Respondent School Location (n=208)		
DoDEA School	1	.5%
Home School	2	1%
Online School	1	.5%
Rural	57	27%
Suburban	46	22%
Urban	101	49%
Respondent U2 Status (n=208)		
Yes – U2	190	91%
No – Not U2	18	9%

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

Mentor Demographics

Demographic data were also collected for adult mentors who responded to the questionnaire (Table 10). Slightly more than half of responding mentors were female (57%). Of the responding mentors, 40% identified as White, 32% as Black or African American, 9% as Asian, and 9% as Hispanic/Latino. Mentor occupation reports were diverse, with 24% responding that they were university educators, 23% other school staff, 17% scientists, engineers, or mathematicians in training, 16% teachers, and 7% scientists, engineers, or mathematics professionals.

Table 10. 2018 Unite Mentor Respondent Profile

Demographic Category	Questionnaire Respondents	
Respondent Gender (n = 103)		
Female	59	57%
Male	44	43%
Respondent Race/Ethnicity (n =103)		
Asian	9	9%
Black or African American	33	32%
Hispanic or Latino	9	9%
Native American or Alaska Native	2	2%
Native Hawaiian or Other Pacific Islander	0	0%
White	42	40%
Other race or ethnicity	4	4%
Choose not to report	4	4%
Respondent Occupation (n = 103)		
Teacher	16	16%
Other school staff	13	13%
University educator	25	24%
Scientist, Engineer, or Mathematician in training	18	17%
Scientist, Engineer, or Mathematics professional	7	7%
Other, (specify) †	24	23%
Respondent Role in Unite (n =103)		
Instructor (typically a University or Army Scientist or Engineer)	40	39%
Classroom Assistant	26	25%
Resource Teacher	8	8%
Other, (specify) ††	29	28%

†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

5 | Priority #1 Findings

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

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 evaluation also included 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.

Assessed Growth in 21st Century Skills Assessment

The FY18 evaluation included an examination of the 21st Century Skills Assessment completed by mentors (Johnson & Sondergeld, 2016). Mentors assessed each participant in a pre/post manner. The first assessment was completed in the first days of the program (pre), and the second assessment was completed at the end of the program (post). The assessment was used to determine the growth toward mastery for each participant during their time in the Unite program. The assessment tool can be found in the Appendix.

Mentors rated each participants' skills in six domains of 21st Century Skills:

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 to assess their student participants in each of the domains that they felt applied to the work students had completed with them over the course of the program. As a result, between 151 and 226 Unite students were assessed for the 24 skills related to the six areas listed above. Table 11 presents an overall summary of the findings for each of the six domains of 21st Century Skills. These are presented graphically in Figure 1.

There were significant increases in participants' skills from the beginning (pre-) to the end (post-) of their Unite experiences (p<.001) for all six of the 21st Century Skills areas (see Table 11). Participants experienced the most growth in the observed skills associated with the Creativity and Innovation and Critical Thinking and Problem Solving domains. On average, participants' initial ratings were observed to be slightly above the Progressing level while their final, post-Unite, ratings approaching Demonstrates Mastery level (2.50 or higher) in each area.

Table 11. 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	226	2.03(0.53)	2.52(0.49)	+0.49	13.10***
Critical Thinking & Problem Solving	226	2.07(0.55)	2.51(0.48)	+0.44	10.78***
Communication, Collaboration, Social, & Cross-Cultural	228	2.11(0.57)	2.49(0.53)	+0.38	9.52***
Information, Media, & Technological Literacy	224	2.12(0.59)	2.47(0.52)	+0.35	8.31***
Flexibility, Adaptability, Initiative, & Self-Direction	228	2.10(0.57)	2.50(0.51)	+0.40	11.01***
Productivity, Accountability, Leadership, & Responsibility	227	2.07(0.57)	2.45(0.52)	+0.38	9.58***

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

Figure 1. 21st Century Skill Set Pre-Post Comparison with Criteria Indicators

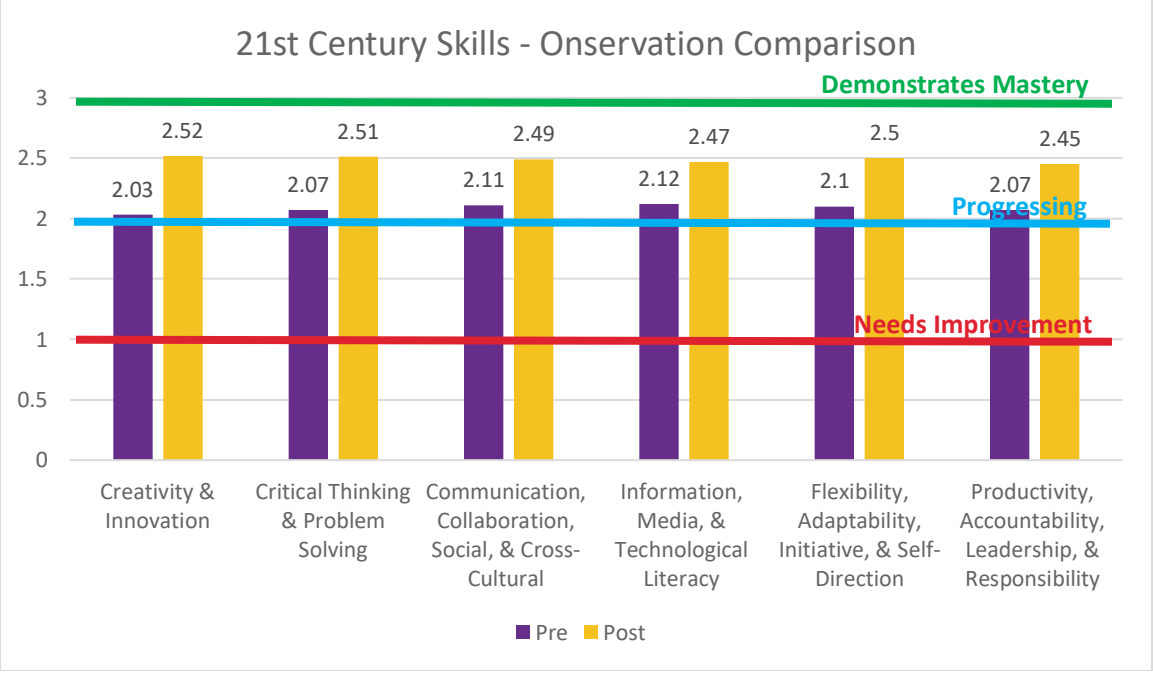


Table 12 displays findings for each of the 24 specific skills associated with the six areas of 21st Century Skills. All of the 24 specific skills observed showed a statistically significant increase from pre- to post-ratings (p<.001).

Table 12. Overall 21st Century Skill Set Pre-Post Findings

Overall Skill Set *Item (Specific Skill Observed)*	*n*	Observation Time		Pre-Post Change	*t*-stat
		Pre - *M*(*SD*)	Post - *M*(*SD*)		
Creativity & Innovation					
Think creatively	223	2.07(0.61)	2.54(0.55)	+0.47	10.19***
Work creatively with others	223	2.03(0.63)	2.53(0.57)	+0.50	10.97***
Implement innovations	223	2.00(0.57)	2.53(0.57)	+0.48	11.05***
Critical Thinking & Problem Solving					
Reason effectively	222	2.10(0.60)	2.56(0.55)	+0.46	9.56***
Use systems thinking	210	2.08(0.63)	2.44(0.57)	+0.36	7.23***
Make judgments and decisions	221	2.02(0.65)	2.44(0.57)	+0.47	8.82***
Solve problems	220	2.08(0.65)	2.53(0.54)	+0.45	8.93***
Communication, Collaboration, Social, & Cross-Cultural					
Communicate clearly	224	2.11(0.64)	2.46(0.60)	+0.35	7.06***
Communicate with others	226	2.08(0.63)	2.47(0.60)	+0.39	8.55***
Interact effectively with others	226	2.15(0.66)	2.47(0.60)	+0.39	8.47***
Information, Media, & Technological Literacy					
Access and evaluate information	218	2.14(0.64)	2.46(0.58)	+0.32	6.56***
Use and manage information	215	2.12(0.66)	2.51(0.56)	+0.39	7.95***
Analyze media	173	2.19(0.68)	2.51(0.56)	+0.31	5.55***
Create media products	151	2.18(0.66)	2.40(0.61)	+0.22	4.04***
Apply technology effectively	190	2.25(0.67)	2.49(0.61)	+0.24	4.48***
Flexibility, Adaptability, Initiative, & Self-Direction					
Adapt to change	211	2.12(0.71)	2.54(0.55)	+0.42	8.40***
Be flexible	212	2.13(0.68)	2.52(0.56)	+0.39	8.80***
Manage goals and time	206	2.03(0.68)	2.52(0.56)	+0.45	9.14***
Work independently	219	2.18(0.63)	2.54(0.59)	+0.36	8.48***
Be a self-directed learner	217	2.02(0.71)	2.47(0.60)	+0.45	9.34***
Productivity, Accountability, Leadership, & Responsibility					
Manage projects	196	1.99(0.72)	2.40(0.64)	+0.41	7.68***
Produce results	206	2.08(0.68)	2.51(0.57)	+0.43	8.94***
Guide and lead others	206	2.02(0.68)	2.51(0.57)	+0.38	7.40***
Be responsible to others	218	2.22(0.58)	2.55(0.58)	+0.33	6.78***

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

STEM Practices

Several items on the Unite student questionnaire focused on students' experiences with STEM practices in Unite and how those experiences compared to their experiences with STEM practices in school. Table 13 displays student responses to questions about their engagement with STEM practices during Unite, and Table 14 shows responses to the same items in the context of student's school experiences. For all items except one, students reported being engaged in the STEM Practices with more frequency than in school. For the one exception, solving real world problems, 83% of students did this at least once in Unite while 85% did this at least once in school. At least half of the students indicated they engaged in all but two (presenting STEM research to a panel of judges from industry or the military and building a computer model) of the STEM Practices items a few times or more during Unite. During Unite, two-thirds or more of students reported the following engaging in the following STEM Practices at least a few times: interacting with STEM researchers (66%); identifying questions or problems to investigate (70%); and working collaboratively as part of a team (86%).

