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ARMY EDUCATIONAL OUTREACH PROGRAM

Unite

2020 Annual Program Evaluation Report
Findings

July 2021

aeop 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 2020, 18 college/university sites hosted Unite programs. Although a total of 21 sites were funded through Unite/AEOP, three institutions did not hold programs due to the COVID-19 pandemic. 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. Because of restrictions imposed by the 2020 COVID-19 pandemic, all Unite sites that held a program in summer 2020 adopted an online format.

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

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

Unite received applications from 738 students, 448 of whom were enrolled in the program, a 61% placement rate. This represents a 9% decrease in applicants but a 2% increase in enrolled students as compared to the 807 applicants and 440 participants (54% placement rate) in 2019, and a <1% increase in applications and a 4% increase in participants as compared to 2018 when 731 students applied and 429 were enrolled in Unite (59% placement rate). Table 1 provides site reports of the number of students who participated at each Unite site. Reports by host sites differ slightly from the Cvent data since not all Unite students registered through Cvent in 2020 (site reports indicate that 448 students were enrolled; Cvent data is available for 419 of these students).

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 2020, the program reported that 273 adults participated in these roles, a 25% decrease from 2019 when 366 adults participated and a 32% decrease from 2018 when 401 adults participated. Adult participants included 25 Army S&Es, the same number as in 2019 and a slight (7%) decrease from 2018 when 27 Army S&Es participated. A total of 113 educators (including university faculty) participated in the program compared to 133 in 2019 and 152 in 2018. No Army/DoD laboratories and centers partnered with Unite in 2020 (as compared to two in 2019). In 2020 nine HBCUs/MSIs hosted programs or provided other resources for the Unite program.

Table 1. 2020 Unite Student Participation by Site*		
Unite Site	**Students Applied (Site Reports)**	**Students Enrolled (Site Reports)**
Alabama State University (AL)	23	20
University of Arkansas (AR)	40	20
University of Colorado, Colorado Springs (CO)	24	24
Florida State University (FL)	28	24
Miami Dade College, Homestead (FL)	36	28
Savannah State University (GA)	15	15
University of Kansas (KA)	15	15
Morgan State University (WV)	50	30
Montana Tech (MT)	65	65
New Jersey Institute of Technology (NJ)	62	19
University of New Mexico (NM)	96	20
Fayetteville State University (NC)	28	21
North Carolina Agricultural & Technical State University (NC)	15	15
Ohio State University, Wooster (OH)	32	26
University of Pennsylvania (PA)	26	18
Texas Southern University (TX)	112	40
Virginia Tech (VA)	39	23
Marshall University (WV)	32	25
TOTAL	**738**	**448**

*21 college/university sites were awarded funding through Unite/AEOP. Due to COVID-related issues, three universities declined to hold a program in summer 2020. Thus, 18 sites held a program in summer 2020.

Table 2 contains an overview of demographic data for the 419 Unite participants who registered through Cvent. As in 2019, a large majority of Unite students (95% in 2020, 94% in 2019) met the AEOP definition of underserved (underserved),[1] representing an increase from 2018 when 88% of students were classified as underserved. More than half of Unite participants were female (65%), an increase in the proportion of female Unite participants as compared to 2019 (58%) and a slight decrease as compared to 2018 (62%). Over a third of students (40%) identified themselves as Black or African American in 2020, a decrease as compared to 2019 (48%) and 2018 (43%). The proportion of Unite students identifying as Hispanic/Latino (17%) also decreased somewhat relative to previous years (20% in 2019, 26% in 2018). The proportion of students identifying themselves as White (22%) increased relative to previous years (17% in 2019, 19% in 2018). Likewise the proportion of Asian students (7%) increased in 2020 relative to previous years (7% in 2019, 3% in 2018). In 2020, a majority of students (73%) indicated that they receive free or reduced-price lunch (FARMS), a commonly used indicator of low income status (74% in 2019, 71% in 2018). The proportion of students who would be first generation college attenders (53%) increased relative to past years (50% in 2019, 51% in 2018), and a large majority of students (86%) spoke English as their first language (89% in 2019, 81% in 2018).

