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ARMY EDUCATIONAL OUTREACH PROGRAM

Unite

2019 Annual Program Evaluation Report
Findings

July 2020

ARMY EDUCATIONAL OUTREACH PROGRAM

UNITE

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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 NC State 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 rising 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 2019, 19 college/university sites were funded through Unite/AEOP. Although Unite site programs differ from one another in terms of how they are executed, they all must meet AEOP's universal requirements. This results in a general consistency in student experiences and outcomes, with the flexibility for sites to design their program to meet the unique needs of their students.

Unite leverages university partnerships and their existing summer programs to collectively develop academically prepared students for post-secondary STEM studies. All Unite programs are designed to meet the following objectives:

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

The 2019 Unite sites included 10 HBCUs/MSIs. Unite received applications from 807 students, 440 of whom were enrolled in the program, a 54% placement rate. This represents a 9% increase in applications and a 3% increase in enrollments as compared to FY18 when 731 students applied and 429 were enrolled. Reports by host sites differ slightly from the Cvent data (Cvent data indicate that 714 students applied to sites in FY19, with 356, or 50%, placed).

Adult participants in Unite included university faculty and students, local teachers, Army S&Es, and industry STEM professionals who played important roles as mentors to Unite students. In FY19, 366 adults participated these roles, a 10% decrease from FY18 when 401 adults participated. Adult participants included 25 Army S&Es, a slight (8%) decrease from FY18 when 27 Army S&Es participated, continuing a downward trend from FY17 when 38 Army S&Es participated in Unite. A total of 133 educators (including university faculty) participated in the program compared to 152 in FY18. There were two Army/DoD laboratories and centers that partnered with Unite in FY19.

Table 1 contains an overview of demographic data for the 356 Unite participants who registered through Cvent. A large majority of FY19 Unite students (94%) met the AEOP definition of underserved (U2),[1] representing an increase from FY18 when 88% of students were classified as U2. Nearly half of students (48%) identified themselves as Black or African American, an increase from FY18 (43%) but a decrease from the 68% of students who identified as Black or African American in FY17. More than half of FY19 Unite participants (58%) were female, a slight decrease from FY18 when 62% were female, but an increase as compared to FY17 (46%). A majority of students (74%) indicated that they receive free or reduced-price lunch, a commonly used indicator of family income, an increase as compared to FY18 (71%) and FY17 (61%). Half of students (50%) reported that they did not have a parent or guardian who graduated from college, a slight decrease from 51% in FY18 and an increase from 31% in FY17. Table 2 provides site reports of the number of students who participated at each Unite site.

[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).

Table 1. 2019 Unite Student Participant Profile		
Demographic Category		
Respondent Gender (n = 356)		
Female	208	58%
Male	145	41%
Choose not to report	3	<1%
Respondent Race/Ethnicity (n = 356)		
Asian	26	7%
Black or African American	171	48%
Hispanic or Latino	72	20%
Native American or Alaska Native	16	5%
Native Hawaiian or other Pacific Islander	0	0%
White	59	17%
Other race or ethnicity	9	2%
Choose not to report	3	<1%
School Location (n=356)		
Urban (city)	169	48%
Suburban	73	21%
Rural (country)	90	25%
Frontier or tribal School	1	<1%
DoDDS/DoDEA School	1	<1%
Home school	1	<1%
Online school	2	<1%
Free or Reduced-Price Lunch Recipient (n = 356)		
Yes	264	74%
No	76	21%
Choose not to report	16	5%
English is First Language (n = 356)		
Yes	315	89%
No	37	10%
Choose not to report	4	1%
One parent/guardian graduated from college (n = 356)		
Yes	177	50%
No	163	45%
Choose not to report	16	5%
U2 Classification (n = 356)		
Yes	334	94%
No	50	12%

Table 2. 2019 Unite Student Participation by Site	
Unite Site	**Participating Students (Site Reports)**
Alabama State University (AL)	24
Fayetteville State University (NC)	19
Florida State University (FL)	24
Harris-Stowe State University (MO)	19
Jackson State University (MS)	15
Marshall University (WV)	32
Michigan Technological University (MI)	18
Montana Tech (MT)	51
Morgan State University (WV)	5
New Jersey Institute of Technology (NJ)	19
Savannah State University (GA)	15
Texas Southern University (TX)	40
University of Colorado, Colorado Springs (CO)	20
University of Iowa (IA)	24
University of Nevada, Las Vegas (NV)	20
University of New Mexico (NM)	15
University of Pennsylvania (PA)	20
University of Puerto Rico (PR)	20
Virginia Tech (VA)	40
TOTAL	**440**

Table 3 summarizes 2019 Unite program costs. The overall cost of Unite for FY19 was $706,997. The cost per student was $1,607.

Table 3. 2019 Unite Program Costs	
Total Cost	$706,997
Total Travel	$17,792
Participant Travel	$0
Total Awards	$188,500
Student Awards/Stipends	$182,900
Adult/Teacher/Mentor Awards	$5,600
Cost Per Student	$1,607

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4 | Evaluation At-A-Glance

NC State 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 program information provided by TSA. Tables 4-6 outline the information collected in student and mentor questionnaires, and information provided by TSA 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. 2019 Student Questionnaires

Category	Description
Profile	**Demographics:** Participant gender, age, grade level, race/ethnicity, and socioeconomic status indicators
	Education Intentions: Degree level, educational goals
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
	Transferable 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. 2019 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
	Transferable 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. 2019 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.

[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.

Study Sample

Table 7 provides sample size, total participants, and participation rate in the evaluation questionnaire by students and adults. The student response rate for 2019 (100%) is significantly higher than 2018 (61.2%) and 2017 (65%) and indicates that all students who registered in Cvent responded to the questionnaire. There is no margin of error due to the perfect response rate. The margin of error for 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 2019 (25.14%) is similar to 2019 (25.7%) and 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. The numbers of Unite student and mentor questionnaire respondents by site are provided in Table 8.

Table 7. 2019 Unite Questionnaire Participation

Participant Group	Respondents (Sample)	Total Participants* (Population)	Participation Rate	Margin of Error @ 95% Confidence[3]
Students	356	356	100%	±0.00%
Adults	92	366	25.14%	±8.85%

* Cvent participation data are used for statistical analyses of student data throughout this report

[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.

Table 8. 2019 Unite Site Questionnaire Respondent Numbers		
	No. of Student Survey Respondents	**No. of Mentor Survey Respondents**
Alabama State University (AL)	24	7
Fayetteville State University (NC)	14	1
Florida State University (FL)	26	12
Harris-Stowe State University (MO)	19	9
Jackson State University (MS)	15	2
Marshall University (WV)	13	7
Michigan Technological University (MI)	19	5
Montana Tech (MT)	24	15
Morgan State University (MD)	4	6
New Jersey Institute of Technology (NJ)	23	3
Savannah State University (GA)	15	1
Texas Southern University (TX)	25	8
University of Colorado, Colorado Springs (CO)	19	4
University of Iowa (IA)	23	0
University of Nevada, Las Vegas (NV)	14	0
University of New Mexico (NM)	16	3
University of Pennsylvania (PA)	18	4
University of Puerto Rico, Rio Piedras (PR)	7	4
Virginia Tech (VA)	38	1
TOTAL	**356**	**92**

Respondent Profiles

Apprentice Demographics

Demographic information for Unite student questionnaire respondents is summarized in Table 9. More females (58%) completed the survey than males (41%). When taken together, approximately two-thirds of students reported their race/ethnicity as either Black/African American (48%) or Hispanic/Latino (20%). Nearly all Unite participants (94%) were identified as underrepresented (U2) students.[4]

Because all Unite students who registered in Cvent responded to the questionnaire, the demographics of questionnaire respondents are the same as the overall population of 2019 Unite students.

Mentor Demographics

Unite mentor demographics for those who responded to the evaluation questionnaire are shown in Table 10. Slightly less than half of responding mentors were female (47%), and nearly half reported being White (47%). Fewer mentors self-identified as Black or African American (39%), Asian (8%), or Hispanic/Latino (3%). Mentors' reported occupations were diverse, with 25% responding that they were university educators; 19% scientists, engineers, or mathematicians in training; 15% other school staff; 12% teachers; and 2% scientists, engineers, or mathematics professionals.

[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.

Table 9. 2019 Unite Student Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 356)		
Female	208	58%
Male	145	41%
Choose not to report	3	<1%
Respondent Race/Ethnicity (n = 356)		
Asian	26	7%
Black or African American	171	48%
Hispanic or Latino	72	20%
Native American or Alaska Native	16	5%
Native Hawaiian or other Pacific Islander	0	0%
White	59	17%
Other race or ethnicity, (specify): †	9	2%
Choose not to report	3	<1%
Respondent Grade Level (n = 356)		
9th	37	10%
10th	139	39%
11th	107	30%
12th	64	18%
College Freshman	8	2%
Other	1	<1%
Choose not to report	0	0%
Respondent Eligible for Free/Reduced-Price Lunch (n = 356)		
Yes	264	74%
No	76	21%
Choose not to report	16	5%
Respondent English 1st Language (n = 356)		
Yes	315	89%
No	37	10%
Choose not to report	4	1%
Respondent's Parent Graduated from College (n = 356)		
Yes	177	50%
No	163	45%
Choose not to report	16	5%

Respondent School Location (n = 356)		
Frontier or tribal school	1	<1%
DoDEA School	1	<1%
Home School	1	<1%
Online School	2	<1%
Rural	90	25%
Suburban	73	21%
Urban	169	48%
Choose not to report	19	5%
Respondent U2 Status (n = 356)		
Yes – U2	334	94%
No – Not U2	22	6%

[†]Other = Biracial, Black and white, East Indian, Hispanic and African American; Middle Eastern, Mixed, Puerto Rican, Puerto Rican and Black.