Table 13. Nature of Student STEM Practices During Unite (n=296)

	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.	32.1%	14.9%	23.6%	18.6%	10.8%	
	95	44	70	55	32	**296**
Work with a STEM researcher on a research project topic assigned by my mentor or teacher.	25.7%	19.3%	21.3%	19.9%	13.9%	
	76	57	63	59	41	**296**
Design my own research or investigation based on my own question(s).	23.6%	23.0%	23.6%	18.2%	11.5%	
	70	68	70	54	34	**296**
Present my STEM research to a panel of judges from industry or the military.	46.6%	20.6%	16.9%	10.8%	5.1%	
	138	61	50	32	15	**296**
Interact with STEM researchers.	15.2%	18.6%	25.3%	23.6%	17.2%	
	45	55	75	70	51	**296**
Identify questions or problems to investigate.	12.5%	17.6%	26.4%	24.3%	19.3%	
	37	52	78	72	57	**296**
Design and carry out an investigation.	16.2%	19.9%	25.0%	23.0%	15.9%	
	48	59	74	68	47	**296**
	9.5%	15.5%	30.1%	23.0%	22.0%	

Analyze data or information and draw conclusions.	28	46	89	68	65	**296**
Work collaboratively as part of a team.	5.1%	8.4%	23.3%	26.7%	36.5%	
	15	25	69	79	108	**296**
Build or make a computer model.	40.2%	19.3%	20.9%	10.5%	9.1%	
	119	57	62	31	27	**296**
Solve real world problems.	16.6%	19.6%	19.9%	22.3%	21.6%	
	49	58	59	66	64	**296**

Table 14. Nature of Student STEM Practices During School (n=296)

	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	43.9%	15.2%	19.3%	14.2%	7.4%	
	130	45	57	42	22	**296**
Work with a STEM researcher on a research project assigned by my teacher.	43.6%	14.2%	22.3%	12.8%	7.1%	
	129	42	66	38	21	**296**
Design my own research or investigation based on my own question(s).	30.1%	18.9%	28.4%	14.5%	8.1%	
	89	56	84	43	24	**296**
Present my STEM research to a panel of judges from industry or the military.	59.5%	19.3%	13.5%	5.1%	2.7%	
	176	57	40	15	8	**296**
Interact with STEM researchers.	32.1%	19.6%	20.6%	17.2%	10.5%	
	95	58	61	51	31	**296**
Identify questions or problems to investigate.	13.2%	18.9%	32.8%	21.6%	13.5%	
	39	56	97	64	40	**296**
Design and carry out an investigation.	18.9%	20.9%	30.7%	19.3%	10.1%	
	56	62	91	57	30	**296**
Analyze data or information and draw conclusions.	11.5%	14.9%	32.8%	26.7%	14.2%	
	34	44	97	79	42	**296**
Work collaboratively as part of a team.	9.1%	6.4%	28.7%	30.7%	25.0%	

	27	19	85	91	74	**296**
Build or make a computer model.	47.6%	21.3%	16.9%	9.5%	4.7%	
	141	63	50	28	14	**296**
Solve real world problems.	14.9%	21.3%	25.0%	19.9%	18.9%	
	44	63	74	59	56	**296**

A composite score[5] was calculated for the Engaging in STEM Practices in Unite items.[6] 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 U2 classification as well as all underrepresented subgroups. No significant differences were found in terms of Engaging in STEM Practices in Unite by U2 classification, gender, race/ethnicity, school location, ELL status, or SES. However, students who did not have a parent who attended college reported significantly greater Engagement with STEM Practices compared to students who are not considered first generation college attenders (small effect of d = 0.311 standard deviations).[7]

Students' typical school Engagement with STEM Practices items were also combined into a composite variable.[8] Chart 1 shows that student-reported Engagement in STEM Practices scores were significantly higher in Unite as compared to in school (medium effect of d = 0.96 standard deviations).[9] This suggests that Unite offers students more intensive STEM learning experiences than they would generally receive in school.

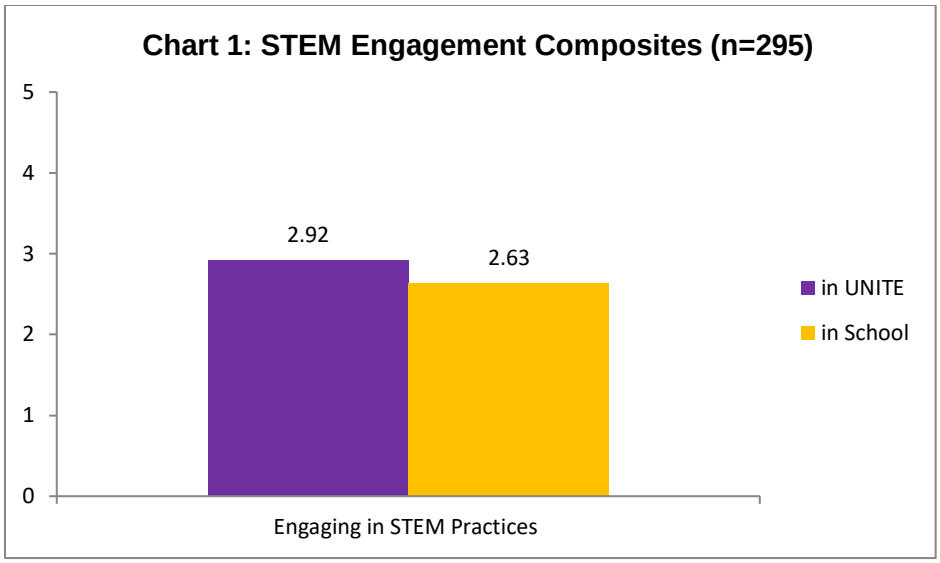
[5] Using multiple statistical tests on related outcomes requires the use of a Type I error rate adjustment to reduce the likelihood of false positives (i.e., detecting a difference when one does not truly exist). However, Type I error rate adjustments lead to a reduction in statistical power (i.e., 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.

[6] The Cronbach's alpha reliability for the 11 STEM Engagement in Unite items was 0.922.

[7] Independent Samples t-test for STEM Engagement by 1st Generation Status: $t(198)=2.19$, $p=.03$.

[8] The Cronbach's alpha reliability for the 11 STEM Engagement in School items was 0.935.

[9] Dependent Samples t-test for STEM Engagement: $t(207)=5.10$, $p<.001$.



STEM Knowledge and Skills

Nearly all student questionnaire respondents reported gains in their STEM knowledge as a result of participating in the Unite program (Table 15), and 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 knowledge of how scientists and engineers work on real problems in STEM (88%), and in-depth knowledge of a STEM topic (87%). Mentors reported similar impacts on students' STEM knowledge although they were at least 10 percentage points more likely to report large gains than were students.

STEM Knowledge items were combined into a composite variable[10] and tested for differential impacts by U2 classification and all other underrepresented subgroups. There were no differences in reported gains in STEM Knowledge by U2 classification. In terms of underrepresented subgroups, significant differences in STEM Knowledge were found by race/ethnicity with minority students reporting higher levels than non-minority students (effect size is small with d = 0.39),[11] and SES with low-SES students reporting higher levels (effect size is small with d = 0.284).[12]

[10] The Cronbach's alpha reliability for the 5 STEM Knowledge items was 0.889.
[11] Independent Samples t-test for STEM Knowledge by Race/Ethnicity: $t(194)=2.69$, $p=.008$.
[12] Independent Samples t-test for STEM Knowledge by SES: $t(197)=1.99$, $p=.048$.

Table 15. Student Report of Impacts on STEM Knowledge (n=296)

	No gain	Small gain	Medium gain	Large gain	Response Total
In depth knowledge of a STEM topic(s)	2.4%	10.8%	45.3%	41.6%	
	7	32	134	123	**296**
Knowledge of research conducted in a STEM topic or field	3.7%	13.5%	39.2%	43.6%	
	11	40	116	129	**296**
Knowledge of research processes, ethics, and rules for conduct in STEM	2.0%	16.9%	40.9%	40.2%	
	6	50	121	119	**296**
Knowledge of how scientists and engineers work on real problems in STEM	2.4%	10.1%	35.1%	52.4%	
	7	30	104	155	**296**
Knowledge of what everyday research work is like in STEM	2.4%	16.9%	34.5%	46.3%	
	7	50	102	137	**296**

Students were asked to report on gains in their STEM competencies or skills as a result of participating in the Unite program. Table 16 shows that approximately two-thirds or more of students reported medium or large gains in each area of STEM competencies listed. STEM competencies for which three-quarters or more of students reported either medium or large gains were: defining a problem that can be solved by developing a new or improved object, process, or system (78%); using knowledge and creativity to propose a testable solution for a problem (77%); and communicating information about design experiments and solutions in different ways (76%).

STEM Competencies items were combined into a composite variables[13] to test for differential impacts by U2 classification and across subgroups of students. There was a significant difference in the STEM Competencies composite by race/ethnicity, with minority students reporting significantly higher gains compared to non-minority students (effect size is medium with d = 0.503).[14] No statistically significant differences were found by U2 classification or any other underrepresented subgroup classification.

[13] The Cronbach's alpha reliability for the 11 STEM Competencies items was .942.
[14] Independent Samples t-test for STEM Competencies by race/ethnicity: $t(194)=3.50$, $p=.001$.