[1] AEOP's definition of underserved (underserved) 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 2. 2020 Unite Student Participant Profile		
Demographic Category		
Gender (n=419)		
Female	275	65.6%
Male	139	33.2%
Choose not to report	5	1.2%
Race/Ethnicity (n=419)		
Asian	28	6.7%
Black or African American	169	40.3%
Hispanic or Latino	73	17.4%
Native American or Alaska Native	10	2.4%
Native Hawaiian or other Pacific Islander	1	<1%
White	93	22.2%
More than one race	39	9.3%
Other race or ethnicity	2	<1%
Choose not to report	4	1.0%
Grade Level (n=419)		
8th	17	4.1%
9th	110	26.3%
10th	128	30.5%
11th	130	31.0%
12th	32	7.6%
College – Freshman	0	0%
College – Sophomore	1	<1%
College – Junior	0	0%
College – Senior	1	<1%
Choose not to report	0	0%
School Location (n=419)		
Urban (city)	190	45.3%
Suburban	83	19.8%
Rural (country)	90	21.5%
Frontier or tribal School	27	6.4%
DoDDS/DoDEA School	0	0%
Home school	1	<1%
Online school	0	0%
Other	8	1.9%
Choose not to report	20	4.8%
Receives Free or Reduced-Price Lunch (FARMS) (n=419)		
Yes	305	72.8%
No	100	23.9%
Choose not to report	14	3.3%
English is First Language (n=419)		
Yes	361	86.2%
No	55	13.1%

Choose not to report	3	<1%
One or More Parent/Guardian Graduated from College (n=419)		
Yes	185	44.2%
No	223	53.2%
Choose not to report	11	2.6%
underserved Status (n=419)		
Yes	399	95.2%
No	12	2.9%
Insufficient data to make determination*	8	1.9%

* Insufficient data is defined as participants who are missing/chose not to report two or more demographic fields OR are missing/chose not to report one demographic field and satisfies only one other condition for underserved status.

Table 3 summarizes 2020 Unite program costs. The overall cost of Unite for FY20 was $665,941. The cost per student was $1,486.

Table 3. 2020 Unite Program Costs	
Total Cost	$665,941
Total Travel*	$826
Participant Travel	$0
Total Awards	$180,460
Student Awards/Stipends	$176,060
Adult/Teacher/Mentor Awards	$4,400
Cost Per Student	$1,486

* The reported travel costs for FY20 programs are from pre-pandemic travel (Oct 2019-Feb 2020) and from non-refundable travel expenses that were booked prior to shifting to virtual programming.

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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 universities • Students participating in 18 Unite programs • STEM professionals and educators serving as Unite instructors • Stipends for students to support meals and travel • Centralized branding and comprehensive marketing • Centralized evaluation	• Students engage in hands-on programs focused on rigorous classroom instruction that prepared students for admissions into engineering tracks in college • STEM professionals and educators facilitate hands-on learning experiences for students • Program activities expose students to AEOP programs and/or STEM careers in the Army or DoD	• Number and diversity of student participants engaged in programs • Number and diversity of STEM professionals and educators serving as instructors for programs • Number and diversity of Army/DoD scientists and engineers and other military personnel engaged in programs • Number and Title 1 status of high schools served through participant engagement • Students, instructors, site coordinators, and TSA contributing to evaluation	• Increased participant STEM competencies (confidence, knowledge, skills, and/or abilities to do STEM) • Increased interest in future STEM engagement • Increased participant awareness of and interest in other AEOP opportunities • Increased participant awareness of and interest in STEM research and careers • Increased participant awareness of and interest in Army/DoD STEM research and careers • Implementation of evidence-based recommendations to improve Unite programs	• Increased student participation in other AEOP opportunities and Army/DoD-sponsored scholarship/ fellowship programs • Increased student pursuit of STEM coursework in secondary and post-secondary schooling • Increased student pursuit of STEM degrees • Increased student pursuit of STEM careers • Increased student pursuit of Army/DoD STEM careers • Continuous improvement and sustainability of Unite

The evaluation included information from multiple participant groups about Unite processes, resources, activities, and their potential effects in order to address key evaluation questions related to program strengths and challenges, benefits to participants, and overall effectiveness in meeting AEOP and Unite program objectives.