Table 10. 2019 Unite Mentor Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 36)		
Female	17	47%
Male	18	50%
Choose not to report	1	3%
Respondent Race/Ethnicity (n = 36)		
Asian	3	8%
Black or African American	14	39%
Hispanic or Latino	1	3%
Native American or Alaska Native	0	0%
Native Hawaiian or other Pacific Islander	0	0%
White	17	47%
Other race or ethnicity	1	3%
Choose not to report	0	0%
Respondent Occupation (n = 92)		
Teacher	11	12%
Other school staff	14	15%
University educator	23	25%
Scientist, Engineer, or Mathematician in training	17	19%
Scientist, Engineer, or Mathematics professional	2	2%
Other, (specify) [†]	25	27%
Respondent Role in Unite (n = 92)		
Instructor (typically a University or Army Scientist or	34	37%
Classroom Assistant	21	23%
Resource Teacher	4	4%
Other, (specify) [††]	33	36%

[†]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

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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

The FY19 evaluation included the 21st Century Skills Assessment completed by adult 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

Between 145 and 155 Unite students were assessed for the 24 skills related to each of the six areas. Table 11 provides an overall summary of the findings for each of the six domains of 21st Century Skills. These are presented graphically in Figure 1. Table 12 shows findings for each of the 24 specific skills associated with the six areas of 21st Century skills.

Statistically significant increases in participants' skills from the beginning (pre-) to the end (post-) of their Unite experiences ($p<.001$) were found in all six of the 21st Century skills areas (see Table 12). On average, participants' initial ratings were observed to be slightly above the Progressing level while their final, post-Unite, ratings approached 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	155	1.96(0.53)	2.54(0.44)	+0.58	14.95***
Critical Thinking & Problem Solving	154	1.95(0.57)	2.53(0.43)	+0.59	13.11***
Communication, Collaboration, Social, & Cross-Cultural	155	2.04(0.60)	2.60(0.41)	+0.56	12.03***
Information, Media, & Technological Literacy	145	2.09(0.60)	2.59(0.41)	+0.50	10.10***
Flexibility, Adaptability, Initiative, & Self-Direction	155	2.03(0.59)	2.59(0.40)	+0.56	12.10***
Productivity, Accountability, Leadership, & Responsibility	154	1.95(0.56)	2.52(0.42)	+0.57	12.96***

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

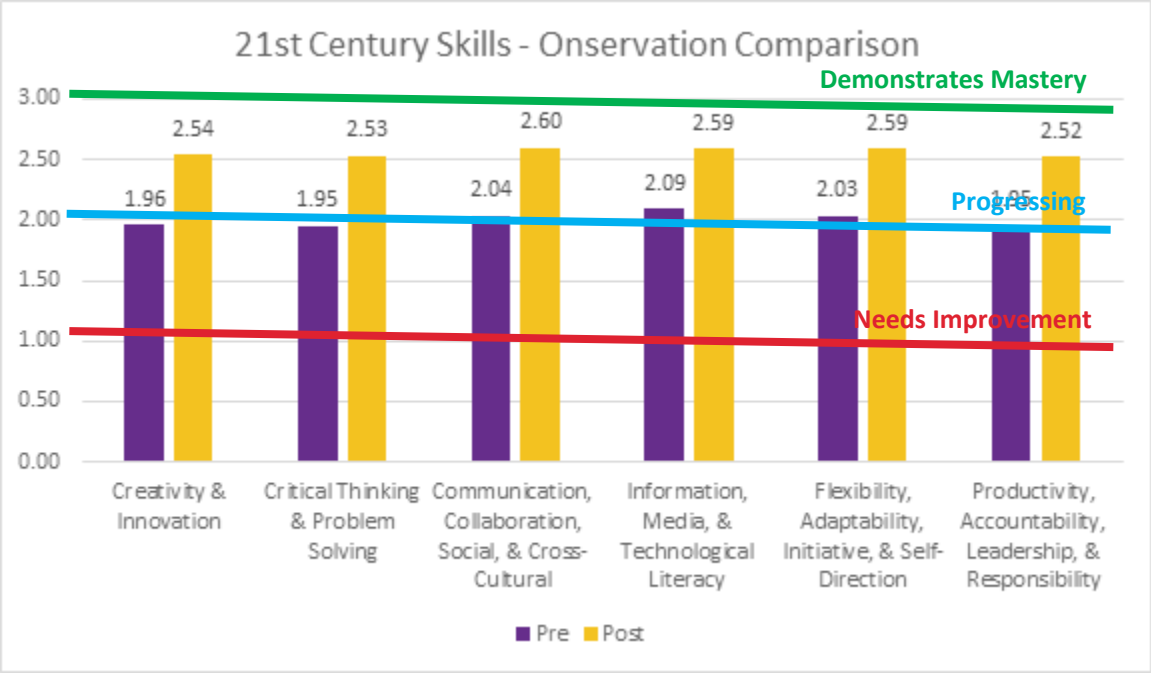


Table 12 displays findings for each of the 24 specific skills associated with the six areas of 21st Century skills. All of the 24 specific skills observed had a statistically significant increase from pre- to post- ratings (p<.001).

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	154	1.97(0.66)	2.55(0.51)	+0.58	11.69***
Work creatively with others	155	1.94(0.62)	2.52(0.54)	+0.57	11.27***
Implement innovations	154	1.95(0.55)	2.55(0.53)	+0.59	11.40***
Critical Thinking & Problem Solving					
Reason effectively	151	2.01(0.65)	2.5(0.53)	+0.49	9.38***
Use systems thinking	153	1.97(0.64)	2.52(0.5)	+0.55	9.74***

Overall Skill Set *Item (Specific Skill Observed)*	*n*	Observation Time		Pre-Post Change	*t*-stat
		Pre - *M*(*SD*)	Post - *M*(*SD*)		
Make judgments and decisions	154	1.96(0.67)	2.57(0.51)	+0.61	10.56***
Solve problems	153	1.87(0.67)	2.56(0.52)	+0.69	11.48***
Communication, Collaboration, Social, & Cross-Cultural					
Communicate clearly	150	1.95(0.68)	2.51(0.50)	+0.56	10.38***
Communicate with others	154	2.08(0.68)	2.53(0.50)	+0.44	7.39***
Interact effectively with others	155	2.07(0.69)	2.57(0.51)	+0.50	8.34***
Information, Media, & Technological Literacy					
Access and evaluate information	142	2.04(0.72)	2.58(0.51)	+0.54	8.01***
Use and manage information	137	2.04(0.67)	2.59(0.49)	+0.55	8.46***
Analyze media	136	2.11(0.70)	2.66(0.49)	+0.55	10.02***
Create media products	133	2.05(0.69)	2.59(0.57)	+0.53	7.76***
Apply technology effectively	142	2.16(0.67)	2.63(0.50)	+0.47	8.52***
Flexibility, Adaptability, Initiative, & Self-Direction					
Adapt to change	154	2.01(.65)	2.56(.52)	+0.55	9.35***
Be flexible	154	2.12(.69)	2.57(.52)	+0.45	7.52***
Manage goals and time	153	1.94(.65)	2.58(.52)	+0.64	10.84***
Work independently	153	2.07(.70)	2.63(.50)	+0.56	10.58***
Be a self-directed learner	155	2.00(.72)	2.63(.51)	+0.63	10.66***
Productivity, Accountability, Leadership, & Responsibility					
Manage projects	154	1.97(0.65)	2.54(0.53)	+0.56	9.70***
Produce results	153	1.87(0.63)	2.54(0.54)	+0.67	11.66***
Guide and lead others	154	1.86(0.68)	2.39(0.55)	+0.53	8.80***
Be responsible to others	154	2.12(0.66)	2.62(0.50)	+0.51	9.53***

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

STEM Practices

To compare student experiences with STEM practices in Unite and at school, students were asked parallel questions about their STEM practices in both environments (see Tables 13 and 14). On the majority of items, students indicated more frequent experiences with STEM practices in Unite compared to at school. For example, considerably more students reported building a computer model at least a few times in Unite (89%) compared to in school (21%). Much larger proportions of students also reported designing and carrying out an investigation at least a few times in Unite (76%) compared to in school (55%). Conversely, on one item (solving real world problems), students indicated they were more likely to do this at least a few times in school (60%) compared to in Unite (30%).

Table 13. Nature of Student STEM Practices During Unite (n=356)

	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	25.0%	14.9%	23.0%	26.1%	11.0%	
	89	53	82	93	39	**356**
Work with a STEM researcher on a research project topic assigned by my mentor or teacher	20.8%	16.0%	21.1%	28.9%	13.2%	
	74	57	75	103	47	**356**
Design my own research or investigation based on my own question(s)	17.7%	23.3%	27.0%	23.0%	9.0%	
	63	83	96	82	32	**356**
Present my STEM research to a panel of judges from industry or the military	43.3%	25.8%	14.6%	11.8%	4.5%	
	154	92	52	42	16	**356**
Interact with STEM researchers	16.3%	13.5%	23.0%	27.5%	19.7%	
	58	48	82	98	70	**356**
Identify questions or problems to investigate	14.9%	13.2%	28.9%	28.4%	14.6%	
	53	47	103	101	52	**356**
Design and carry out an investigation	9.0%	14.6%	24.2%	32.3%	19.9%	
	32	52	86	115	71	**356**
Analyze data or information and draw conclusions	13.5%	15.7%	23.3%	32.3%	15.2%	
	48	56	83	115	54	**356**
Work collaboratively as part of a team	8.1%	11.2%	26.1%	32.3%	22.2%	
	29	40	93	115	79	**356**
Build or make a computer model	5.6%	5.6%	16.3%	31.2%	41.3%	