Table 16. Students Reporting Gains in Their STEM Competencies (n=296)

	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	4.7%	17.6%	42.6%	35.1%	
	14	52	126	104	**296**
Using knowledge and creativity to propose a testable solution for a problem	3.4%	20.9%	39.9%	35.8%	
	10	62	118	106	**296**
Making a model of an object or system to show its parts and how they work	8.1%	17.6%	38.2%	36.1%	
	24	52	113	107	**296**
Carrying out procedures for an experiment and recording data accurately	8.1%	17.6%	38.2%	36.1%	
	24	52	113	107	**296**
Using computer models of an object or system to investigate cause and effect relationships	10.5%	21.3%	36.5%	31.8%	
	31	63	108	94	**296**
Considering different interpretations of the data when deciding if a solution works as intended	7.1%	22.3%	41.2%	29.4%	
	21	66	122	87	**296**
Organizing data in charts or graphs to find patterns and relationships	15.9%	20.6%	32.4%	31.1%	
	47	61	96	92	**296**
Supporting a solution for a problem with data from experiments	8.4%	17.9%	41.6%	32.1%	
	25	53	123	95	**296**
Defending an argument that conveys how a solution best meets design criteria	11.1%	20.3%	36.1%	32.4%	
	33	60	107	96	**296**
Integrating information from technical or scientific texts and other media to support your solution to a problem	9.8%	21.3%	38.5%	30.4%	
	29	63	114	90	**296**
Communicating information about your design experiments and solutions in different ways (through talking, writing, graphics, or math equations)	7.1%	15.9%	39.2%	37.8%	
	21	47	116	112	**296**

The impact of Unite on students' self-reported 21st Century Skills were also assessed in the questionnaire (Table 17). At least 85% of students reported medium or large gains in all 21st Century Skills items and 90%

or more of students reported medium or large gains for making changes when things do not go as planned and communicating effectively with others. A composite score was calculated for the 6 items comprising the 21st Century Skills item.[15] No statistically significant differences were found by U2 classification. Race/ethnicity was the only subgroup with significant differences in 21st Century Skills gains, with minority students reporting higher gains than non-minority students (effect size is medium with d = 0.538).[16]

Table 17. Student Report of Impacts on 21st Century Skills (n=296)

	No gain	Small gain	Medium gain	Large gain	Response Total
Sticking with a task until it is finished	2.7%	10.5%	29.7%	57.1%	
	8	31	88	169	**296**
Making changes when things do not go as planned	2.4%	8.8%	30.1%	58.8%	
	7	26	89	174	**296**
Working well with students from all backgrounds	2.7%	11.1%	19.9%	66.2%	
	8	33	59	196	**296**
Including others' perspectives when making decisions	2.4%	9.8%	26.7%	61.1%	
	7	29	79	181	**296**
Communicating effectively with others	4.1%	7.4%	27.7%	60.8%	
	12	22	82	180	**296**
Viewing failure as an opportunity to learn	3.0%	12.5%	26.7%	57.8%	
	9	37	79	171	**296**

STEM Identity and Confidence

While deep knowledge and skills in STEM fields may encourage students to pursue STEM education and future careers, students must also see themselves as capable of succeeding in STEM in order to pursue these STEM educational pathways and careers.[17] 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

[15] 21st Century Skills composite (6 items) has a Cronbach's alpha reliability of .911.
[16] Independent Samples t-test for 21st Century Skills by race/ethnicity: $t(194)=3.75$, $p<.001$.
[17] 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.

Unite on their STEM identities (Table 18). More than three-quarters of students reported medium or large gains in each area of STEM identity listed. Areas in which the largest proportions of students reported medium or large gains were: sense of accomplishing something in STEM (85%); feeling prepared for more challenging STEM activities (84%); and thinking creatively about a STEM project or activity (81%). A composite score for STEM Identity was created from these items[18] and used to compare responses by U2 classification and across subgroups. Statistically significant differences were not found by U2 classification. Race/ethnicity was the only underrepresented subgroup area with significant differences in STEM Identity gains, with minority students reporting higher gains than non-minority students (effect size is small with d = 0.445).[19]

Table 18. Student Report of Impacts on Student Identity (n=296)

	No gain	Small gain	Medium gain	Large gain	Response Total
Interest in a new STEM topic	5.7%	15.9%	28.0%	50.3%	
	17	47	83	149	**296**
Deciding on a path to pursue a STEM career	6.4%	15.5%	29.1%	49.0%	
	19	46	86	145	**296**
Sense of accomplishing something in STEM	3.0%	12.2%	29.4%	55.4%	
	9	36	87	164	**296**
Feeling prepared for more challenging STEM activities	3.0%	12.8%	33.1%	51.0%	
	9	38	98	151	**296**
Thinking creatively about a STEM project or activity	2.4%	16.6%	29.4%	51.7%	
	7	49	87	153	**296**
Desire to build relationships with mentors who work in STEM	5.4%	14.9%	28.7%	51.0%	
	16	44	85	151	**296**
Connecting a STEM topic or field to my personal values	5.4%	13.9%	28.7%	52.0%	
	16	41	85	154	**296**

[18] The Cronbach's alpha reliability for the 7 STEM Identity items was 0.916.
[19] Independent Samples t-test for STEM Identity by race/ethnicity: $t(194)=3.10$, $p=.002$.

6 | Priority #2 Findings

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

Mentor Strategies and Support

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.

Mentors were asked whether or not they used a number of strategies when working with students (see Tables 20-24). These strategies comprised five main areas of effective mentoring:[20]

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

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 (Table 19). The most frequently reported strategies

[20] 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.

were: becoming familiar with student backgrounds and interests at the beginning of Unite (87%); helping students become aware of the role(s) that STEM plays in their everyday lives (87%); and giving students real-life problems to investigate or solve. The strategy of "selecting readings or activities that relate to students' backgrounds" was the least frequently reported strategy, used by 57% of mentors.

Table 19. Mentors Using Strategies to Establish Relevance of Learning Activities (n=103)

	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	87.4%	12.6%	
	90	13	**103**
Giving students real-life problems to investigate or solve	86.4%	13.6%	
	89	14	**103**
Selecting readings or activities that relate to students' backgrounds	57.3%	42.7%	
	59	44	**103**
Encouraging students to suggest new readings, activities, or projects	69.9%	30.1%	
	72	31	**103**
Helping students become aware of the role(s) that STEM plays in their everyday lives	87.4%	12.6%	
	90	13	**103**
Helping students understand how STEM can help them improve their own community	78.6%	21.4%	
	81	22	**103**
Asking students to relate real-life events or activities to topics covered in Unite	81.6%	18.4%	
	84	19	**103**

Most mentors also reported supporting the diverse needs of students as learners through the use of various strategies (Table 20). The most frequently employed strategies were interacting with students and other personnel the same way regardless of their background (89%) and using a variety of teaching and/or mentoring activities to meet the needs of all students (88%). Two-thirds or more of mentors reported implementing all other strategies related to supporting the diverse needs of students as learners.

Table 20. Mentors Using Strategies to Support Diverse Needs of Students as Learners (n=103)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Identify the different learning styles that my students may have at the beginning of the Unite experience	69.9%	30.1%	
	72	31	**103**
Interact with students and other personnel the same way regardless of their background	89.3%	10.7%	
	92	11	**103**
Use a variety of teaching and/or mentoring activities to meet the needs of all students	88.3%	11.7%	
	91	12	**103**
Integrating ideas from education literature to teach/mentor students from groups underrepresented in STEM	73.8%	26.2%	
	76	27	**103**
Providing extra readings, activities, or learning support for students who lack essential background knowledge or skills	68.9%	31.1%	
	71	32	**103**
Directing students to other individuals or programs for additional support as needed	76.7%	23.3%	
	79	24	**103**
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	70.9%	29.1%	
	73	30	**103**

To support development of students' collaboration and interpersonal skills, mentors most frequently reported having student(s) listen to the ideas of others with an open mind (90%), and having students work on collaborative activities or projects as a member of a team (89%). Table 21 shows that approximately three-quarters or more of mentors reported using all other strategies related to this area of mentoring.

Table 21. Mentors Using Strategies to Support Student Development of Collaboration and Interpersonal Skills (n=103)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Having my students tell other people about their backgrounds and interests	72.8%	27.2%	
	75	28	**103**
Having my students explain difficult ideas to others	78.6%	21.4%	

	81	22	**103**
Having my students listen to the ideas of others with an open mind	90.3%	9.7%	
	93	10	**103**
Having my students exchange ideas with others whose backgrounds or viewpoints are different from their own	81.6%	18.4%	
	84	19	**103**
Having my students give and receive constructive feedback with others	77.7%	22.3%	
	80	23	**103**
Having students work on collaborative activities or projects as a member of a team	89.3%	10.7%	
	92	11	**103**
Allowing my students to resolve conflicts and reach agreement within their team	85.4%	14.6%	
	88	15	**103**

Two-thirds or more of mentors also reported using all strategies listed to support students' engagement in authentic STEM activities (Table 22). Over 90% of mentors reported encouraging students to learn collaboratively (91%) and encouraging students to seek support from other team members (91%). The strategy used least frequently in this area was having students search for and review technical research to support their work (70%).

Table 22. Mentors Using Strategies to Support Student Engagement in "Authentic" STEM Activities (n=103)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Teaching (or assigning readings) about specific STEM subject matter	79.6%	20.4%	
	82	21	**103**
Having my students search for and review technical research to support their work	69.9%	30.1%	
	72	31	**103**
Demonstrating laboratory/field techniques, procedures, and tools for my student(s)	80.6%	19.4%	
	83	20	**103**
Supervising my students while they practice STEM research skills	81.6%	18.4%	
	84	19	**103**
	87.4%	12.6%	

Providing my students with constructive feedback to improve their STEM competencies	90	13	**103**
Allowing students to work independently to improve their self-management abilities	89.3%	10.7%	
	92	11	**103**
Encouraging students to learn collaboratively (team projects, team meetings, journal clubs, etc.)	91.3%	8.7%	
	94	9	**103**
Encouraging students to seek support from other team members	91.3%	8.7%	
	94	9	**103**

Mentors were also asked to report on strategies they used to support students' STEM education and career pathways (Table 23). While half or more of responding mentors indicated using all of these strategies, mentors reported using these strategies less frequently overall than those associated with the other areas of mentoring. For example, less than two-thirds reported using the strategies of helping students with their resumes, applications, personal statements, and/or interview preparations (52%) and helping students build professional networks in a STEM field (61%). The most frequently used strategies in this area included asking students about their educational and/or career goals (89%) and providing guidance about educational pathways that will prepare students for STEM careers (86%). Mentors were more likely to discuss STEM careers and opportunities that were not related to AEOP or the DoD with their students than those opportunities related to AEOP or DoD. For example, nearly three-quarters of mentors reported discussing STEM career opportunities in industry or academia (72%) with their students while only 62% of mentors reported recommending AEOPs that align with students' goals and discussing STEM career opportunities within the DoD or other government agencies with their students.