The assessment strategy for Unite included student and adult/mentor questionnaires, phone interviews with students and mentors, and program information provided by TSA. Tables 4-8 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. 2020 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 AEOP and Army/DoD STEM research and careers
Satisfaction & Suggestions	Benefits to participants, suggestions for improving programs, overall satisfaction

Table 5. 2020 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 AEOP, 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 AEOP and Army/DoD STEM research and careers
Satisfaction & Suggestions	Benefits to participants, suggestions for improving programs, overall satisfaction

Table 6. 2020 Student Interviews	
Category	Description
Profile	Past participation in Unite, past participation in other AEOP programs
Satisfaction & Suggestions	Awareness of AEOP, motivating factors for participation, involvement in other programs in addition to Unite, satisfaction with and suggestions for improving Unite programs, benefits to participants
AEOP Goal 1 and 2 Program Efforts	Army STEM: AEOP Opportunities – Extent to which students were exposed to other AEOP opportunities
	Army STEM: Army/DoD STEM Careers– Extent to which students were exposed to STEM and Army/DoD STEM jobs

Table 7. 2020 Mentor Interviews	
Category	Description
Profile	Role in Unite, past participation in Unite, past participation in other AEOP programs

Satisfaction & Suggestions	Perceived value of Unite, benefits to participants, suggestions for improving Unite programs
AEOP Goal 1 and 2 Program Efforts	Army STEM: AEOP Opportunities – Efforts to expose students to AEOP opportunities
	Army STEM: Army/DoD STEM Careers – Efforts to expose students to STEM and Army/DoD STEM jobs
	Mentor Capacity: Local Educators – Strategies used to increase diversity/support diversity in Unite

Table 8. 2020 Program-Provided Information

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

[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.

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. Student and mentor interview protocols are provided in Appendix D and Appendix E. Major trends in data and analyses are reported herein.

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

Evaluation survey participant sample size, total participants, and participation rate for students and adults are provided in Table 9. The student response rate was 70%, however the response rate was considerably smaller for adults (23%). The margin of error for the adult survey is larger than generally acceptable. Caution is warranted when interpreting data, as the responses may not be representative of the overall populations participating in the Unite program. The numbers of Unite student and mentor questionnaire respondents by site are provided in Table 10.

Table 9. 2020 Unite Questionnaire Participation

Participant Group	Respondents (Sample)	Total Participants* (Population)	Participation Rate	Margin of Error @ 95% Confidence[3]
Students	295	419	70.4%	±3.11%
Adults	62	273	22.7%	±10.96%

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

Because of the 2020 pandemic, most Unite programs were held virtually; therefore, phone interviews were conducted with student participants and mentors in lieu of on-site focus groups. Interviews were conducted with 11 students and five mentors representing two program sites. Interviews are not intended to yield generalizable findings; rather, they provide additional evidence of, explanation for, or illustrations of questionnaire data. They add to the overall narrative of Unite's efforts and impact, and highlight areas for future exploration in programming and evaluation.

[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 10. 2020 Unite Site Questionnaire Respondent Numbers		
	No. of Student Survey Respondents	**No. of Mentor Survey Respondents**
Alabama State University (AL)	9	1
Fayetteville State University (NC)	13	0
Florida State University (FL)	23	7
Marshall University (WV)	12	0
Miami Dade College, Homestead (FL)	17	7
Montana Tech (MT)	53	11
Morgan State University (MD)	23	8
New Jersey Institute of Technology (NJ)	16	4
North Carolina Agriculture & Technical State University (NC)	13	3
Ohio State University (OH)	14	1
Savannah State University (GA)	10	2
Texas Southern University (TX)	21	1
University of Arkansas (AR)	0	1
University of Colorado, Colorado Springs (CO)	20	1
University of Kansas (KS)	15	2
University of New Mexico (NM)	17	8
University of Pennsylvania (PA)	17	4
University of Puerto Rico, Rio Piedras (PR)*	0	0
Virginia State University (VA)*	0	0
Virginia Tech (VA)*	2	1
West Virginia State University (WV)	0	0
TOTAL	**295**	**62**

*Site cancelled programming due to COVID-19.