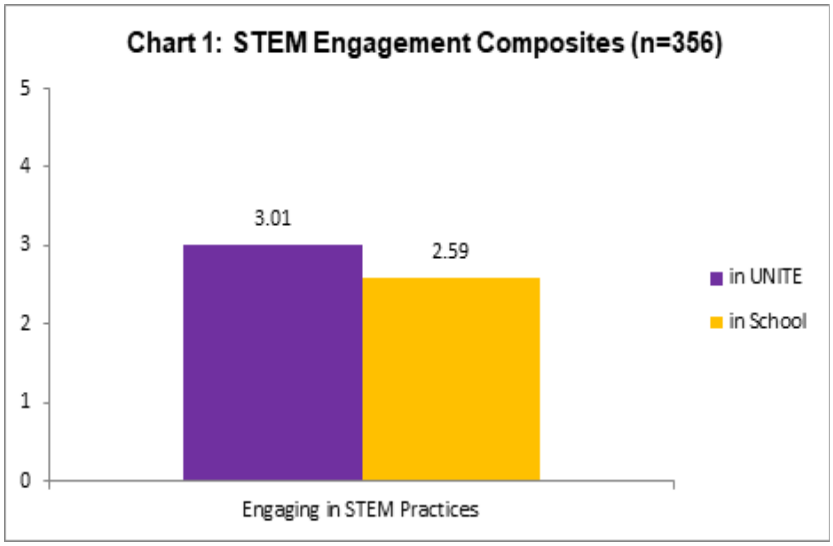
	Not at all	At least once	A few times	Most days	Every day	Response Total
	20	20	58	111	147	**356**
Solve real world problems	50.0%	19.9%	13.8%	11.8%	4.5%	
	178	71	49	42	16	**356**

Table 14. Nature of Student STEM Practices During School (n=356)

	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	44.4%	15.4%	17.4%	14.9%	7.9%	
	158	55	62	53	28	**356**
Work with a STEM researcher on a research project assigned by my teacher	43.8%	16.0%	18.0%	15.2%	7.0%	
	156	57	64	54	25	**356**
Design my own research or investigation based on my own question(s)	28.9%	22.2%	26.1%	16.3%	6.5%	
	103	79	93	58	23	**356**
Present my STEM research to a panel of judges from industry or the military	63.8%	18.0%	10.4%	5.6%	2.2%	
	227	64	37	20	8	**356**
Interact with STEM researchers	35.7%	22.5%	19.1%	13.2%	9.6%	
	127	80	68	47	34	**356**
Identify questions or problems to investigate	17.4%	14.9%	28.4%	21.3%	18.0%	
	62	53	101	76	64	**356**
Design and carry out an investigation	20.8%	23.9%	26.7%	18.0%	10.7%	
	74	85	95	64	38	**356**
Analyze data or information and draw conclusions	11.2%	13.2%	30.3%	28.4%	16.9%	
	40	47	108	101	60	**356**
Work collaboratively as part of a team	9.6%	8.1%	21.9%	32.9%	27.5%	
	34	29	78	117	98	**356**
Build or make a computer model	60.4%	18.8%	9.8%	7.3%	3.7%	
	215	67	35	26	13	**356**
Solve real world problems	20.2%	19.7%	23.3%	18.8%	18.0%	
	72	70	83	67	64	**356**

Engaging in STEM practices in Unite items were used to compute a composite score.[5, 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, ELL status, or SES. However, there were significant differences by first generation college status, school location, and race/ethnicity. Racial/ethnic minorities reported significantly less engagement in STEM practices (small effect of d = 0.223 standard deviations); students from urban and rural areas reported significantly greater engagement (small effect of d = 0.348 standard deviations students); and students who did not have a parent who attended college reported significantly greater engagement with STEM practices (small effect of d = 0.243 standard deviations).[7]

Students' reported 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 = 0.456 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 0.917.

[7] Independent Samples t-test for STEM Engagement by: race/ethnicity: $t(367)=2.14$, $p=.03$; school location: $t(383)=3.41$, $p=.001$; 1st generation status: $t(340)=2.24$, $p=.026$

[8] The Cronbach's alpha reliability for the 11 STEM Engagement in School items was 0.917.

[9] Dependent Samples t-test for STEM Engagement: $t(384)=9.33$, $p<.001$.

STEM Knowledge and Skills

More than 90% of student questionnaire respondents reported gains in their STEM knowledge as a result of participating in the Unite program (Table 15). Further, approximately three-quarters or more indicated they had medium to large gains across the STEM knowledge items. Items with the largest proportion of students reporting medium or large gains were knowledge or research conducted in a STEM topic or field (84%), in depth knowledge of a STEM topic(s) (82%), and knowledge of how scientists and engineers work on real problems in STEM (81%).

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 or any of the demographic variables contributing to U2 status.

Table 15. Student Report of Impacts on STEM Knowledge (n=356)

	No gain	Small gain	Medium gain	Large gain	Response Total
In depth knowledge of a STEM topic(s)	2.5%	15.7%	44.1%	37.6%	
	9	56	157	134	**356**
Knowledge of research conducted in a STEM topic or field	4.2%	11.5%	45.2%	39.0%	
	15	41	161	139	**356**
Knowledge of research processes, ethics, and rules for conduct in STEM	6.2%	21.3%	39.9%	32.6%	
	22	76	142	116	**356**
Knowledge of how scientists and engineers work on real problems in STEM	5.1%	13.5%	37.9%	43.5%	
	18	48	135	155	**356**
Knowledge of what everyday research work is like in STEM	5.3%	18.8%	39.3%	36.5%	
	19	67	140	130	**356**

Students were asked to report on gains in their STEM competencies as a result of participating in the Unite program (Table 16). More than half of students reported medium or large gains in each STEM competency listed. STEM competencies for which approximately three-quarters or more of students reported either medium or large gains were: using knowledge and creativity to propose a testable solution for a problem (78%); communicating information about design experiments and solutions in different ways (73%); and defining a problem that can be solved by developing a new or improved object, process, or system (73%).

[10] The Cronbach's alpha reliability for the 5 STEM Knowledge items was 0.891.

STEM competency items were combined into a composite variable[11] to test for differential impacts by U2 classification and across subgroups of students. There was a significant difference in the STEM competencies composite by school location, with urban/rural students reporting significantly higher gains compared to suburban students (effect size is small with d = 0.268).[12] No statistically significant differences were found by U2 classification or any other underrepresented subgroup classification.

Table 16. Students Reporting Gains in Their STEM Competencies (n=356)

	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	5.6%	21.3%	48.6%	24.4%	
	20	76	173	87	**356**
Using knowledge and creativity to propose a testable solution for a problem	5.6%	16.3%	45.2%	32.9%	
	20	58	161	117	**356**
Making a model of an object or system to show its parts and how they work	10.4%	21.9%	34.6%	33.1%	
	37	78	123	118	**356**
Carrying out procedures for an experiment and recording data accurately	10.7%	20.2%	39.3%	29.8%	
	38	72	140	106	**356**
Using computer models of an object or system to investigate cause and effect relationships	22.5%	26.1%	30.6%	20.8%	
	80	93	109	74	**356**
Considering different interpretations of the data when deciding if a solution works as intended	10.1%	23.6%	43.0%	23.3%	
	36	84	153	83	**356**
Organizing data in charts or graphs to find patterns and relationships	15.4%	22.8%	34.8%	27.0%	
	55	81	124	96	**356**
Supporting a solution for a problem with data from experiments	9.6%	21.6%	38.8%	30.1%	
	34	77	138	107	**356**
Defending an argument that conveys how a solution best meets design criteria	11.5%	25.0%	40.2%	23.3%	
	41	89	143	83	**356**
Integrating information from technical or scientific texts and other media to support your solution to a problem	11.2%	25.6%	37.9%	25.3%	
	40	91	135	90	**356**
	7.3%	19.4%	35.4%	37.9%	

[11] The Cronbach's alpha reliability for the 11 STEM Competencies items was .921.

[12] Independent Samples t-test for STEM Competencies by school location: $t(383)=2.62$, $p=.009$.

	No gain	Small gain	Medium gain	Large gain	Response Total
Communicating information about your design experiments and solutions in different ways (through talking, writing, graphics, or math equations)	26	69	126	135	**356**

Students' perceptions of their 21st Century skills gains as a result of Unite were also assessed in the questionnaire (Table 17). At least half of the students reported medium or large gains in all 21st Century skills items. The three items with the reported largest gains (medium to large) were working creatively with others (89%), thinking creatively (85%), and solving problems (85%). The two items with the fewest students reporting medium to large gains were creating media products like videos, blogs, social media (51%); and analyzing media (news) - understanding points of view in the media (51%). A composite score was calculated for the 23 items making up the 21st Century skills item set.[13] No statistically significant differences were found by U2 classification. School location was the only subgroup with significant differences in 21st Century skills gains, with urban/rural students reporting higher gains than suburban students (effect size is small with d = 0.251).[14]

Table 17. Student Report of Impacts on 21st Century Skills (n=356)

	No gain	Small gain	Medium gain	Large gain	Response Total
Thinking creatively	2.2%	12.6%	36.0%	49.2%	
	8	45	128	175	**356**
Working creatively with others	1.7%	9.3%	30.3%	58.7%	
	6	33	108	209	**356**
Using my creative ideas to make a product	3.9%	14.9%	33.7%	47.5%	
	14	53	120	169	**356**
Thinking about how systems work and how parts interact with each other	3.7%	17.4%	37.6%	41.3%	
	13	62	134	147	**356**
Evaluating others' evidence, arguments, and beliefs	6.5%	20.2%	37.6%	35.7%	
	23	72	134	127	**356**
Solving problems	2.2%	13.2%	39.6%	44.9%	
	8	47	141	160	**356**

[13] 21st Century Skills composite (23 items) has a Cronbach's alpha reliability of .958.

[14] Independent Samples t-test for 21st Century Skills by school location: $t(383)=2.46$, $p=.000$.