Table 23. Mentors Using Strategies to Support Student STEM Education and Career Pathways (n=103)

	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	89.3%	10.7%	
	92	11	**103**
Recommending extracurricular programs that align with students' goals	74.8%	25.2%	
	77	26	**103**
Recommending Army Educational Outreach Programs that align with students' goals	62.1%	37.9%	
	64	39	**103**
	86.4%	13.6%	

Providing guidance about educational pathways that will prepare my students for a STEM career	89	14	**103**
Discussing STEM career opportunities within the DoD or other government agencies	62.1%	37.9%	
	64	39	**103**
Discussing STEM career opportunities in private industry or academia	72.8%	27.2%	
	75	28	**103**
Discussing the economic, political, ethical, and/or social context of a STEM career	73.8%	26.2%	
	76	27	**103**
Recommending student and professional organizations in STEM to my students	74.8%	25.2%	
	77	26	**103**
Helping students build a professional network in a STEM field	61.2%	38.8%	
	63	40	**103**
Helping my students with their resume, application, personal statement, and/or interview preparations	51.5%	48.5%	
	53	50	**103**

Program Features and Feedback/Satisfaction

Students and mentors were asked how satisfied they were with a number of features of the Unite program (Tables 24 and 25). Table 24 displays student responses and suggests that students were quite satisfied with Unite features, with more than 70% of students indicating they were at least somewhat satisfied with each of the listed program features. Students were most satisfied with applying or registering for the program (83%); stipends (83%); and invited speakers or career events (83%). Very few students indicated that they were "not at all" satisfied with any program feature (<5%).

Table 24. Student Satisfaction with Unite Program Features (n=296)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Applying or registering for the program	0.7%	2.7%	13.2%	23.6%	59.8%	
	2	8	39	70	177	**296**
Communicating with your Unite host site organizers	2.4%	3.7%	17.2%	27.4%	49.3%	
	7	11	51	81	146	**296**

The physical location(s) of Unite activities	1.7%	3.7%	14.5%	27.0%	53.0%	
	5	11	43	80	157	**296**
The variety of STEM topics available to you in Unite	1.4%	2.7%	17.6%	29.1%	49.3%	
	4	8	52	86	146	**296**
Teaching or mentoring provided during Unite activities	1.0%	3.4%	14.5%	25.3%	55.7%	
	3	10	43	75	165	**296**
Stipends (payment)	3.0%	2.7%	10.8%	17.9%	65.5%	
	9	8	32	53	194	**296**
Educational materials (e.g., workbooks, online resources, etc.) used during program activities	2.4%	4.4%	15.9%	24.0%	53.4%	
	7	13	47	71	158	**296**
Invited speakers or "career" events	0.7%	4.1%	12.8%	27.7%	54.7%	
	2	12	38	82	162	**296**
Field trips or laboratory tours	2.7%	2.4%	11.8%	20.6%	62.5%	
	8	7	35	61	185	**296**

An open-ended item on the questionnaire asked students to comment on their overall satisfaction with their Unite experiences. Of the 252 students who provided a response to this item, nearly all (96%) had only positive comments. Many of these responses were simple affirmations of their program experiences such as "I loved it and would love to come again" and "It was a blast…a very very awesome experience." Other students who provided more detail about their satisfaction with features of the Unite program focused on their STEM learning, the career information they gained, and the friends they made in the program. For example,

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

> "I am very satisfied with my Unite experience it has been a wonderful experience it has taught me a lot about the different opportunities in life and different careers I could take and I have learned a lot over these past weeks for example robotics, solar energy, coding, soldering, bridge building and working as a team when you work as a team you help each other and help each other better themselves." [Unite Student]

> "It was a wonderful experience and I would definitely participate again. I have enjoyed exploring new careers and career options and different things about myself." [Unite Student]

Only 1 respondent had nothing positive to say about Unite, answering simply "No" when asked about his overall satisfaction with the program. Another 10 students had positive things to say about Unite but included some caveats. These caveats included dissatisfaction with the topics, lack of understanding of content, a wish for more field trips or more interesting field trips, a complaint about other program participants, and comments about preferring a shorter or less stressful program. For example,

> "Overall [I am] satisfied, but I would have preferred it if it was more mechanical engineering rather than computer science/software engineering." [Unite Student]

> "[Unite] was ok but would have been better had we had more field trips to talk about the DoD and AEOP program. This was basically just a STEM camp with the experiments that we've done numerous amounts of times." [Unite Student]

Students were also asked to list three benefits of participating in Unite. A total of 234 students identified at least one benefit of participating. The most frequently mentioned benefits were STEM learning (115 students, or 49%) and career information (105 students, or 45%). Benefits mentioned by about 20% of students included teamwork (47 students), STEM-related skills (46 students), the opportunity to make friends (44 students), and receiving educational and/or college information (44 students). Between 12% and 15% of students cited gaining communication skills (34 students), increases in their interest or motivation for STEM (30 students), and the opportunities for hands-on experiences (28 students) as benefits of Unite. Other benefits, mentioned by 17 or fewer students (7% or less) included being exposed to new opportunities, increasing their confidence, increasing their self-knowledge, the stipend, developing patience, the field trips, improving their organization and/or time management, the field trips, and the opportunity to network with STEM professionals and/or build their resumes.

Another open-ended questionnaire item asked students to list three ways that the program could be improved. Of the 211 students who made at least one suggestion for program improvement, the most frequently mentioned improvements, mentioned by around a quarter of students, included providing more hands-on content (62 students); more or better field trips and/or college visits (57 students); and improvements in scheduling (57 students), including providing a longer or shorter program, a less packed schedule, more sleep and/or a later start time, more breaks, and more free time. About 17% of students suggested improvements in mentors, including providing more mentors, better mentors, improving teaching methods, and providing more diverse instructors. Improvements mentioned by between 12% and 14% of students included improving organization and/or communication from the program (30 students) providing more or more choice of topics (26 students), a longer program (24 students), and improving the food (24 students). Other improvements mentioned by 14 or fewer students (7%) included providing more group activities, providing more in-depth information or focus on specific topics, more

participants, more career connections, a larger stipend, and more recreational activities. For example, Unite students responded that improvements would include:

> "I would like to have more activities and less videos. I liked doing lab stuff and building everyday."
>
> "More field trips that are hands on."
>
> "More visits with college students that are in STEM because we can relate to them more."
>
> "Visit other Engineering fields that don't revolve around mechanical engineering."
>
> "Elongate the program to allow for more advanced and prepared projects."
>
> "More engaging, even-paced lessons"
>
> "More connections to jobs (not just this is something engineers do)."

Most mentors also reported being satisfied with all Unite features (Table 25). 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 (<4%). Features receiving the highest endorsement ("somewhat" or "very much" satisfied) by mentors were: the physical location of Unite activities (84%); support for instruction or mentorship during program activities (75%); and communicating with Unite site coordinators (75%). While mentors were largely satisfied with program features, it is important to note that 2018 mentor satisfaction with program features tended to be lower than that reported by mentors in 2017. For example, 72% of 2018 mentors were at least somewhat satisfied with Unite field trips or laboratory tours, compared with 83% of 2017 mentors.

Table 25. Mentor Satisfaction with Unite Program Features (n=103)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Application or registration process	38.8%	1.0%	2.9%	15.5%	41.7%	
	40	1	3	16	43	**103**
Communicating with Technology Student Association (TSA)	39.8%	0.0%	1.0%	12.6%	46.6%	
	41	0	1	13	48	**103**
Communicating with Unite site coordinators	16.5%	1.9%	6.8%	16.5%	58.3%	
	17	2	7	17	60	**103**
The physical location(s) of Unite's activities	11.7%	1.0%	3.9%	20.4%	63.1%	
	12	1	4	21	65	**103**
	14.6%	2.9%	7.8%	15.5%	59.2%	

Support for instruction or mentorship during program activities	15	3	8	16	61	**103**
Stipends (payment)	18.4%	3.9%	6.8%	13.6%	57.3%	
	19	4	7	14	59	**103**
Invited speakers or "career" events	30.1%	0.0%	1.9%	9.7%	58.3%	
	31	0	2	10	60	**103**
Field trips or laboratory tours	24.3%	0.0%	3.9%	15.5%	56.3%	
	25	0	4	16	58	**103**

The mentor questionnaire also included open-ended items asking for mentors' opinions about Unite. Mentors were asked to comment on their overall satisfaction with the program. Of the 60 mentors who responded to this item, all had something positive to say about the program and nearly all (54, or 90%) made only positive comments. Mentors specifically cited the opportunity Unite provides for underserved and underrepresented students, the career information students receive, the increased interest in STEM they see in Unite students, mentors' appreciation for the program generally, and students' gains in STEM knowledge and skills and their confidence. For example,

> "I have watched numerous kids come through the program and steadily improve in demeanor. Kids with behavioral issues in school or harrowing home life come to [Unite] and thrive. I love this program because it brings so many amazing teens together to learn and grow. [Unite] teaches these kids so much more than just STEM. Yes, they have microbiology and mathematics classes, but they also have etiquette dinners and community service projects. The participants [of our program] would not have this opportunity without Unite. Thank you for changing my life as well as many others!" [Unite Mentor]

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

> "I was so excited to be a part of this program. High school curriculum is not keeping pace with state-of-the-art STEM, and students are capable of much more than is usually expected of them. I got to help students and teachers master computer vision and graphic processing tools that they were able to apply to create valuable software that other people will use. I believe this program has inspired them to continue STEM projects and bring these topics back to the classroom." [Unite Mentor]

> "Our students are having a fantastic time learning about technology. They have created their own websites, created their own games, created and edited their own videos, learning about cyber-

security, and so much more. This has truly been a great opportunity for our instructors and educators as well." [Unite Mentor]

Six of the mentors made positive comments but also offered some caveats. These caveats focused on students' academic preparation and behavior and mentor preparation for related issues, the curriculum, and a lack of AEOP information. For example,