Respondent Profiles

Student Demographics

Table 11 presents demographic information for Unite student evaluation survey respondents. More females (65%) completed the survey than males (35%). Collectively, 60% of Unite students reported their race/ethnicity as either Black/African American (39%) or Hispanic/Latino (21%). Approximately two-thirds of students reported receiving free/reduced lunch (64%) and nearly all Unite participants indicated they spoke English as a first language (94%). Half of students (49%) reported having at least one parent who graduated from college and a similar proportion reported attending an Urban school (52%). A large majority of Unite participants (89%) met the AEOP definition of underrepresented (underserved).

Table 11. 2020 Unite Student Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Gender (n=295)		
Female	191	64.7%
Male	102	34.6%
Choose not to report	2	<1%
Race/Ethnicity (n=295)		
Asian	30	10.2%
Black or African American	115	39.0%
Hispanic or Latino	62	21.0%
Native American or Alaska Native	8	2.7%
Native Hawaiian or other Pacific Islander	0	0%
White	69	23.4%
Other race or ethnicity, (specify): *	6	2.0%
Choose not to report	5	1.7%
Grade Level (n=295)		
9th	22	7.5%
10th	92	31.2%
11th	97	32.9%
12th	82	27.8%
College - Freshman	1	<1%
Other	1	<1%
Choose not to report	0	0%
School Location (n=295)		
Urban (city)	154	52.1%

Suburban	89	30.2%
Rural (country)	30	10.2%
Frontier or tribal school	0	0%
DoDDS/DoDEA School	0	0%
Home School	0	0%
Online School	0	0%
Other	0	0%
Choose not to report	22	7.5%
Receives Free or Reduced-Price Lunch (FARMS) (n=295)		
Yes	189	64.1%
No	91	30.8%
Choose not to report	15	5.1%
English is First Language (n=295)		
Yes	276	93.6%
No	19	6.4%
Choose not to report	0	0%
One or More Parent/Guardian Graduated from College (n=295)		
Yes	145	49.1%
No	120	40.7%
Choose not to report	30	10.2%
Underserved Status (n=295)		
Yes – Underserved	261	88.5%
No – Not underserved	24	8.1%
Insufficient data to make determination**	10	3.4%

*Other = Black and white (2); Black, Asian, and White; Black, White, and Native American; Hispanic and Native American; & Trinidadian and Dominican.

**Insufficient data is defined as participants who are missing/chose not to report two or more demographic fields OR are missing/chose not to report one demographic field and satisfies only one other condition for underserved status.

Mentor Demographics

Unite mentor survey respondent demographics are provided in Table 12. Nearly two-thirds of responding mentors were female (61%). Approximately 42% of mentors reported being White followed by Black/African American (28%) and Asian (15%). Mentors reported a diverse array of occupations; 24% were scientists, engineers, or mathematicians in training; 21% were other school staff; 19% were

university educators; 13% were teachers; and 3% were scientists, engineers, or mathematics professionals.

Table 12. 2020 Unite Mentor Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Gender (n = 62)		
Female	38	61.3%
Male	24	38.7%
Choose not to report	0	0%
Race/Ethnicity (n = 62)		
Asian	9	14.5%
Black or African American	17	27.5%
Hispanic or Latino	5	8.1%
Native American or Alaska Native	3	4.8%
Native Hawaiian or other Pacific Islander	0	0%
White	26	41.9%
Other race or ethnicity	0	0%
Choose not to report	2	3.2%
Occupation (n = 62)		
Teacher	8	12.8%
Other school staff	13	21.0%
University educator	12	19.4%
Scientist, Engineer, or Mathematician in training	15	24.2%
Scientist, Engineer, or Mathematics professional	2	3.2%
Other, (specify) [†]	12	19.4%
Role in Unite (n = 62)		
Instructor (typically a university or Army scientist or engineer)	26	41.9%
Classroom Assistant	19	30.7%
Resource Teacher	3	4.8%
Other, (specify) [††]	14	22.6%

[†]Other = Student (5); Information Technology; Coordinator (4); Program Director; & Community Outreach Provider

[††] Other = Administrative Assistant (2); Mentor; Coordinator (3); Administrator (2); Advisor; Director; Mentor; Student Assistant (3); Volunteer

5

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.