Communicating clearly (written and oral) with others	3.7%	18.3%	34.3%	43.8%	
	13	65	122	156	**356**
Collaborating with others effectively and respectfully in diverse teams	2.5%	16.0%	30.3%	51.1%	
	9	57	108	182	**356**
Interacting effectively with others in a respectful and professional manner	2.5%	15.2%	34.3%	48.0%	
	9	54	122	171	**356**
Accessing and evaluating information efficiently (time) and critically (evaluates sources)	3.9%	21.1%	40.7%	34.3%	
	14	75	145	122	**356**
Using and managing data accurately, creatively and ethically	7.6%	21.6%	34.3%	36.5%	
	27	77	122	130	**356**
Analyzing media (news) - understanding points of view in the media	17.4%	23.9%	29.5%	29.2%	
	62	85	105	104	**356**
Creating media products like videos, blogs, social media	24.4%	24.4%	23.0%	28.1%	
	87	87	82	100	**356**
Use technology as a tool to research, organize, evaluate, and communicate information	5.9%	18.0%	35.7%	40.4%	
	21	64	127	144	**356**
Adapting to change when things do not go as planned	3.7%	17.4%	34.6%	44.4%	
	13	62	123	158	**356**
Incorporating feedback on my work effectively	6.2%	18.0%	39.6%	36.2%	
	22	64	141	129	**356**
Setting goals and utilizing time wisely	2.2%	17.7%	34.8%	45.2%	
	8	63	124	161	**356**
Working independently and completing tasks on time	4.2%	18.0%	37.6%	40.2%	
	15	64	134	143	**356**
Taking initiative and doing work without being told to	5.1%	19.9%	35.7%	39.3%	
	18	71	127	140	**356**
Prioritizing, planning, and managing projects to achieve completion	4.2%	17.7%	34.3%	43.8%	
	15	63	122	156	**356**

Producing results - sticking with a task until it is finished	3.4%	13.5%	37.4%	45.8%	
	12	48	133	163	**356**
Leading and guiding others in a team or group	7.3%	16.6%	38.5%	37.6%	
	26	59	137	134	**356**
Being responsible to others - thinking about the larger community	3.4%	15.7%	34.3%	46.6%	
	12	56	122	166	**356**

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.[15] To better understand how students believed Unite impacted their own capabilities in STEM - or STEM identity - students were asked to respond to a series of questions (Table 18). Approximately three-quarters of students or more reported medium or large gains for each STEM identity item. Items with the largest proportions of students reporting medium or large gains were sense of accomplishing something in STEM (82%), feeling prepared for more challenging STEM activities (97%), and desire to build relationships with mentors who work in STEM (79%). A composite score for STEM identity was created from these items[16] and used to compare responses by U2 classification and across subgroups. Statistically significant differences were not found by U2 classification. ELL status was the only subgroup area with significant differences in STEM identity gains, with ELL students reporting higher gains than non-ELL students (effect size is small with d = 0.214).[17]

[15] 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.
[16] The Cronbach's alpha reliability for the 7 STEM Identity items was 0.905.
[17] Independent Samples t-test for STEM Identity by ELL status: $t(383)=2.10$, $p=.037$.

Table 18. Student Report of Impacts on Student Identity (n=356)

	No gain	Small gain	Medium gain	Large gain	Response Total
Interest in a new STEM topic	5.3%	19.7%	30.6%	44.4%	
	19	70	109	158	**356**
Interest in pursuing a STEM career	8.4%	18.8%	27.8%	44.9%	
	30	67	99	160	**356**
Sense of accomplishing something in STEM	4.8%	13.5%	36.5%	45.2%	
	17	48	130	161	**356**
Feeling prepared for more challenging STEM activities	4.2%	16.6%	35.7%	43.5%	
	15	59	127	155	**356**
Confidence to try out new ideas or procedures on my own in a STEM project	5.3%	18.8%	35.1%	40.7%	
	19	67	125	145	**356**
Desire to build relationships with mentors who work in STEM	5.3%	15.7%	29.8%	49.2%	
	19	56	106	175	**356**

6

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:[18]

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 mentors were asked about their use of strategies to help make learning activities relevant to students, approximately two-thirds or more reported using all strategies listed (Table 19). The most

[18] 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.

frequently reported strategies were helping students become aware of the role(s) that STEM plays in their everyday lives (96%), becoming familiar with students' background and interests at the beginning of the Unite experience (94%), and asking students to relate real-life events or activities to topics covered in Unite (92%). The strategy "selecting readings or activities that relate to students' backgrounds" was the least frequently used strategy (64%), although this is an increase from 2018 (57%).

Table 19. Mentors Using Strategies to Establish Relevance of Learning Activities (n=92)

	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	93.5%	6.5%	
	86	6	**92**
Giving students real-life problems to investigate or solve	88.0%	12.0%	
	81	11	**92**
Selecting readings or activities that relate to students' backgrounds	64.1%	35.9%	
	59	33	**92**
Encouraging students to suggest new readings, activities, or projects	80.4%	19.6%	
	74	18	**92**
Helping students become aware of the role(s) that STEM plays in their everyday lives	95.7%	4.3%	
	88	4	**92**
Helping students understand how STEM can help them improve their own community	90.2%	9.8%	
	83	9	**92**
Asking students to relate real-life events or activities to topics covered in Unite	92.4%	7.6%	
	85	7	**92**

More than three-quarters of mentors reported supporting the diverse needs of students as learners through all of the various strategies presented (Table 20). The most frequently employed strategies were interacting with students and other personnel the same way regardless of their background (95%) and using a variety of teaching and/or mentoring activities to meet the needs of all students (90%).

Table 20. Mentors Using Strategies to Support Diverse Needs of Students as Learners (n=92)

	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	80.4%	19.6%	
	74	18	**92**
Interact with students and other personnel the same way regardless of their background	94.6%	5.4%	
	87	5	**92**
Use a variety of teaching and/or mentoring activities to meet the needs of all students	90.2%	9.8%	
	83	9	**92**
Integrating ideas from education literature to teach/mentor students from groups underrepresented in STEM	78.3%	21.7%	
	72	20	**92**
Providing extra readings, activities, or learning support for students who lack essential background knowledge or skills	78.3%	21.7%	
	72	20	**92**
Directing students to other individuals or programs for additional support as needed	77.2%	22.8%	
	71	21	**92**
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	77.2%	22.8%	
	71	21	**92**

More than three-quarters of mentors indicated they used all strategies in the domain of supporting the development of collaboration and interpersonal skills within students (Table 21). Mentors most frequently reported having students listen to the ideas of others with an open mind (91%), and having students work on collaborative activities or projects as members of a team (91%).

Table 21. Mentors Using Strategies to Support Student Development of Collaboration and Interpersonal Skills (n=92)

	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	81.5%	18.5%	
	75	17	**92**
Having my students explain difficult ideas to others	79.3%	20.7%	
	73	19	**92**
Having my students listen to the ideas of others with an open mind	91.3%	8.7%	
	84	8	**92**
Having my students exchange ideas with others whose backgrounds or viewpoints are different from their own	87.0%	13.0%	
	80	12	**92**
Having my students give and receive constructive feedback with others	83.7%	16.3%	
	77	15	**92**
Having students work on collaborative activities or projects as a member of a team	91.3%	8.7%	
	84	8	**92**
Allowing my students to resolve conflicts and reach agreement within their team	88.0%	12.0%	
	81	11	**92**

More than two-thirds of mentors reported using all strategies listed to support student engagement in authentic STEM activities (Table 22). Over 90% of mentors reported encouraging students to seek support from other team members (92%), encouraging students to learn collaboratively (91%), and providing students with constructive feedback to improve their STEM competencies (90%).

Table 22. Mentors Using Strategies to Support Student Engagement in "Authentic" STEM Activities (n=92)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Teaching (or assigning readings) about specific STEM subject matter	80.4%	19.6%	
	74	18	**92**
Having my students search for and review technical research to support their work	71.7%	28.3%	
	66	26	**92**
Demonstrating laboratory/field techniques, procedures, and tools for my student(s)	78.3%	21.7%	
	72	20	**92**
Supervising my students while they practice STEM research skills	85.9%	14.1%	
	79	13	**92**
Providing my students with constructive feedback to improve their STEM competencies	90.2%	9.8%	
	83	9	**92**
Allowing students to work independently to improve their self-management abilities	84.8%	15.2%	
	78	14	**92**
Encouraging students to learn collaboratively (team projects, team meetings, journal clubs, etc.)	91.3%	8.7%	
	84	8	**92**
Encouraging students to seek support from other team members	92.4%	7.6%	
	85	7	**92**

While approximately two-thirds or more of mentors indicated they used all strategies to support students' STEM education and career pathways (see Table 23), strategies least implemented were recommending other AEOPs (63%) or discussing DoD STEM career opportunities (66%). However, mentors were much more likely to indicate they asked students about their educational and/or career goals (95%) and provided guidance about educational pathways to prepare students for STEM careers (90%).

Table 23. Mentors Using Strategies to Support Student STEM Education and Career Pathways (n=92)

	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	94.6%	5.4%	
	87	5	**92**
Recommending extracurricular programs that align with students' goals	87.0%	13.0%	
	80	12	**92**
Recommending Army Educational Outreach Programs that align with students' goals	63.0%	37.0%	
	58	34	**92**
Providing guidance about educational pathways that will prepare my students for a STEM career	90.2%	9.8%	
	83	9	**92**
Discussing STEM career opportunities within the DoD or other government agencies	66.3%	33.7%	
	61	31	**92**
Discussing STEM career opportunities in private industry or academia	84.8%	15.2%	
	78	14	**92**
Discussing the economic, political, ethical, and/or social context of a STEM career	71.7%	28.3%	
	66	26	**92**
Recommending student and professional organizations in STEM to my students	81.5%	18.5%	
	75	17	**92**
Helping students build a professional network in a STEM field	70.7%	29.3%	
	65	27	**92**
Helping my students with their resume, application, personal statement, and/or interview preparations	69.6%	30.4%	
	64	28	**92**

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). Student responses are reported in Table 24, and they suggest students were very satisfied with Unite features. Three-quarters of students or more reported being at least somewhat satisfied with all features asked about. Students were most satisfied with stipends (87%), teaching or mentoring provided during Unite activities (84%), and the physical location of Unite activities (84%)**.** Very few students indicated that they were "not at all" satisfied with any program feature (<6%).