> "Many of my concerns are with the UNITE students, not the program. Students come from a background of social survival. Science often requires putting your social setting second. These two scenarios conflict. Students spent a lot of time on social media and not focused on science. We got the sense that several students did not want to participate, but were obligated somehow. I fully understand that this is a condition of their environment, generation, and why they are with us…the hidden message is that they are likely frustrated, too, but express it differently and/or they may be projecting what their peers at home think of this experience. These are the students who need UNITE the most. Getting these students to build the confidence in themselves enough so they can evolve their thinking (and attitude) is a challenge and we could all use more training to help bridge that intellectual and social gap." [Unite Mentor]

> "I am happy with most of my students' progression throughout the course of this program. I truly believe that many of them have learned a great deal and have a deeper understanding of various STEM topics. However, I feel that if a more stable curriculum was developed before the program started, all of the students would have taken more away from the program." [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. A total of 72 mentors listed at least one strength of the program. The most frequently mentioned strength, mentioned by 38% (27) mentors was students' STEM learning. Nearly a quarter (22%-24%) mentioned the value of the teamwork and collaboration students experience (17 mentors), the opportunities Unite provides for underserved and underrepresented students (16 mentors), and the real-world and hands-on experiences in Unite (16 mentors). Between 10% and 17% of mentors also mentioned as benefits program organization and support (12 mentors), specific STEM skills and research skills that students gain (11 mentors), the opportunity to network and work with STEM professionals (11 mentors), the career information students receive (9 mentors), students' communication skills (9 mentors), the quality of the instructors and mentors (9 mentors), and the college information students receive (7 mentors). For example, Unite mentors said that benefits included:

> "Reaching underserved and underrepresented community."
>
> "Learning to communicate effectively with others."
>
> "Allows students access to professionals and mentors in tech disciplines and majors."
>
> "Freedom to develop the lesson to fit the students."
>
> "Encouraging students to explore different ways of looking at the world."

"UNITE increased the ability of the students to understand engineering design problems."

Mentors were also asked in an open-ended questionnaire item to list three ways in which Unite could be improved for future participants. A total of 60 mentors provided at least one suggestion. These mentors offered a wide variety of suggestions. Eleven mentors (18%) suggested improving Unite by including more field trips and/or speakers or visitors. Nine mentors each (or 15%) suggested providing more outreach or advertising about the program, more hands-on content and/or more research experience for students, and improving student selection processes and/or student accountability once enrolled in Unite. Another 8 mentors (13%) suggested drawing more connections and/or having more interaction between Unite and the Army or DoD, and the same number suggested having more field trips, mentor information or teaching materials. Seven mentors (12%) also suggested improving organization, planning, and/or communication and another 7 suggested increasing the budget and/or staff stipends. A range of other improvements were suggested by five or fewer mentors (8% or less), including providing more career information; improving the food; increasing the amount of free time or the number of breaks during program activities; continuing program activities and/or mentor-student communication during the school year; providing more AEOP information; providing flexibility in funding to pay for housing, food, and transportation; and including more technology or addressing technology issues.

The following are examples of Unite mentors' responses when asked to provide suggestions for program improvement:

"Research based lessons/equipment provided to high school level students."

"Provide instructors with the clear objectives (i.e.: exposure to DoD) that we should integrate."

"Provide clear info. to students about the program."

"Better communication with teachers."

"The mentors spent time everyday prepping for the UNITE students and should be compensated for it."

"More trips to varying locations."

"More actual engineers visit."

"Molecular biology is expensive, so some funds to cover students' experiments would be welcomed."

7 | Priority #3 Findings

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

How Participants Found out About AEOP

To understand which recruitment methods were most effective, students were asked at registration to identify all of the ways they had learned about AEOP (see Table 26). The sources of information most frequently chosen were someone who works at the school or university the student attends (29%), someone who works with the program (25%), and a school or university newsletter, email, or website (24%). Only 5% learned about AEOP from the AEOP website, and no students reported learning about AEOP from social media.

Table 26. How Students Learned About AEOP (n=193)

	Response Percent	Response Total
Army Educational Outreach Program (AEOP) Website	4.66 %	9
AEOP on Facebook, Twitter, Instagram, or other social media	0.00 %	0
School or university newsletter, email, or website	23.83 %	46
Past participant of program	8.81 %	17
Friend	15.54 %	30
Family Member	11.92 %	23
Someone who works at the school or university I attend	29.02%	56
Someone who works with the program	24.88 %	48
Someone who works with the Department of Defense (Army, Navy, Air Force, etc.)	0.72 %	2
Community group or program	1.04 %	28
Choose Not to Report	8.81 %	17

Mentors were also asked to report how they learned about AEOP (Table 27). A past participant of Unite (32%) was the most frequently cited source of information. Other frequently reported sources of information about AEOP included someone who works with the program (32%); someone who works at their school or university (28%); and the AEOP website (16%). Less frequently chosen responses included learning about AEOP on social media (4%); from someone who works with the DoD (4%); from a family member (8%); and from a community group or program (8%).

Table 27. How Mentors Learned About AEOP (n=25)

	Response Percent	Response Total
Army Educational Outreach Program (AEOP) Website	16%	4
AEOP on Facebook, Twitter, Instagram, or other social media	4%	1
School or university newsletter, email, or website	12%	3
Past participant of program	32%	8
Friend	12%	3
Family Member	8%	2
Someone who works at the school or university I attend	28%	7
Someone who works with the program	32%	8
Someone who works with the Department of Defense (Army, Navy, Air Force, etc.)	4%	1
Community group or program	8%	2
Choose Not to Report	8%	2

Students were asked at registration about their reasons for participating in Unite (see Table 28). The two motivators most frequently chosen by students were the desire to learn something new or interesting (65%) and interest in STEM (65%). Half of students cited having fun as a reason for participating. Less than half of students selected any of the other motivators for participating in Unite.

Table 28. Factors Motivating Students to Participate in Unite (n=193)

	Response Percent	Response Total
Teacher or professor encouragement	21.76 %	42
An academic requirement or school grade	4.66 %	9
Desire to learn something new or interesting	65.28 %	126
The mentor(s)	7.77 %	15

Building college application or résumé	43.00 %	83
Networking opportunities	25.91 %	50
Interest in science, technology, engineering, or mathematics (STEM)	65.28 %	126
Interest in STEM careers with the Army	16.06 %	31
Having fun	50.26 %	97
Earning stipends or awards for doing STEM	30.57 %	59
Opportunity to do something with friends	22.28 %	43
Opportunity to use advanced laboratory technology	38.86 %	75
Desire to expand laboratory or research skills	41.97 %	81
Learning in ways that are not possible in school	40.41 %	78
Serving the community or country	21.76 %	42
Exploring a unique work environment	35.23 %	68
Figuring out education or career goals	45.60 %	88
Seeing how school learning applies to real life	26.42 %	51
Recommendations of past participants	5.18 %	10
Choose Not to Report	5.70 %	11

Previous Program Participation & Future Interest

Students were asked at registration about their previous participation in AEOPs (see Table 29). While 19% of students reported previously participating in Unite, only 2 participants reported having previously participated in Camp Invention and 1 in REAP. The majority of students (61%) reported never having participated in any AEOPs in the past.

Table 29. Student Participation in AEOP Programs (n=193)

	Response Percent	Response Total
Camp Invention	1.04 %	2
eCYBERMISSION	0.00 %	0
Junior Solar Sprint (JSS)	0.00 %	0
Gains in the Education of Mathematics and Science (GEMS)	0.00 %	0
Unite	18.65 %	36

Junior Science & Humanities Symposium (JSHS)	0.00 %	0
Science & Engineering Apprenticeship Program (SEAP)	0.00 %	0
Research & Engineering Apprenticeship Program (REAP)	0.52 %	1
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	61.14 %	118

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 (Table 30). Similar to 2017, mentors reported that they most frequently discussed Unite (70%) and REAP (53%) with their students. Most mentors did not specifically discuss any other AEOPs with students. Nearly half (48%) of mentors reported discussing AEOP with students, but without reference to any particular program.

Table 30. Mentors Explicitly Discussing AEOPs with Students (n=103)

	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)	41.7%	58.3%	
	43	60	**103**
Unite	69.9%	30.1%	
	72	31	**103**
Junior Science & Humanities Symposium (JSHS)	39.8%	60.2%	
	41	62	**103**
Science & Engineering Apprenticeship Program (SEAP)	38.8%	61.2%	
	40	63	**103**
Research & Engineering Apprenticeship Program (REAP)	53.4%	46.6%	
	55	48	**103**
High School Apprenticeship Program (HSAP)	41.7%	58.3%	
	43	60	**103**
College Qualified Leaders (CQL)	31.1%	68.9%	
	32	71	**103**

GEMS Near Peer Mentor Program	26.2%	73.8%	
	27	76	**103**
Undergraduate Research Apprenticeship Program (URAP)	43.7%	56.3%	
	45	58	**103**
Science Mathematics, and Research for Transformation (SMART) College Scholarship	44.7%	55.3%	
	46	57	**103**
National Defense Science & Engineering Graduate (NDSEG) Fellowship	28.2%	71.8%	
	29	74	**103**
I discussed AEOP with my student(s) but did not discuss any specific program	47.6%	52.4%	
	49	54	**103**

Awareness of STEM Careers & DoD STEM Careers & Research

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 31 displays student responses to questionnaire items asking them about their exposure to STEM jobs and careers generally and DoD STEM jobs and careers more specifically. Nearly all students reported learning about at least one STEM job/career (98%) and at least one DoD STEM job/career (91%) while participating in Unite. Far fewer students indicated they learned about 3 or more DoD STEM jobs/careers (60%) compared to STEM jobs/careers in general (91%).

Table 31. Number of STEM Jobs/Careers Students Learned About During Unite in 2018 (n = 296)

	STEM Jobs/Careers	DoD STEM Jobs/Careers
None	2.03 %	9.46 %
1	0.68 %	12.16 %
2	6.76 %	17.91 %
3	14.19 %	15.54 %
4	12.16 %	12.50 %
5 or more	64.19 %	32.43 %

For students to maintain continued interest in and potential involvement in future DoD STEM careers, it is important for students to have a positive perspective about DoD research and researchers. Students were therefore asked to rate their level of agreement with various statements about DoD research and researchers. Table 32 shows that approximately three-quarters of students agreed or strongly agreed to

all items. It is important to note, however, that approximately 20% did not offer an opinion for each item (selected "neither agree nor disagree"). This suggests that these students may have had limited familiarity with DoD research and researchers.