STEM Practices

Student experiences with STEM practices in Unite were assessed through the evaluation survey (Table 13). Two-thirds or more of students (69%-91%) indicated they engaged in all STEM practices during Unite at least once except for presenting their STEM research to a panel of judges from industry or military (48%). STEM activities in which the most students reported engaging regularly (most days to every day) were working collaboratively as part of a team (62%) and analyzing data and drawing conclusions (61%).

Survey items related to engaging in STEM practices during Unite were used to compute a composite score.[4, 5] Response categories were converted to a scale of 1 = "Not at all" to 4 = "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 overall underserved classification and underrepresented

[4] 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.

[5] The Cronbach's alpha reliability for the 10 STEM Engagement in Unite items was 0.916.

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subgroups. No differences were found in Unite STEM engagement by overall underserved Status. However, there were significant differences by FARMS status with free/reduced lunch students reporting significantly greater engagement (small effect of d = 0.245).[6]

Table 13. Nature of Student STEM Practices During Unite (n=295)

	Not at all	At least once	Most days	Every day	Response Total
Work with a STEM researcher or company on a real-world STEM research project	25.4%	33.9%	23.1%	17.6%	
	75	100	68	52	**295**
Work with a STEM researcher on a research project topic assigned by my mentor or teacher	21.4%	32.9%	28.1%	17.6%	
	63	97	83	52	**295**
Design my own research or investigation based on my own question(s)	23.1%	32.9%	26.8%	17.3%	
	68	97	79	51	**295**
Present my STEM research to a panel of judges from industry or the military	51.9%	28.8%	10.8%	8.5%	
	153	85	32	25	**295**
Interact with STEM researchers	13.9%	34.6%	30.2%	21.4%	
	41	102	89	63	**295**
Use laboratory procedures and tools	31.2%	31.9%	26.8%	10.2%	
	92	94	79	30	**295**
Design and carry out an investigation	21.4%	30.8%	30.8%	16.9%	
	63	91	91	50	**295**
Analyze data or information and draw conclusions	8.8%	30.5%	34.6%	26.1%	
	26	90	102	77	**295**
Work collaboratively as part of a team	11.9%	26.1%	35.3%	26.8%	
	35	77	104	79	**295**
Solve real world problems	17.3%	27.5%	28.1%	27.1%	
	51	81	83	80	**295**

To compare student reported engagement in STEM during Unite to their typical school experiences, students were asked a parallel set of items on the survey (Table 14). Student engagement with STEM

[6] Independent Samples *t*-test for STEM Engagement by FARMS: $t(275)=2.03$, $p=.044$.

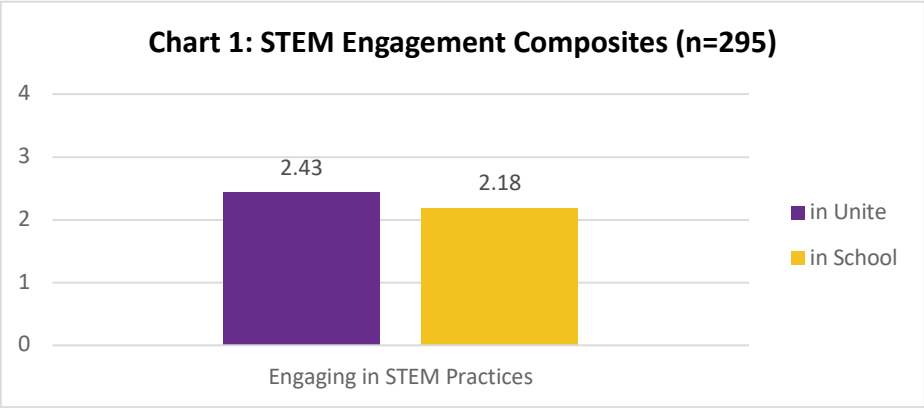
practices in school items were also combined into a composite variable.[7] Chart 1 shows that student engagement in STEM practices was significantly higher in Unite than in school (medium effect of d = 0.792).[8] This suggests that Unite offers students more intensive STEM learning experiences than they would generally receive in school.