Table 24. Student Satisfaction with Unite Program Features (n=356)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Applying or registering for the program	3.4%	2.2%	14.3%	29.2%	50.8%	
	12	8	51	104	181	**356**
Communicating with your Unite host site organizers	5.6%	3.7%	15.2%	30.1%	45.5%	
	20	13	54	107	162	**356**
The physical location(s) of Unite activities	2.0%	2.0%	12.4%	29.5%	54.2%	
	7	7	44	105	193	**356**
The variety of STEM topics available to you in Unite	3.4%	2.0%	12.4%	28.7%	53.7%	
	12	7	44	102	191	**356**
Teaching or mentoring provided during Unite activities	2.5%	1.1%	12.1%	27.2%	57.0%	
	9	4	43	97	203	**356**
Stipends (payment)	5.6%	1.1%	6.5%	16.0%	70.8%	
	20	4	23	57	252	**356**
Educational materials (e.g., workbooks, online resources, etc.) used during program activities	3.9%	2.5%	11.5%	27.8%	54.2%	
	14	9	41	99	193	**356**
Invited speakers or "career" events	5.1%	2.2%	10.7%	26.7%	55.3%	
	18	8	38	95	197	**356**
Field trips or laboratory tours	3.9%	3.7%	11.2%	15.7%	65.4%	
	14	13	40	56	233	**356**

Unite students were asked to comment, in an open-ended item on the questionnaire, about their overall satisfaction with their experiences in the program. A large majority of the 332 respondents (94%) had only positive comments about Unite. Many responses were simple affirmations of their Unite experiences such

as “It was amazing” and “It was very fun and I would do it again.” Students who provided more detail about their experiences made comments about the career information they gained, their STEM learning, the college information they received, the field trips, their relationships with their mentors, and the friends they made in the program. For example,

> *“Overall the Unite program has been amazing. The projects that we did were interesting and mostly hands on. The panel nearing the end of the program was extremely beneficial and the GPS and math class helped my writing and core math skills.”* (Unite Student)

> *“I have made friends and memories that would last a lifetime. [Unite] showed me that there are many job opportunities and that the world is about to go into another technological advancement. I am glad I was able to be a part of this experience because it is a once in a lifetime opportunity.”* (Unite Student)

> *“[Unite] gave me the opportunity to be ahead of my classes, meet new people, come out of my comfort zone and express and project my voice... Also It gave me the feeling and view of college - what it would be like, classes and how professors really teach.”* [(Unite Student)

> *“Unite taught me different STEM careers as well as allowing me to solve real world problems and perform hands on activities. Additionally, it was very enjoyable, and it taught me practical skills that everyone should know, but aren't taught in school.”* (Unite Student)

A small number of respondents (4, or 1%) had nothing positive to say about Unite, commenting on organizational and time management issues, a stipend payment issue, and a desire for more field trips. Another 11 students (3%) had positive things to say about Unite but included some caveats. These caveats included being bored, dissatisfaction with the instructors and amount of homework, a wish for more hands-on content, lack of understanding of content, dissatisfaction with the food and expense of parking, and desire for more hands-on activities, more complex content, and a longer program experience. For example,

> *“I enjoyed my time at UNITE, as I met a lot of peers who all share a passion for science, technology and math. Nevertheless, I would have liked there to be more focus on research in more complex fields.”* (Unite Student)

> *“My overall satisfaction with UNITE was okay. I was a bit bored and I had no friends to make the program more exciting. Also, my instructor was kind of mean. I did really enjoy the field trips and guest lectures.”* (Unite Student)

> *“From a scale of 1 to 10, I’d give my experience about an 8.5. we had lots of fun, and work hands on, but I feel we could’ve done a bit more or the camp could’ve been longer.”* (Unite Student)

Students were also asked to list three benefits of participating in Unite. Among the 130 student responses sampled, the most frequently mentioned benefits were career information (55 students, or 42%) and STEM learning (52 students, or 40%). About a third of students (39, or 30%) cited specific STEM skills such as coding or research skills as a benefit of Unite. About 18% of students also valued the opportunity to

meet peers and make friends and cited gains in confidence as a benefit. Other benefits, cited by 10-20 students (8%-15%) included developing collaboration or teamwork skills; networking with professionals; gaining college experience or information; gaining 21st Century skills such as problem solving, critical thinking, time management, and leadership; and the stipend.

Student participants were also asked to respond to an open-ended questionnaire item asking them to list three ways that the program could be improved. Of the 130 student responses sampled, the most frequently mentioned improvement was to increase the number of hands-on activities or projects (mentioned by 39 students, or 30%). Nearly a quarter of students (30, or 23%) suggested providing more classes, topics, or choice of topics as an improvement to Unite, and a similar number (29, or 22%) suggested providing more or better field trips. Fewer than 20 students (15%) mentioned any other single improvement. Between 7% and 11% of students mentioned improvements such as better or different food options, providing better or more diverse speakers, a longer program, various schedule changes, and better quality of teaching or better instructions and explanations. For example, Unite students offered the following suggestions:

> *"Less lectures, more hands-on activities."*
>
> *"Have more topics in the science field."*
>
> *"The daily speakers need to be more engaging and less 'lecture-like.'"*
>
> *"More trips and speakers to come and join us."*

Table 25 shows that more than half of mentors were at least somewhat satisfied with all features of Unite about which they were asked on the questionnaire. Two aspects mentors were most satisfied with were support for instruction or mentorship during program activities (92%) and the physical location of Unite activities (87%). Very few mentors were "not at all" satisfied with program features (<2%). More than a quarter reported not experiencing the application or registration process (30%) or communicating with TSA (44%).

Table 25. Mentor Satisfaction with Unite Program Features (n=92)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Application or registration process	30.4%	0.0%	3.3%	16.3%	50.0%	
	28	0	3	15	46	**92**
Communicating with Technology Student Association (TSA)	43.5%	0.0%	3.3%	6.5%	46.7%	
	40	0	3	6	43	**92**
Communicating with Unite site coordinators	16.3%	1.1%	1.1%	10.9%	70.7%	
	15	1	1	10	65	**92**
The physical location(s) of Unite's activities	9.8%	0.0%	3.3%	12.0%	75.0%	
	9	0	3	11	69	**92**
Support for instruction or mentorship during program activities	5.4%	1.1%	1.1%	12.0%	80.4%	
	5	1	1	11	74	**92**
Stipends (payment)	14.1%	1.1%	5.4%	15.2%	64.1%	
	13	1	5	14	59	**92**
Invited speakers or "career" events	16.3%	0.0%	3.3%	10.9%	69.6%	
	15	0	3	10	64	**92**
Field trips or laboratory tours	14.1%	0.0%	3.3%	6.5%	76.1%	
	13	0	3	6	70	**92**

The mentor questionnaire also included open-ended items asking for mentors' opinions about Unite and included an item asking mentors to comment on their overall satisfaction with the program. Of the 49 mentors who responded to this item, all had something positive to say about the program and nearly all (46, or 94%) made unreservedly positive comments. In their responses, mentors cited students' exposure to STEM and to college, the career information students receive, the funding provided to students, and benefits to their own professional practice. For example,

> *"I love love love this program!! With the support of Unite our students are able to work with university faculty to perform research that they never would have had the opportunity [to do] otherwise or at least would not have been able to do so until they were in college. Our students read about research but have no idea what it means until they are actually doing it. It is so much more meaningful to them. I give high praises and appreciation of the Unite program for assisting us in establishing a culture of STEM research with our high school students!"* (Unite Mentor)

> *"This program provides a wonderful opportunity for high school students to experience STEM research at the college level. From my own experience I felt that my students' level of interest in a*

STEM career was significantly increased due to their participation in this program. Thank you for your support!" (Unite Mentor)

"The program continues to be an excellent means for introducing high school students to STEM fields that they might not otherwise be exposed to." (Unite Mentor)

"My experience with UNITE students was very pleasant, I expanded my way of teaching and my knowledge, I learned from other speakers and from the students themselves." (Unite Mentor)

Three of the mentors made positive comments but also offered some caveats. These caveats included suggestions for more funding, better staff communication, a longer program, and better field trips. Mentors wrote, for example:

"Good experience overall, needs more funding…I thoroughly enjoyed the experience. Director was wonderful and knowledgeable. I appreciate the opportunity!" (Unite Mentor)

"*I wish the program ran for a longer time so that we wouldn't have to condense the information so much. Other than that, and poor trips, I felt like the program was well organized and run."* (Unite Mentor)

"The skills they learn will be helpful for any math/computer science-based STEM field they may choose if they don't choose the actuary route. Staff communication could improve, but staff environment is very friendly. We have a great batch of bright, math loving students who make mentoring them an overall enjoyable experience." (Unite Mentor)

Mentors were also asked to list three strengths of Unite in an open-ended questionnaire item. A total of 58 mentors listed at least one strength of the program. The most frequently mentioned strength, mentioned by 29% (17) mentors, was students' hands-on experience with STEM. Over a quarter (16 mentors, or 27%) also mentioned the value of the program's support of sites and the resources provided. Nearly a quarter (14 or 24%) mentioned as a strength students' exposure to STEM and STEM topics generally, while 22% mentioned the career information students receive and 21% mentioned students' STEM learning. About 19% cited the diversity of students in the program and the inclusion of under-represented students as a benefit of Unite, while 10% felt that the funding provided to students was a program strength. Fewer than 5 mentors (9%) mentioned any other single benefit. Benefits mentioned by between three and five mentors included the opportunity for students to experience a college environment, students' opportunity to network with professionals, students' gains in confidence, and the opportunity for students to develop communication skills.

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 43 mentors provided at least one suggestion. These mentors offered a wide variety of suggestions. The most frequent suggestion, made by 10 mentors (23%) was to provide more funding for program elements such as food, transportation, "swag," staff pay, and student scholarships. Nine mentors (21%) suggested providing more or better field trips, eight (19%) suggested

providing more or better speakers and six (14%) suggested providing more resources or technology to sites. Improvements suggested by five or fewer mentors (less than 12%) included:

- More outreach or marketing
- Ensuring that students are invested or engaged in the program, supporting student discipline, or tying students' stipend to their learning or behavior
- Proving more information about or contact with the DoD
- Surveying students' interest before the program and tailoring lessons to those interests
- Representing more diverse fields (e.g., mathematics, writing, reading) in content

7

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

Students were asked to identify all of the ways they had learned about AEOP (see Table 26) in order to better understand the impact of recruitment methods. The sources of information most frequently selected were a school or university newsletter, email, or website (34%); someone who works at the school or university they attend (28%); and someone who works with the program (20%). Only 3% learned about AEOP from the AEOP website, and none reported learning about AEOP from social media or someone who works with the DoD.

Similarly, mentors were asked to report how they learned about AEOP (Table 27). The most frequent ways mentors learned about AEOP were through someone who works at their school or university (39%); a school or university newsletter, email, or website (31%); and having been a past participant (31%). Less frequently chosen responses included learning about AEOP on social media (3%); from someone who works with the DoD (3%); or from a family member (3%).