Table 32. Student Opinions about DoD Researchers and Research (n=296)

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Response Total
DoD researchers advance science and engineering fields	1.7%	1.0%	22.6%	45.6%	29.1%	
	5	3	67	135	86	**296**
DoD researchers develop new, cutting edge technologies	1.4%	1.0%	22.3%	47.6%	27.7%	
	4	3	66	141	82	**296**
DoD researchers solve real-world problems	1.0%	1.4%	19.9%	41.6%	36.1%	
	3	4	59	123	107	**296**
DoD research is valuable to society	0.7%	1.4%	19.9%	44.3%	33.8%	
	2	4	59	131	100	**296**

Interest & 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 STEM Engagement, students were asked to reflect on whether the likelihood of their engaging in STEM activities outside of required school activities changed as a result of their Unite experience (Table 33). Approximately 50% or more of Unite students reported an increased likelihood of engaging in each STEM activity. Nearly three-quarters or more of students reported being more likely take an elective STEM class (72%); work on a STEM project or experiment in a university or professional setting (71%); participate in a STEM camp, club, or competition (71%); and tinker with a mechanical or electrical device (71%). A composite score was created from the Future STEM Engagement items.[21] No significant differences were found by U2 classification or any underrepresented subgroup in terms of Future STEM Engagement.

[21] These 10 Future STEM Engagement items had a Cronbach's alpha reliability of 0.916.

Table 33. Change in Likelihood Students Will Engage in STEM Activities Outside of School (n=296)

	Much less likely	Less likely	About the same before and after	More likely	Much more likely	Response Total
Watch or read non-fiction STEM	3.4%	8.4%	39.9%	29.7%	18.6%	
	10	25	118	88	55	**296**
Tinker (play) with a mechanical or electrical device	2.4%	4.7%	22.0%	38.5%	32.4%	
	7	14	65	114	96	**296**
Work on solving mathematical or scientific puzzles	1.7%	4.7%	32.8%	33.4%	27.4%	
	5	14	97	99	81	**296**
Use a computer to design or program something	1.0%	6.4%	27.7%	29.7%	35.1%	
	3	19	82	88	104	**296**
Talk with friends or family about STEM	2.4%	4.7%	24.0%	35.5%	33.4%	
	7	14	71	105	99	**296**
Mentor or teach other students about STEM	3.4%	8.1%	30.1%	31.1%	27.4%	
	10	24	89	92	81	**296**
Help with a community service project related to STEM	2.0%	7.8%	24.3%	35.5%	30.4%	
	6	23	72	105	90	**296**
Participate in a STEM camp, club, or competition	1.0%	4.4%	23.3%	30.7%	40.5%	
	3	13	69	91	120	**296**
Take an elective (not required) STEM class	1.7%	3.4%	23.3%	30.1%	41.6%	
	5	10	69	89	123	**296**
Work on a STEM project or experiment in a university or professional setting	1.4%	4.1%	23.3%	30.7%	40.5%	
	4	12	69	91	120	**296**

Another key AEOP goal is keeping students engaged across the portfolio of AEOP initiatives. As such, students were asked about their interest in participating in future AEOPs (Table 34). Students expressed strong interest in participating in Unite again (76% indicating that they were somewhat or very much interested). More than half of the students indicated being at least somewhat interested in participating in other AEOPs including SMART (52%), REAP (58%), and SEAP (51%). However, approximately a quarter or more of students reported not having heard about programs for which they are or soon will be eligible such as SEAP (23%), GEMS (27%), JSHS (30%), and GEMS Near Peer Mentors (32%). It is notable that the

percentage of students indicating they had not heard of these AEOPs decreased by an average of 11 percentage points from 2017 levels, suggesting that 2018 participants may have had more exposure to information about other AEOPs.

Table 34. Student Interest in Future AEOP Programs (n=296)

	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)	26.7%	3.7%	20.9%	26.0%	22.6%	
	79	11	62	77	67	**296**
Unite	2.0%	3.4%	18.9%	22.3%	53.4%	
	6	10	56	66	158	**296**
Junior Science & Humanities Symposium (JSHS)	29.7%	9.1%	23.3%	20.3%	17.6%	
	88	27	69	60	52	**296**
Science & Engineering Apprenticeship Program (SEAP)	23.0%	4.1%	22.3%	21.3%	29.4%	
	68	12	66	63	87	**296**
Research & Engineering Apprenticeship Program (REAP)	18.6%	4.1%	19.3%	20.9%	37.2%	
	55	12	57	62	110	**296**
High School Apprenticeship Program (HSAP)	26.7%	6.8%	20.6%	17.6%	28.4%	
	79	20	61	52	84	**296**
College Qualified Leaders (CQL)	32.1%	5.7%	24.0%	17.6%	20.6%	
	95	17	71	52	61	**296**
GEMS Near Peer Mentor Program	32.1%	7.8%	19.9%	20.9%	19.3%	
	95	23	59	62	57	**296**
Undergraduate Research Apprenticeship Program (URAP)	32.1%	7.8%	18.2%	20.3%	21.6%	
	95	23	54	60	64	**296**
Science Mathematics, and Research for Transformation (SMART) College Scholarship	24.0%	4.4%	19.6%	19.9%	32.1%	
	71	13	58	59	95	**296**
National Defense Science & Engineering Graduate (NDSEG) Fellowship	30.4%	6.4%	20.3%	19.9%	23.0%	
	90	19	60	59	68	**296**

All AEOPs have a goal of broadening, deepening, and diversifying the pool of STEM talent, a goal that requires students to pursue STEM educational opportunities. To evaluate this goal, students were asked about their educational aspirations after participating in Unite. Table 35 shows that nearly all students intended to finish college (93%) and that almost half aspired to get more education after college (49%).

Table 35. Student Education Aspirations After Participating in Unite (n=296)

Choice	Response Percent	Response Total
Graduate from high school	3.72 %	11
Go to a trade or vocational school	0.68 %	2
Go to college for a little while	3.38 %	10
Finish college (get a Bachelor's degree)	42.91 %	127
Get more education after college	49.32 %	146

In order to further understand how Unite impacted students' future likelihood of engaging in STEM, 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 263 students who provided a response, all but 18 (7%) indicated that Unite had a positive influence on their interest in STEM careers. Of the 18 students who reported that Unite had not increased their interest in STEM, about half provided more explanation of why their experience had not increased their interest in STEM, indicating that they had an interest in STEM careers before participating in Unite. As one student said, "I was already planning on pursuing a science or engineering career and Unite only reinforced that thought." Many other students provided simple affirmations that Unite had increased their interest in pursuing STEM careers saying, for example, that Unite "has helped me to expand my options in life," "helped a lot," and "increased my interest a lot because I do want to pursue a career in STEM."

Students who provided more detailed responses credited the Unite activities, their hands-on experiences, the information they gained about STEM careers, and their first-hand experience with STEM careers for their increased interest. Some students cited field trips, speakers, and their mentors as sources of information about careers. For example,

> "I now understand that there are MANY career options that involve STEM, and I don't have to stick to just learning math to be successful in a career because most careers in the STEM field involve a lot other than just math but also science and technology." [Unite Student]
>
> "The activities gave me more knowledge on what the jobs are like and that gave me interests in some of the careers." [Unite Student]
>
> "Listening to what a DoD agent does makes me want to be like them more and get a career as an engineer." [Unite Student]

"My participation in Unite has helped to broaden my perspective on the STEM field, specifically the range of jobs and complexities of certain fields." [Unite Student]

"The Unite activities and experience helped increase my interest in pursuing a career in STEM disciplines because even though I already knew a lot about STEM, Unite helped open my eyes to all the opportunities that exist out there for me to take and apply so I can use STEM to make a significant change on Earth." [Unite Student]

"[Unite] opened my mind in engineering knowledge and the disciplines that follow into it. Along with that, it has allowed me to learn of the values and traits that is required for a task to be successful in the end." [Unite Student]

In order to gain an understanding of what Unite topics were most impactful, students were asked to respond to an open-ended questionnaire item asking them to list the topics from their Unite experiences that were "most impressive." A total of 265 students provided answers to this item, and listed a variety of topics and experiences. Many students noted that they enjoyed the hands-on work, teamwork, and general gains in STEM knowledge. Among students who referenced specific topics, the most frequently mentioned were engineering and building (mentioned by 48 students or 18%); robotics (mentioned by 35 students or 13%); computer programming, coding or web design (mentioned by 26 students or 10%); and biology, microbiology, and health or medicine (mentioned by 26 students or 10%). Other topics students mentioned included game design (mentioned by 14 students, or 5%); activities using drones (mentioned by 10 students, or 4%); renewable energy sources (mentioned by 5 students, or 2%). Some students specifically mentioned that they enjoyed field trips and guest speakers (16 students, or 6%) and Army/DoD and AEOP information (10 students, or 4%).

Resources

Students were asked to report on how various resources impacted their awareness of AEOPs (Table 36). Resources that more than two-thirds of students reported as at least somewhat impactful on their awareness of AEOPs were: invited speakers or career events during Unite (76%); participation in Unite (72%); their Unite instructor(s) (69%); and the AEOP brochure (68%). More than a third reported not having experienced the TSA website (39%) and AEOP on social media (41%). Around a quarter of students had not experienced the AEOP brochure (25%) and the AEOP website (22%).

Table 36. Impact of Resources on Student Awareness of AEOPs (n=296)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	39.2%	11.8%	21.6%	18.2%	9.1%	
	116	35	64	54	27	**296**

Army Educational Outreach Program (AEOP) website	22.0%	7.1%	24.3%	23.0%	23.6%	
	65	21	72	68	70	**296**
AEOP on Facebook, Twitter, Pinterest or other social media	41.2%	12.5%	24.0%	13.9%	8.4%	
	122	37	71	41	25	**296**
AEOP brochure	25.0%	9.1%	27.4%	19.3%	19.3%	
	74	27	81	57	57	**296**
My Unite instructor(s)	5.7%	4.4%	21.6%	27.4%	40.9%	
	17	13	64	81	121	**296**
Invited speakers or "career" events during Unite	7.4%	4.1%	19.3%	26.4%	42.9%	
	22	12	57	78	127	**296**
Participation in Unite	5.7%	2.4%	15.5%	21.6%	54.7%	
	17	7	46	64	162	**296**

Students were also asked to report on the impact of various resources on their awareness of DoD STEM careers (Table 37). Participation in Unite (68%), invited speakers or career events (65%), and students' Unite mentors (64%) were reported most often as being somewhat or very much impactful. Less than half of students reported that other resources listed were at least somewhat impactful on their awareness of DoD careers. These findings are similar to those of 2017, but are approximately 10 percentage points less in magnitude as compared to 2017 findings. Many students had not experienced resources such as AEOP on social media (41%) and the TSA website (39%).