Table 14. Nature of Student STEM Practices During School (n=295)

	Not at all	At least once	Most days	Every day	Response Total
Work with a STEM researcher or company on a real-world STEM research project	46.8%	29.2%	15.3%	8.8%	
	138	86	45	26	**295**
Work with a STEM researcher on a research project assigned by my teacher	41.7%	31.2%	18.3%	8.8%	
	123	92	54	26	**295**
Design my own research or investigation based on my own question(s)	32.5%	39.7%	20.7%	7.1%	
	96	117	61	21	**295**
Present my STEM research to a panel of judges from industry or the military	70.8%	20.0%	5.8%	3.4%	
	209	59	17	10	**295**
Interact with STEM researchers	36.9%	36.9%	18.3%	7.8%	
	109	109	54	23	**295**
Use laboratory procedures and tools	20.7%	35.9%	35.9%	7.5%	
	61	106	106	22	**295**
Design and carry out an investigation	25.1%	36.6%	29.5%	8.8%	
	74	108	87	26	**295**
Analyze data or information and draw conclusions	6.4%	31.9%	41.7%	20.0%	
	19	94	123	59	**295**
Work collaboratively as part of a team	7.1%	24.7%	45.4%	22.7%	
	21	73	134	67	**295**
Solve real world problems	17.6%	33.2%	30.2%	19.0%	
	52	98	89	56	**295**

[7] The Cronbach's alpha reliability for the 10 STEM Engagement in School items was 0.889.

[8] Dependent Samples *t*-test for STEM Engagement: $t(294)=6.79$, $p=.000$.



One student interview participant commented that her Unite experiences differed from her typical in-school STEM experiences in terms of the opportunity for independent learning. She commented that in Unite, students were less dependent on the instructor for information than they typically are in school. This student felt that this model of learning, where the instructor was available for assistance but the students were accountable for their own learning, was beneficial, saying,

> *"[Unite] was more of like a teach yourself kind of thing and then receive help from the professor. So, you weren't like leaning on the professor for like the entire course...in my school, you know, they don't really do it that way...I really appreciate that because it was really helpful to me and I learned a lot."* (Unite Student)

STEM Knowledge and Skills

Approximately 70% or more of student survey respondents reported medium to large gains in their STEM knowledge as a result of participating in the Unite program (Table 15). Items with the largest proportion of students reporting medium or large gains were in depth knowledge of a STEM topic(s) (83%) and knowledge of how scientists and engineers work on real problems in STEM (82%).

STEM knowledge items were combined into a composite variable[9] and tested for differential impacts by underserved classification and subgroups. There were no differences in reported gains in STEM knowledge by overall underserved classification. But there were significant differences in STEM knowledge by FARMS (FARMS students reported greater gains; small effect size of d=0.271) and race/ethnicity (minority students reported greater gains; small effect size of d=0.259)[10].

[9] The Cronbach's alpha reliability for the 4 STEM Knowledge items was 0.876.
[10] Independent Samples *t*-test for STEM Knowledge by: FARMS – $t(275)=2.25$, $p=.025$; Race/Ethnicity – $t(285)=2.19$, $p=.030$.

Table 15. Student Report of Impacts on STEM Knowledge (n=295)

	No gain	Small gain	Medium gain	Large gain	Response Total
In depth knowledge of a STEM topic(s)	2.4%	14.6%	46.4%	36.6%	
	7	43	137	108	**295**
Knowledge of research processes, ethics, and rules for conduct in STEM	5.4%	24.7%	34.9%	34.9%	
	16	73	103	103	**295**
Knowledge of how scientists and engineers work on real problems in STEM	4.4%	13.6%	38.6%	43.4%	
	13	40	114	128	**295**
Knowledge of what everyday research work is like in STEM	5.1%	18.3%	36.3%	40.3%	
	15	54	107	119	**295**

Students also reported gains in their STEM competencies as a result of participating in the Unite program (Table 16). More than half (54%-79%) reported medium or large gains in each STEM competency on the survey. Approximately three-quarters or more of students reported either medium or large gains in the following STEM competencies: using knowledge and creativity to propose a testable solution for a problem (79%) and defining a problem that can be solved by developing a new or improved product or process (75%).