Students were also asked why they decided to participate in Unite (see Table 28). The two motivators most frequently chosen by students were the desire to learn something new or interesting (63%) and interest in STEM (61%). Slightly more than half of students (56%) cited having fun as a reason for participating. Less than half of students selected any of the other motivators as reasons for participating in Unite.

Table 26. How Students Learned About AEOP (n=250)

	Response Percent	Response Total
Army Educational Outreach Program (AEOP) Website	3%	8
AEOP on Facebook, Twitter, Instagram, or other social media	0%	1
School or university newsletter, email, or website	34%	84
Past participant of program	12%	31
Friend	18%	45
Family Member	16%	40
Someone who works at the school or university I attend	28%	69
Someone who works with the program	20%	49
Someone who works with the DoD (Army, Navy, Air Force, etc.)	0%	1
Community group or program	11%	28
Choose Not to Report	6%	14

Table 27. How Mentors Learned About AEOP (n=36)

	Response Percent	Response Total
Army Educational Outreach Program (AEOP) Website	14%	5
AEOP on Facebook, Twitter, Instagram, or other social media	3%	1
School or university newsletter, email, or website	31%	11
Past participant of program	31%	11
Friend	8%	3
Family Member	3%	1
Someone who works at the school or university I attend	39%	14
Someone who works with the program	28%	10
Someone who works with the DoD (Army, Navy, Air Force, etc.)	3%	1
Community group or program	6%	2
Choose Not to Report	3%	1

Table 28. Factors Motivating Students to Participate in Unite (n=250)

	Response Percent	Response Total
Teacher or professor encouragement	24%	60
An academic requirement or school grade	4%	10
Desire to learn something new or interesting	63%	158
The mentor(s)	13%	33
Building college application or résumé	46%	114
Networking opportunities	21%	52
Interest in science, technology, engineering, or mathematics (STEM)	61%	153
Interest in STEM careers with the Army	13%	32
Having fun	56%	140
Earning stipends or awards for doing STEM	32%	80
Opportunity to do something with friends	30%	74
Opportunity to use advanced laboratory technology	30%	75
Desire to expand laboratory or research skills	34%	84
Learning in ways that are not possible in school	39%	98
Serving the community or country	16%	41
Exploring a unique work environment	34%	84
Figuring out education or career goals	43%	108
Seeing how school learning applies to real life	28%	70
Recommendations of past participants	12%	31
Choose Not to Report	2%	5

Previous Program Participation & Future Interest

Students were asked which AEOPs they had previously participated in (see Table 29). Almost a third (29%) of students reported previously participating in Unite, however close to half (44%) reported never having participated in any AEOPs in the past. Nearly a third (31%) indicated they had participated in other STEM programs in the past.

Table 29. Student Participation in AEOP Programs (n=250)

	Response Percent	Response Total
Camp Invention	3%	8
eCYBERMISSION	0%	0
Junior Solar Sprint (JSS)	0%	0
Gains in the Education of Mathematics and Science (GEMS)	0%	0
Unite	29%	73
Junior Science & Humanities Symposium (JSHS)	1%	2
Science & Engineering Apprenticeship Program (SEAP)	1%	2
Research & Engineering Apprenticeship Program (REAP)	0%	0
High School Apprenticeship Program (HSAP)	1%	2
College Qualified Leaders (CQL)	0%	0
Undergraduate Research Apprenticeship Program (URAP)	0%	0
Science Mathematics & Research for Transformation (SMART) College Scholarship	0%	0
I've never participated in any AEOP programs	44%	111
Other STEM Program	31%	77

Establishing and maintaining a pipeline of AEOPs is an AEOP priority. As such, mentors were asked which AEOP programs they discussed explicitly with their students during Unite (Table 30). Two thirds of mentors reported discussing Unite with their students. Less than half reported discussing any of the other AEOPs explicitly, however 62% indicated they talked to their students about AEOP in general.

Table 30. Mentors Explicitly Discussing AEOPs with Students (n=92)

	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)	37.0%	63.0%	
	34	58	**92**
Unite	66.3%	33.7%	
	61	31	**92**
Junior Science & Humanities Symposium (JSHS)	27.2%	72.8%	
	25	67	**92**
Science & Engineering Apprenticeship Program (SEAP)	28.3%	71.7%	
	26	66	**92**
Research & Engineering Apprenticeship Program (REAP)	47.8%	52.2%	
	44	48	**92**
High School Apprenticeship Program (HSAP)	25.0%	75.0%	
	23	69	**92**
College Qualified Leaders (CQL)	21.7%	78.3%	
	20	72	**92**
GEMS Near Peer Mentor Program	20.7%	79.3%	
	19	73	**92**
Undergraduate Research Apprenticeship Program (URAP)	26.1%	73.9%	
	24	68	**92**
Science Mathematics, and Research for Transformation (SMART) College Scholarship	35.9%	64.1%	
	33	59	**92**
National Defense Science & Engineering Graduate (NDSEG) Fellowship	23.9%	76.1%	
	22	70	**92**
I discussed AEOP with my student(s) but did not discuss any specific program	62.0%	38.0%	
	57	35	**92**

Awareness of STEM Careers & DoD STEM Careers & Research

Increasing the number of underserved students who pursue STEM careers is a Unite goal. Thus, it is important to know how many jobs/careers (both STEM and DoD STEM) Unite students learned about during their program. 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 over three-quarters had learned about at least one DoD STEM job/career (79%) while participating in Unite. Far fewer students indicated they learned about 3 or more DoD STEM jobs/careers (61%) compared to STEM jobs/careers in general (86%).

Table 31. Number of STEM Jobs/Careers Students Learned About During Unite in 2018 (n = 356)

	STEM Jobs/Careers	DoD STEM Jobs/Careers
None	2%	21%
1	4%	8%
2	8%	10%
3	13%	19%
4	9%	8%
5 or more	64%	34%

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. To evaluate this, students were 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=356)

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Response Total
DoD researchers advance science and engineering fields	1.4%	1.1%	23.6%	44.7%	29.2%	
	5	4	84	159	104	**356**
DoD researchers develop new, cutting edge technologies	1.7%	1.1%	22.5%	43.3%	31.5%	
	6	4	80	154	112	**356**
DoD researchers solve real-world problems	1.4%	1.1%	19.4%	41.9%	36.2%	
	5	4	69	149	129	**356**
DoD research is valuable to society	1.1%	1.1%	20.8%	39.3%	37.6%	
	4	4	74	140	134	**356**

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 **t**o examine the impact of Unite on students' interest in future STEM Engagement, students were asked to report changes in the likelihood of their engaging in STEM activities outside of required school activities as a result of their Unite experience (Table 33). Approximately half or more of Unite students reported an increased likelihood of engaging in each STEM activity (48%-74%). Nearly three-quarters of students reported being more likely to take an elective STEM class (74%) and use a computer to design or program something (73%). A composite score was created from the Future STEM Engagement items.[19] No significant differences were found by U2 classification for Future STEM Engagement. There were differences found by school location and ELL status, but none of the other demographic subgroup variables. Students who attend urban or rural schools reported significantly greater likelihood of engaging in future STEM activities compared to suburban students (medium effect size d=0.505).[20] Additionally, ELL students reported significantly greater likelihood of engaging in future STEM activities compared to non-ELL students (small effect size d=0.335).[21]

[19] These 10 Future STEM Engagement items had a Cronbach's alpha reliability of 0.901.

[20] Future STEM Engagement independent samples t-test results for school location: $t(383)=4.94$, $p=.000$

[21] Future STEM Engagement independent samples t-test results for ELL status: $t(383)=3.28$, $p=.001$

Table 33. Change in Likelihood Students Will Engage in STEM Activities Outside of School (n=356)

	Much less likely	Less likely	About the same before and after	More likely	Much more likely	Response Total
Watch or read non-fiction STEM	4.8%	7.0%	40.7%	34.3%	13.2%	
	17	25	145	122	47	**356**
Tinker (play) with a mechanical or electrical device	2.2%	3.7%	25.6%	39.9%	28.7%	
	8	13	91	142	102	**356**
Work on solving mathematical or scientific puzzles	1.7%	4.5%	31.2%	40.2%	22.5%	
	6	16	111	143	80	**356**
Use a computer to design or program something	2.2%	4.2%	20.5%	39.9%	33.1%	
	8	15	73	142	118	**356**
Talk with friends or family about STEM	1.4%	3.7%	29.5%	32.3%	33.1%	
	5	13	105	115	118	**356**
Mentor or teach other students about STEM	2.0%	5.9%	30.9%	34.8%	26.4%	
	7	21	110	124	94	**356**
Help with a community service project related to STEM	1.7%	3.7%	28.1%	38.5%	28.1%	
	6	13	100	137	100	**356**
Participate in a STEM camp, club, or competition	2.0%	3.9%	19.9%	37.4%	36.8%	
	7	14	71	133	131	**356**
Take an elective (not required) STEM class	2.0%	3.4%	26.1%	33.4%	35.1%	
	7	12	93	119	125	**356**
Work on a STEM project or experiment in a university or professional setting	2.2%	2.5%	23.6%	35.7%	36.0%	
	8	9	84	127	128	**356**

Another key AEOP goal is keeping students engaged across the portfolio of AEOP initiatives. To evaluate this goal, students were asked about their interest in participating in future AEOPs (Table 34). Many students expressed strong interest in participating in Unite again (77% indicating that they were somewhat or very much interested). Less than half of the students indicated being at least somewhat interested in participating in any other AEOP. Further, between a quarter and a third of students indicated they had not heard of the other AEOPs.