Table 37. Impact of Resources on Student Awareness of DoD Careers (n=296)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	38.9%	11.5%	21.6%	15.5%	12.5%	
	115	34	64	46	37	**296**
Army Educational Outreach Program (AEOP) website	25.0%	11.1%	23.3%	19.6%	20.9%	
	74	33	69	58	62	**296**
AEOP on Facebook, Twitter, Pinterest or other social media	41.2%	12.5%	22.3%	14.2%	9.8%	
	122	37	66	42	29	**296**
AEOP brochure	24.0%	11.8%	25.0%	19.9%	19.3%	

	71	35	74	59	57	**296**
My UNITE mentor(s)	7.1%	5.7%	23.6%	24.0%	39.5%	
	21	17	70	71	117	**296**
Invited speakers or "career" events during UNITE	9.1%	6.4%	19.9%	26.4%	38.2%	
	27	19	59	78	113	**296**
Participation in Unite	7.8%	3.7%	20.9%	19.9%	47.6%	
	23	11	62	59	141	**296**

In accordance with the AEOP goal of creating a pipeline of AEOP initiatives, mentors were also asked to report on the usefulness of various resources in exposing students to AEOPs (Table 38). More than two-thirds of mentors indicated the following resources were at least somewhat useful: participation in Unite (74%); the Unite program administrator or site coordinator (70%); and invited speakers or career events (66%). Half or more of responding mentors reported not having experienced AEOP on social media (59%) and the TSA website (50%).

Table 38. Usefulness of Resources for Exposing Students to AEOPs (n=103)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	49.5%	1.0%	8.7%	12.6%	28.2%	
	51	1	9	13	29	**103**
Army Educational Outreach Program (AEOP) website	40.8%	1.0%	1.9%	17.5%	38.8%	
	42	1	2	18	40	**103**
AEOP on Facebook, Twitter, Pinterest or other social media	59.2%	4.9%	4.9%	8.7%	22.3%	
	61	5	5	9	23	**103**
AEOP brochure	40.8%	2.9%	7.8%	15.5%	33.0%	
	42	3	8	16	34	**103**
Unite Program administrator or site coordinator	25.2%	1.9%	2.9%	20.4%	49.5%	
	26	2	3	21	51	**103**
Invited speakers or "career" events	31.1%	1.0%	1.9%	12.6%	53.4%	
	32	1	2	13	55	**103**
Participation in Unite	20.4%	1.9%	2.9%	13.6%	61.2%	

	21	2	3	14	63	**103**

Mentors were asked to rate how useful the same resources were for exposing students to DoD STEM careers (Table 39). Responses showed a similar pattern to the previous item, with mentors most likely to indicate that participation in Unite was at least somewhat useful (73%), followed by the program administrator or site coordinators (66%), and invited speakers or career events (65%). Similar to the prior item, half or more of the mentors reported not having experienced AEOP on social media (58%) and the TSA website (52%) for the purpose of exposing students to DoD STEM careers.

Table 39. Usefulness of Resources in Exposing Students to DoD STEM Careers (n=103)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	52.4%	2.9%	6.8%	16.5%	21.4%	
	54	3	7	17	22	**103**
Army Educational Outreach Program (AEOP) website	43.7%	1.9%	5.8%	14.6%	34.0%	
	45	2	6	15	35	**103**
AEOP on Facebook, Twitter, Pinterest or other social media	58.3%	2.9%	5.8%	8.7%	24.3%	
	60	3	6	9	25	**103**
AEOP brochure	39.8%	2.9%	5.8%	17.5%	34.0%	
	41	3	6	18	35	**103**
Unite Program administrator or site coordinator	32.0%	1.9%	0.0%	16.5%	49.5%	
	33	2	0	17	51	**103**
Invited speakers or "career" events	33.0%	1.0%	1.0%	13.6%	51.5%	
	34	1	1	14	53	**103**
Participation in Unite	23.3%	1.9%	1.9%	16.5%	56.3%	
	24	2	2	17	58	**103**

Overall Impact

Students were asked about impacts of participating in Unite more broadly. Table 40 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 nearly two-thirds or more reporting that Unite contributed to increases for each item. Almost all students indicated that Unite contributed to increases

in their confidence in their STEM knowledge, skills, and abilities (90%). Similarly, 88% of students indicated that Unite contributed to their increased awareness of other AEOPs, and 84% 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 (80%); their interest in pursuing STEM careers (79%), and their interest in pursuing STEM careers with the Army or DoD (71%).

Overall Unite Impact items were combined into a composite variable[22] to test for differences by U2 classification and among underrepresented subgroups of students. Statistically significant differences were not found by U2 classification. Race/ethnicity was the only underrepresented subgroup area for which significant differences in Overall Unite Impact were found, with minority students reporting higher levels of impact than non-minority students (effect size is small with d = 0.323).[23] Mentors were also asked about impacts on students in these areas, and their reports of impacts were similar but tended to be somewhat higher than those of the students.

Table 40. Student Opinions of Unite Impacts (n=296)

	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	2.7%	7.8%	62.2%	27.4%	
	8	23	184	81	**296**
I am more interested in participating in STEM activities outside of school requirements	4.1%	9.1%	58.4%	28.4%	
	12	27	173	84	**296**
I am more aware of other AEOP opportunities	5.7%	6.4%	51.7%	36.1%	
	17	19	153	107	**296**
I am more interested in participating in other AEOP opportunities	5.1%	10.8%	50.3%	33.8%	
	15	32	149	100	**296**
I am more interested in taking STEM classes in school	3.0%	15.5%	51.4%	30.1%	
	9	46	152	89	**296**
I am more interested in earning a STEM degree	4.1%	16.2%	53.4%	26.4%	
	12	48	158	78	**296**
	4.7%	15.9%	49.3%	30.1%	

[22] The Cronbach's alpha reliability for these 10 Unite Impact items was 0.921.
[23] Independent Samples t-test for Overall Unite Impact by race/ethnicity: $t(194)=2.25$, $p=.025$.

I am more interested in pursuing a career in STEM	14	47	146	89	**296**
I am more aware of Army or DoD STEM research and careers	6.1%	11.1%	49.7%	33.1%	
	18	33	147	98	**296**
I have a greater appreciation of Army or DoD STEM research	6.4%	9.8%	49.7%	34.1%	
	19	29	147	101	**296**
I am more interested in pursuing a STEM career with the Army or DoD	14.2%	15.2%	43.9%	26.7%	
	42	45	130	79	**296**

8 | Findings and Recommendations

Summary of Findings

The FY18 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 41 below.

Table 41. 2018 Unite Evaluation Findings	
Priority #1: *Broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industry Base*	
Participation in Unite increased in FY18	A new host site was added in 2018 for a total of 19 host sites for Unite. The program received applications from 731 students, 429 of whom were enrolled in the program, a 17% increase in enrollment compared to 2017.
	The student placement rate was higher in FY18 (59%) than in FY17 (43%) and FY16 (41%).
Most Unite students had not previously participated in any AEOP.	While 19% of students reported previously participating in Unite, only 1 or 2 students reported at registration that they had participated in another AEOP previously (Camp Invention and REAP). The majority of students (61%) reported never having participated in any AEOPs .
Unite continues to successfully serve students from groups historically underserved and underrepresented in STEM	A large majority of 2018 Unite students (88%) met the AEOP definition of underserved.
	Over a third (43%) of students identified themselves as Black or African American. This is a decrease from the 68% of students who identified as Black or African American in 2017.
	More than half of 2018 Unite participants (62%) were female, an increase over the 2017 when 46% of participants were female.
	More students (71%) indicated that they receive free or reduced-price lunch as compared to 2017 when 61% of students reported receiving free or reduced price lunch.

	Over half of students (51%) reported that they did not have a parent or guardian who graduated from college, an increase from 31% in 2017.
	English was the first language for most Unite participants (81%) in 2018, although nearly one-fifth (18%) reported that English was not their first language.
Unite mentors reported significant gains in students' 21st Century Skills.	Participants demonstrated significant increases in 21st Century Skills from the beginning (pre-) to the end (post-) of their Unite experiences (p<.001) for all six of the 21st Century Skills areas. Students experienced the most growth in skills associated with Creativity and Innovation and Critical Thinking and Problem Solving.
Students reported engaging in STEM practices more frequently in Unite than in their typical school experiences; students whose parents or guardians did not attend college reported more frequent engagement than their peers whose parents or guardians did attend college.	Students reported significantly higher frequency of engagement in STEM practices scores in Unite as compared to in school (medium effect size), suggesting that Unite offers students more intensive STEM learning experiences than they would generally receive in school.
	No significant differences were found in reported frequency of engaging in STEM Practices in Unite by U2 classification, although students who did not have a parent or guardian who attended college reported significantly greater engagement with STEM Practices compared to students whose parents or guardians attended college (small effect size).
Students reported gains in their STEM knowledge as a result of participating in Unite, and minority and low-SES students reported larger gains than non-minority students.	More than 80% of students reported medium or large gains in each area of STEM knowledge about which they were asked.
	There were no differences in gains in STEM Knowledge by U2 classification although there were significant differences in STEM knowledge gains by race/ethnicity, with minority students reporting higher gains than non-minority students (small effect size) and by SES with low-SES students reporting higher gains (small effect size).
Students reported gains in their STEM competencies as a result of participating in Unite, and minority students reported larger gains than non-minority students.	About two-thirds or more of students reported medium or large gains in each STEM competency.
	There were no differences in gains in STEM Knowledge by U2 classification although there were significant differences in STEM competency gains by race/ethnicity, with minority students reporting significantly than non-minority students (medium effect size).
Students reported that Unite participation had positive	A large majority (85% or more) of students reported medium or large gains in all 21st Century Skills items.