Table 34. Student Interest in Future AEOP Programs (n=356)

	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)	33.4%	6.2%	18.5%	23.0%	18.8%	
	119	22	66	82	67	**356**
Unite	6.2%	3.7%	13.5%	17.4%	59.3%	
	22	13	48	62	211	**356**
Junior Science & Humanities Symposium (JSHS)	37.4%	9.3%	13.8%	23.3%	16.3%	
	133	33	49	83	58	**356**
Science & Engineering Apprenticeship Program (SEAP)	32.3%	6.2%	16.0%	22.5%	23.0%	
	115	22	57	80	82	**356**
Research & Engineering Apprenticeship Program (REAP)	27.2%	7.3%	16.0%	23.6%	25.8%	
	97	26	57	84	92	**356**
High School Apprenticeship Program (HSAP)	33.1%	5.1%	18.0%	22.2%	21.6%	
	118	18	64	79	77	**356**
College Qualified Leaders (CQL)	36.2%	7.9%	21.3%	17.1%	17.4%	
	129	28	76	61	62	**356**
GEMS Near Peer Mentor Program	39.6%	8.7%	19.9%	17.4%	14.3%	
	141	31	71	62	51	**356**
Undergraduate Research Apprenticeship Program (URAP)	35.7%	9.0%	19.9%	18.5%	16.9%	
	127	32	71	66	60	**356**
Science Mathematics, and Research for Transformation (SMART) College Scholarship	25.8%	6.5%	21.3%	18.5%	27.8%	
	92	23	76	66	99	**356**
National Defense Science & Engineering Graduate (NDSEG) Fellowship	37.4%	7.6%	22.5%	14.0%	18.5%	
	133	27	80	50	66	**356**

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. As such, students were asked about their educational aspirations after participating in Unite (Table 35). Nearly all students intended to finish college (95%) and approximately half aspired to get more education after college (51%).

Table 35. Student Education Aspirations After Participating in Unite (n=356)

Choice	Response Percent	Response Total
Graduate from high school	<1%	3
Go to a trade or vocational school	2%	6
Go to college for a little while	2%	8
Finish college (get a bachelor's degree)	44%	159
Get more education after college	51%	180

In order to further understand how Unite impacted students' future aspirations in STEM, students were asked to respond to an open-ended questionnaire item asking them, "How have your Unite activities or experience helped increase your interest in pursuing a career in STEM areas?" Of the 130 student responses sampled, a large majority (118, or 91%) indicated that Unite had a positive influence on their interest in STEM careers. Of the 22 students who reported that Unite had not increased their interest in STEM, most indicated that they had an interest in STEM careers before participating in Unite. As one student responded, "It hasn't increased my interest as I have always wanted to go into a STEM career, but it has increased my knowledge about different STEM careers and to me that was super beneficial." Some students who indicated that Unite had increased their interest in a STEM career provided simple affirmations that Unite had increased their interest in pursuing STEM careers saying, for example, "[Unite] increased my interest a lot!"

Students who provided more detailed responses about their increased interest in STEM careers credited the Unite activities, their mentors and program speakers, their hands-on experiences, and the information they gained about STEM careers. For example,

> *"Getting to build a drone and getting to learn more about engineering in the Unite program did increase my interest in pursuing a career in STEM areas. Learning new things like programming and cyber security and also listening to other engineers also contributed."* (Unite Student)

> *"The Unite experience has increased my interest in pursuing a career in STEM areas because they gave me the tools (guest speakers, topics, and college advice) to figure out what I want to do in STEM."* (Unite Student)

> "*All of the activities and my experiences boosted my interest in a STEM career. It made me realize the diversity in engineering and the huge amount of opportunities that I didn't even know about."* (Unite Student)

> *"Originally, I wasn't entirely sure what I wanted to do after high school, or even how to get to where I wanted to be in order to have a STEM career, but this camp helped introduce me to more opportunities and options, as well as showed me how to get to where I want to be in order to become more involved with STEM and STEM careers."* (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 "What topic(s) from your Unite experience were most impressive?" The 130 student responses sampled cited a variety of topics and experiences. The most frequently mentioned topics were engineering (mentioned by 18 students, or 14%) and coding or software engineering (mentioned by 14 students or 11%). No other single topic was mentioned by more than 5% of students. For example, seven students cited microbiology or biology as the most impressive topic, seven referred to "fake news" as an impressive topic, six mentioned 3D modeling or virtual reality, six mentioned cybersecurity, five mentioned biomedical, five mentioned physics, and five mentioned the Army or DoD opportunities they had learned about. Other topics, mentioned by fewer than five students included aerospace, mathematics, data mining, robotics, economics, costume making, and mathematics.

Resources

Table 36 displays student responses about which resources impacted their awareness of AEOPs. Resources that three-quarters or more of students indicated impacted them at least somewhat were directly related to their Unite experience, including participation in Unite (79%) and their Unite instructors (75%). Approximately a third reported not having experienced the TSA website (35%) and AEOP on social media (33%). Around a quarter of students had not experienced the AEOP brochure (23%).

Table 36. Impact of Resources on Student Awareness of AEOPs (n=356)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	34.6%	9.3%	22.5%	20.5%	13.2%	
	123	33	80	73	47	**356**
Army Educational Outreach Program (AEOP) website	17.7%	5.1%	22.2%	21.9%	33.1%	
	63	18	79	78	118	**356**
AEOP on Facebook, Twitter, Pinterest or other social media	33.4%	20.2%	18.3%	17.7%	10.4%	
	119	72	65	63	37	**356**
AEOP brochure	22.8%	9.0%	25.8%	19.7%	22.8%	
	81	32	92	70	81	**356**
My Unite instructor(s)	7.3%	3.7%	14.0%	22.8%	52.2%	
	26	13	50	81	186	**356**
Invited speakers or "career" events during Unite	13.5%	6.7%	15.4%	22.5%	41.9%	
	48	24	55	80	149	**356**
Participation in Unite	5.3%	3.4%	12.4%	26.1%	52.8%	
	19	12	44	93	188	**356**

Students were also asked to report on the impact of various resources on their awareness of DoD STEM careers (Table 37). A similar pattern was found with these resources. Students most often reported that their Unite mentors (72%) and participation in Unite (72%) were impactful on their awareness of DoD STEM careers (at least somewhat agreement). Again, many students had not experienced resources such as AEOP on social media (32%) and the TSA website (34%).

Table 37. Impact of Resources on Student Awareness of DoD Careers (n=365)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	34.3%	10.7%	24.4%	16.0%	14.6%	
	122	38	87	57	52	**356**
Army Educational Outreach Program (AEOP) website	16.3%	8.7%	27.0%	21.6%	26.4%	
	58	31	96	77	94	**356**
AEOP on Facebook, Twitter, Pinterest or other social media	32.3%	22.8%	18.5%	16.0%	10.4%	
	115	81	66	57	37	**356**
AEOP brochure	19.9%	12.4%	27.2%	20.5%	19.9%	
	71	44	97	73	71	**356**
My UNITE mentor(s)	8.7%	4.8%	14.9%	23.9%	47.8%	
	31	17	53	85	170	**356**
Invited speakers or "career" events during UNITE	12.4%	6.5%	14.6%	23.0%	43.5%	
	44	23	52	82	155	**356**
Participation in Unite	6.5%	3.9%	17.4%	20.5%	51.7%	
	23	14	62	73	184	**356**

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 shows that mentors had the same pattern of responses as students with one of the most useful resource being participation in Unite (72%). Mentors also noted Unite program administrators (73%) and invited speakers (71%) as at least somewhat useful resources for exposing students to AEOPs. Similar to students, many mentors reported having not experienced AEOP on social media (42%) and the TSA website (40%).

Table 38. Usefulness of Resources for Exposing Students to AEOPs (n=92)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	40.2%	3.3%	6.5%	17.4%	32.6%	
	37	3	6	16	30	**92**
Army Educational Outreach Program (AEOP) website	30.4%	1.1%	7.6%	16.3%	44.6%	
	28	1	7	15	41	**92**
AEOP on Facebook, Twitter, Pinterest or other social media	42.4%	4.3%	9.8%	14.1%	29.3%	
	39	4	9	13	27	**92**
AEOP brochure	28.3%	3.3%	4.3%	23.9%	40.2%	
	26	3	4	22	37	**92**
Unite Program administrator or site coordinator	23.9%	1.1%	2.2%	14.1%	58.7%	
	22	1	2	13	54	**92**
Invited speakers or "career" events	26.1%	2.2%	1.1%	8.7%	62.0%	
	24	2	1	8	57	**92**
Participation in Unite	18.5%	2.2%	0.0%	8.7%	70.7%	
	17	2	0	8	65	**92**

Mentors were asked to rate how useful the same resources were for exposing students to DoD STEM careers (Table 39). Responses show a similar pattern to the previous item, with mentors most likely to indicate that participation in Unite was at least somewhat useful (72%), followed by the program administrator or site coordinators (71%), and invited speakers or career events (70%). Similar to the prior item, more than a third of the mentors reported not having experienced AEOP on social media (45%) and the TSA website (42%) for the purpose of exposing students to DoD STEM careers.

Table 39. Usefulness of Resources in Exposing Students to DoD STEM Careers (n=92)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	42.4%	3.3%	7.6%	12.0%	34.8%	
	39	3	7	11	32	**92**
Army Educational Outreach Program (AEOP) website	37.0%	2.2%	5.4%	13.0%	42.4%	
	34	2	5	12	39	**92**
AEOP on Facebook, Twitter, Pinterest or other social media	44.6%	3.3%	12.0%	13.0%	27.2%	
	41	3	11	12	25	**92**
AEOP brochure	31.5%	1.1%	9.8%	17.4%	40.2%	
	29	1	9	16	37	**92**
Unite Program administrator or site coordinator	25.0%	1.1%	3.3%	15.2%	55.4%	
	23	1	3	14	51	**92**
Invited speakers or "career" events	26.1%	1.1%	3.3%	16.3%	53.3%	
	24	1	3	15	49	**92**
Participation in Unite	23.9%	1.1%	3.3%	12.0%	59.8%	
	22	1	3	11	55	**92**

Overall Impact

Students were asked about impacts of participating in Unite more broadly. Table 40 presents responses to a questionnaire items where students were asked to rate the impact of Unite in various areas. Students reported that Unite had a substantial impact on them, with 80% or more agreeing with each item except being more interested in pursuing a STEM career with the Army or DoD (68%). Almost all students indicated that Unite contributed to increases in their confidence in their STEM knowledge, skills, and abilities (92%). Similarly, 87% of students indicated that Unite contributed to their increased awareness of other AEOPs, and 83% 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%) and their interest in pursuing STEM careers (81%).

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 or any of the subgroup demographics under study.

Table 40. Student Opinions of Unite Impacts (n=365)

	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	3.1%	5.3%	62.1%	29.5%	
	11	19	221	105	**356**
I am more interested in participating in STEM activities outside of school requirements	5.3%	9.0%	54.8%	30.9%	
	19	32	195	110	**356**
I am more aware of other AEOP opportunities	9.0%	4.5%	43.3%	43.3%	
	32	16	154	154	**356**
I am more interested in participating in other AEOP opportunities	10.4%	6.2%	46.6%	36.8%	
	37	22	166	131	**356**
I am more interested in taking STEM classes in school	6.2%	10.4%	54.5%	28.9%	
	22	37	194	103	**356**
I am more interested in earning a STEM degree	7.0%	12.9%	51.1%	28.9%	
	25	46	182	103	**356**
I am more interested in pursuing a career in STEM	7.0%	11.8%	53.7%	27.5%	
	25	42	191	98	**356**
I am more aware of Army or DoD STEM research and careers	11.2%	6.5%	46.6%	35.7%	
	40	23	166	127	**356**
I have a greater appreciation of Army or DoD STEM research	12.6%	6.7%	42.4%	38.2%	
	45	24	151	136	**356**
I am more interested in pursuing a STEM career with the Army or DoD	22.5%	9.6%	41.0%	27.0%	
	80	34	146	96	**356**

[22] The Cronbach's alpha reliability for these 10 Unite Impact items was 0.915.

8

8 | Findings and Recommendations

Summary of Findings

The FY19 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. 2019 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 as compared to FY18.	Unite received applications from 807 students, 440 of whom were enrolled in the program, a 54% placement rate. This represents a 9% increase in applications and a 3% increase in enrollments as compared to FY18 when 731 students applied and 429 were enrolled.
Few Unite students had previously participated in any AEOP other than Unite.	While 29% of students reported previously participating in Unite, only between two and eight students reported at registration that they had participated in another AEOP (Camp Invention, JSHS, SEAP, and HSAP). Nearly half of students (44%) reported never having participated in any AEOPs, although nearly a third (31%) indicated that they had participated in a STEM program in the past.
Unite continues to successfully serve students from groups historically underserved and underrepresented in STEM	A large majority of Unite students (94%) met the AEOP definition of underserved in FY19, an increase from FY18 (88%).
	Over a third of students (48%) identified themselves as Black or African American. This is an increase from the 43% of students who identified as Black or African American in 2018.
	More than half of Unite participants (58%) were female in FY19, a slight decrease from FY18 when 62% of participants were female.
	Nearly three-quarters of FY 19 students (74%) indicated that they receive free or reduced-price lunch, a slight increase from FY18 (71%).

	Half of Unite students (50%) reported that they did not have a parent or guardian who graduated from college, a slight decrease from 51% in FY18.
	As in FY18, English was the first language for most Unite participants, although there was a slight increase in FY19 (81% in FY18; 89% in FY19).
Unite mentors reported significant gains in students' 21st Century skills.	Unite students 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. As in FY18, students demonstrated 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; there was no difference in U2 students' overall engagement as compared to non-U2 students, however there were significant differences within three of the subgroups comprising U2 status.	Students reported significantly higher frequency of engagement in STEM practices 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 overall U2 classification, although significant differences were found within three of the subgroups that comprise the U2 classification.
	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 from urban and rural areas reported significantly greater engagement with STEM Practices compared to students from suburban and other school locations (small effect size).
	Students from racial/ethnic minority groups qualifying for U2 status reported significantly less engagement in STEM practices as compared to other students (small effect size).
Students reported gains in their STEM knowledge as a result of participating in Unite; there were no differences in knowledge gain between U2 students and other students.	Three-quarters (75%) or more of Unite 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 between U2 students overall and non-U2 students and no differences in any subgroup of the U2 classification.
Students reported gains in their STEM competencies as a result of	About two-thirds or more of students reported medium or large gains in each area of STEM competency.

participating in Unite; urban and rural students reported larger gains than suburban students.	There were no differences in gains in STEM competencies between U2 students overall and non-U2 students.
	There was a significant difference in STEM competencies gains by school location, with urban and rural students reporting significantly higher gains compared to suburban students (small effect size).
Students reported that Unite participation had positive impacts on their 21st Century skills, and urban and rural students reported larger gains than suburban students.	At least half (51% or more) of students reported medium or large gains in all 21stCentury skills items, and a large majority (85% or more) reported medium or large gains in several areas.
	There were no differences in gains in 21st Century skills between U2 students overall and non-U2 students.
	There was a significant difference in Unite's impact on 21st Century skills gains by school location, with urban and rural students reporting significantly higher gains compared to suburban students (small effect size).
Students reported gains in their STEM identities as a result of participating in Unite, and ELL reported students reported larger gains than those for whom English is a first language.	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 between U2 students overall and non-U2 students.
	ELL students reporting higher gains than non-ELL students in their STEM identities (small 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. About two-thirds or more of mentors reported using all strategies to help make learning activities relevant to students; more than three-quarters of mentors reported using each strategy to support the diverse needs of students as learners; more than 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 two-thirds 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.	Three-quarters or more of students indicated they were at least somewhat satisfied with all Unite program features, and nearly all respondents (94%) made positive comments about their Unite experiences. Very few students indicated that they were "not at all" satisfied with any program feature (<4%).
	The most frequently mentioned benefits of Unite, each mentioned by nearly half of students, were the career information they received and their STEM learning.
	The most frequently mentioned suggestions for improvement, each mentioned by around a quarter to a third of students, were increasing the number of hands-on activities or projects; providing more classes, topics, or choice of topics; and providing more or better field trips.
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 (94%) made positive comments about Unite. Very few mentors reported being "not at all" satisfied with any Unite program feature (≤1%). The most frequently mentioned strength, mentioned by 29% of mentors, was students' hands-on experiences with STEM. Over a quarter (27%) also mentioned the value of the program's support of sites and the resources provided. Other benefits mentioned by 19%-24% of mentors included students' exposure to STEM, STEM learning, the career information students receive, and the diversity of Unite. Mentors offered a wide variety of suggestions for program improvement. The most frequently mentioned improvements were to provide more funding for programs (23%), more or better field trips (21%), or more or better speakers (19%).
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 communications through their school or workplace or through personal contacts.	Students most frequently learned about AEOP through a school or university newsletter, email, or website (34%); someone who works at the school or university they attend (28%); and someone who works with the program (20%).
	Mentors most frequently learned about AEOP through someone who works at their school or university (39%); a school or university newsletter, email, or website (31%); and having been a past participant of Unite (31%).
Students were motivated to participate in Unite primarily by the learning opportunities and their interest in STEM.	The two motivators most frequently reported by students were the desire to learn something new or interesting (63%) and interest in STEM (61%). Slightly more than half of students (56%) cited having fun as a reason for participating.

Mentors discussed AEOPs with students, but with only limited reference to specific programs.	Two thirds of mentors reported discussing Unite with their students. Less than half reported discussing any of the other AEOPs explicitly, however, 62% indicated they talked to their students about AEOP generally.
Most students expressed interest in participating in Unite again, although fewer expressed interest in participating in other AEOPs in the future and many had not heard of AEOPs for which they are or will soon be eligible.	More than three-quarters of students (77%) expressed at least some interest in participating in Unite again. Less than half of the students indicated being at least somewhat interested in participating in any other AEOP. Between a quarter and a third of students indicated they had not heard of the other AEOPs.
	The most frequently student-reported resources for learning about AEOPs were participation in Unite (79%) and Unite instructors (75%).
	The most frequently mentor-reported resources for informing students about AEOPs were participation in Unite (72%), the Unite program administrators (71%), and invited speakers (71%).
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 most (79%) had learned about at least one DoD STEM job/career while participating in Unite. Fewer students indicated they learned about 3 or more DoD STEM jobs/careers (61%) compared to STEM jobs/careers in general (86%).
	Students most often reported that their Unite mentors (72%) and participation in Unite (72%) were impactful resources for their awareness of DoD STEM careers.
	A large majority (91%) of students indicated that participating in Unite had a positive impact on their interest in pursuing STEM careers, citing the Unite activities, their mentors and program speakers, their hands-on experiences, and the information they gained about STEM careers.
	Mentors were most likely to cite participation in Unite (72%), Unite program administrators (73%), and invited speakers (71%) as at least somewhat useful resources for exposing students to DoD STEM 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	Approximately 50% or more of Unite students reported that they were more likely to engage in STEM activities after participating in Unite. The activities that most students reported they were likely to

STEM activities in the future after participating in Unite.	participate in after Unite were taking an elective STEM class (74%) and using a computer to design or program something (73%).
Most students planned to at least complete a bachelor's degree after participating in Unite.	Nearly all students reported after participating in Unite that they intended to finish college (95%) and over half (51%) reported aspiring to get more education after college.
Unite students reported that participating in the program impacted their confidence and interest in their STEM abilities and interest in STEM.	A large majority of students (80% or more) reported that Unite had impacted them in various ways, although slightly fewer expressed interest in pursuing a STEM career with the Army or DoD (68%). Almost all students indicated that Unite contributed to increases in their confidence in their STEM knowledge, skills, and abilities (92%). Similarly, 87% of students indicated that Unite contributed to their increased awareness of other AEOPs, and 83% that Unite contributed to their increased interest in participating in other AEOPs.
	There were no differences in Unite's impact between U2 students overall and non-U2 students and no differences in any subgroup of the U2 classification.

Recommendations for FY20 Program Improvement/Growth

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. 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 findings revealed that Unite experienced another successful year of programming in FY19. Unite was delivered in 19 sites for FY19 and was able to include over 50% of the applicants, with a 94% participation rate for underserved students overall. There was significant growth toward mastery for Unite participants in their assessed 21st Century skills in all six areas during the program, and more than 70% 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 FY20 and beyond.

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

No recommendations for FY20.

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

As in FY19, Unite students 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 the past three years (FY16-FY18), less than half of mentors reported they did not specifically discuss any other AEOPs with students. 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.