impacts on their 21st Century Skills, and minority students reported larger gains than non-minority students.	There were no differences in gains in 21st Century Skills by U2 classification although there were significant differences in 21st Century Skill gains by race/ethnicity, with minority students reporting significantly higher gains than non-minority students (medium effect size).
Students reported gains in their STEM identities as a result of participating in Unite, and minority students reported larger gains than non-minority students.	More than three-quarters of students reported medium or large gains in each area of STEM identity.
	There were no differences in gains in STEM identity gains by U2 classification although there were significant differences in STEM identity gains by race/ethnicity, with minority students reporting significantly higher gains than non-minority students (medium effect size).
Priority #2: *Support and empower educators with unique Army research and technology resources.*	
Mentors used a range of mentoring strategies with students.	Most mentors reported using strategies associated with each of the five areas of effective mentoring about which they were asked. More than half of mentors reported using all strategies to help make learning activities relevant to students; more than two-thirds of mentors reported using each strategy to support the diverse needs of students as learners; nearly three-quarters or more of mentors reported using each strategy to support development of students' collaboration and interpersonal skills; two-thirds or more of mentors reported using all strategies listed to support students' engagement in authentic STEM activities; and half or more of mentors reported using each strategy to support students' STEM education and career pathways.
Unite students were satisfied with program features that they had experienced and identified a number of benefits of Unite. Students also offered various suggestions for program improvement.	More than 70% of students indicated they were at least somewhat satisfied with all Unite program features, and nearly all respondents (96%) made positive comments about their Unite experiences. Very few students indicated that they were "not at all" satisfied with any program feature (<5%).
	The most frequently mentioned benefits of Unite, each mentioned by nearly half of students, were the STEM learning they experienced and the career information they received.
	The most frequently mentioned suggestions for improvement, each mentioned by around a quarter of students, were including more hands-on content; offering more or better field trips and/or college visits; and making various improvements in scheduling, including providing a longer or shorter

	program, a less packed schedule, more time for sleep and/or a later start time, more breaks, and more free time.
Unite mentors satisfied with program features that they had experienced and identified a number of strengths of the Unite program. Mentors also offered various suggestions for program improvements.	More than half of mentors indicated they were at least somewhat satisfied with all Unite features they experienced, and a large majority (90%) had only positive comments about Unite. Very few mentors reported being "not at all" satisfied with any Unite program feature (<4%).
	The most frequently mentioned strength, mentioned by 38% of mentors was students' STEM learning. Nearly a quarter of mentors cited teamwork and collaboration of students as a strength, as well as the opportunities Unite provides for underserved and underrepresented students, and the real-world and hands-on experiences in Unite as strengths of the program.
	Mentors offered a wide variety of suggestions for program improvement; however none were mentioned by more than 18% of respondents. The most frequently mentioned suggestions (15%-18%) included providing more field trips and/or speakers or visitors, more outreach or advertising about the program, more hands-on content and/or more research experience for students, and improving student selection processes and/or student accountability once enrolled in Unite.
Priority #3: *Develop and implement a cohesive, coordinated and sustainable STEM education outreach infrastructure across the Army*	
Both students and mentors learned about AEOP primarily through personal contacts or communications through their school or workplace.	Students most frequently learned about AEOP through someone who works at the school or university they attend (29%), someone who works with the program (25%), and a school or university newsletter, email, or website (24%).
	Being a past participant of Unite (32%) was the most frequently cited source of AEOP information for mentors, followed by someone who works with the program (32%), and someone who works at their school or university (28%).
Students were motivated to participate in Unite primarily by the learning opportunities and their interest in STEM.	The two reasons for participating in Unite most frequently chosen by students at registration were the desire to learn something new or interesting (65%) and interest in STEM (65%). Half of students cited having fun as a reason for participating.
Mentors discussed AEOPs with students, but with only limited reference to specific programs.	Mentors reported that they most frequently discussed Unite (70%) and REAP (53%) with their students. Fewer than half of mentors reported discussing any other specific AEOP with students.

Most students expressed interest in participating in various AEOPs in the future, but many had not heard of AEOPs for which they are eligible.	More than three-quarters of students (76%) expressed at least some interest in participating in Unite again. Slightly more than half of students (51%-58%) indicated being at least somewhat interested in participating in other AEOPs including SMART, REAP, and SEAP. About a quarter or more of students (23%-32%) reported not having heard about several programs for which they are or soon will be eligible such as SEAP, GEMS, JSHS, and GEMS Near Peer Mentors.
	The percentage of students who had not heard of other AEOPs for which they are eligible decreased by an average of 11 percentage points from 2017 levels, suggesting that 2018 participants may have had more exposure to information about other AEOPs.
	The most frequently student-reported (68%-76%) resources for learning about AEOPs were invited speakers or career events during Unite, participation in Unite, their Unite instructors, and the AEOP brochure.
	The most frequently mentor-reported (66%-74%) resources for informing students about AEOPs were participation in Unite, the Unite program administrator or site coordinator, and invited speakers or career events.
Students learned about STEM careers during Unite, although they learned about more STEM careers generally than STEM careers specifically within the DoD.	Nearly all students reported learning about at least one STEM job/career (98%) and at least one DoD STEM job/career (91%) while participating in Unite. Fewer students indicated they learned about 3 or more DoD STEM jobs/careers (60%) compared to STEM jobs/careers in general (91%).
	Students were most likely to cite (64%-68%) participation in Unite, invited speakers or career events, and their mentors as resources useful for learning about DoD careers.
	Mentors were most likely to cite (66%-74%) participation in Unite, the Unite program administrator or site coordinator, and invited speakers or career events as resources useful for informing students about DoD careers.
Students expressed positive opinions about DoD research and researchers, although many students did not have an opinion when asked about these topics.	About three-quarters of students agreed or strongly agreed to all items related to DoD research and researchers, indicating that they view DoD research and researchers positively.
	About 20% of students did not offer an opinion for items related to DoD research and researchers, suggesting that they may have limited familiarity with these topics.

Students reported that they were more likely to engage in various STEM activities in the future after participating in Unite.	Approximately 50% or more of Unite students reported an increased likelihood of engaging in each STEM activity about which they were asked. The activities in which most students reported increased likelihood (71%-72%) were taking an elective STEM class; working on a STEM project or experiment in a university or professional setting; participating in a STEM camp, club, or competition; and tinkering with a mechanical or electrical device.
Most Unite students planned to at least complete a Bachelor's degree and most reported that Unite increased their interest in STEM careers in various ways.	Nearly all students reported after participating in Unite that they intended to finish college (93%) and almost half (49%) reported aspiring to get more education after college.
	Nearly all (93%) of students indicated that Unite had a positive influence on their interest in STEM careers, citing the Unite activities, their hands-on experiences, the information they gained about STEM careers, and their first-hand experience with STEM careers for their increased interest.
Unite students reported that participating in the program impacted their confidence and interest in STEM and STEM careers. Minority students reported larger impacts than non-minority students	Nearly two-thirds or more students reported that Unite contributed to each area relating to their confidence and interest in STEM. Almost all students (90%) indicated that Unite contributed to increases in their confidence in their STEM knowledge, skills, and abilities. A similarly large majority (88%) indicated that Unite contributed to their increased awareness of other AEOPs, and 84% that Unite contributed to their increased interest in participating in other AEOPs. Large percentages of students (71%-80%) also reported that Unite impacted them in areas such as their interest in STEM degrees, their interest in pursuing STEM careers, and their interest in pursuing STEM careers with the Army or DoD. Minority students reported higher levels of overall Unite impact than non-minority students.

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. 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 FY17 made to programs are highlighted along with a summary of efforts and outcomes reflected in the FY18 APR toward these areas.

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

FY17 Recommendation: 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.

Unite FY18 Efforts and Outcomes: Sites selected to receive 2018 funding appeared to have a compelling STEM program in place – one that could deliver a program that features STEM academics and hands-on activities, and that could expose students to STEM career information and professionals. Sites received AEOP videos, electronic AEOP and STEM career flyers, and information about connections to SWE mentors for the purpose of enhancing the recruitment process and increasing enrollment.

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

FY17 Recommendation: None

Unite FY18 Efforts and Outcomes: N/A

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

FY17 Recommendation: 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.

Unite FY18 Efforts and Outcomes: This year, high emphasis was placed on instructors/mentors/undergraduate and graduate assistants gaining knowledge about AEOP opportunities and helping to transfer that knowledge to students. AEOP promotional videos were distributed electronically to sites for recruitment and education/training, as were electronic flyers about AEOP opportunities and STEM careers. Sites were encouraged to have REAP students on campus connect with Unite students, and this happened at a number of sites. A "meet and greet" of HSAP, URAP, and Unite students was proposed to be held at one site.

Recommendations for FY19 Program Improvement/Growth

Evaluation findings revealed that Unite experienced another successful year of programming in FY18. Unite added a new host site in FY18, growing to 19 sites, student applicant placement rate grew to 59%, and the overall percentage of underserved students was 88%, including 62% female participants. There was significant growth toward mastery for Unite participants in their assessed 21st Century Skills during the program, and more than 80% of participants reported large gains in STEM knowledge.

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 FY19 and beyond.

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

No recommendations for FY19.

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

The FY18 evaluation continued to provide evidence of the consistently positive impact of Unite on participants. However, students in the program shared that they would like to have more hands-on experiences/content in the program. The content for Unite is driven locally in most cases by the university and the focus of the proposal. It is our recommendation that Unite work with the evaluation team to refine the Request for Proposals (RFP) for Unite to incorporate a strategy to have more common hands-on experiences across the program that could be branded Unite activities, and/or a framework for local universities to use to plan required experiences to be determined for the program.

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

As in FY16 and FY17, nearly half of mentors reported they did not specifically discuss any other AEOPs with students (48%). While improved slightly from FY17, this has been a recurring and persistent area of concern for Unite. It is recommended that Unite develop a centralized and required component of the program that includes activities that are specifically designed to introduce participants to the relevant AEOPs within their pipeline.