STEM competency items were combined into a composite variable[11] and tested for differential impacts by underserved classification and subgroups. There were no differences in reported gains in STEM competencies by overall underserved classification. But there were significant differences in STEM competencies by FARMS (FARMS students reported greater gains; small effect size of d=0.414) and race/ethnicity (minority students reported greater gains; small effect size of d=0.303)[12].

Table 16. Students Reporting Gains in Their STEM Competencies (n=295)

	No gain	Small gain	Medium gain	Large gain	Response Total
Defining a problem that can be solved by developing a new or improved product or process	4.7%	20.0%	42.4%	32.9%	
	14	59	125	97	**295**
Creating a hypothesis or question that can be tested in an experiment	8.8%	27.5%	35.3%	28.5%	
	26	81	104	84	**295**

[11] The Cronbach's alpha reliability for the 13 STEM Competency items was 0.946.

[12] Independent Samples *t*-test for STEM Competencies by: FARMS – $t(275)=3.43$, $p=.001$; Race/Ethnicity – $t(285)=2.56$, $p=.011$.

Using my knowledge and creativity to suggest a solution to a problem	2.7%	18.6%	38.0%	40.7%	
	8	55	112	120	**295**
Making a model to show how something works	8.8%	23.1%	32.9%	35.3%	
	26	68	97	104	**295**
Designing procedures or steps for an experiment that work	10.5%	25.4%	33.6%	30.5%	
	31	75	99	90	**295**
Identifying the limitations of the methods and tools used for collecting data	10.8%	20.3%	39.0%	29.8%	
	32	60	115	88	**295**
Carrying out an experiment and recording data accurately	11.5%	26.1%	34.2%	28.1%	
	34	77	101	83	**295**
Creating charts or graphs to display data and find patterns	17.6%	28.1%	30.8%	23.4%	
	52	83	91	69	**295**
Considering multiple interpretations of data to decide if something works as intended	8.8%	24.7%	35.3%	31.2%	
	26	73	104	92	**295**
Supporting an explanation with my STEM knowledge or data from experiments	8.1%	21.7%	38.0%	32.2%	
	24	64	112	95	**295**
Identifying the strengths and limitations of data or arguments presented in technical or scientific texts	13.9%	26.4%	32.5%	27.1%	
	41	78	96	80	**295**
Presenting an argument that uses data and/or findings from an experiment	15.6%	23.1%	32.5%	28.8%	
	46	68	96	85	**295**
Defending an argument based upon findings from an experiment or other data	13.6%	25.1%	32.2%	29.2%	
	40	74	95	86	**295**

Student gains in their 21st Century skills as a result of Unite are presented in Table 17. More than half (53%-85%) noted at least medium gains across all 21st Century skills. Items with 85% of students reporting medium to large gains were thinking creatively (85%) and thinking about how systems work and how parts interact with each other (85%). The following items related to media had the fewest students reporting medium to large gains: creating media products (53%) and analyzing media (55%).

Items were combined into a composite variable for the 21st Century Skills section of the evaluation survey[13] and tested for differential impacts by underserved classification and subgroups. There were no differences in reported gains in 21st Century Skills by overall underserved classification. But there were significant differences in 21st Century Skills by FARMS (FARMS students reported greater gains; small effect size of d=0.408) and race/ethnicity (minority students reported greater gains; small effect size of d=0.425)[14].

Table 17. Student Report of Impacts on 21st Century Skills (n=295)

	No gain	Small gain	Medium gain	Large gain	Response Total
Thinking creatively	2.0%	13.2%	36.6%	48.1%	
	6	39	108	142	**295**
Working creatively with others	7.5%	14.6%	31.2%	46.8%	
	22	43	92	138	**295**
Using my creative ideas to make a product	4.1%	16.6%	31.9%	47.5%	
	12	49	94	140	**295**
Thinking about how systems work and how parts interact with each other	4.7%	9.8%	39.0%	46.4%	
	14	29	115	137	**295**
Evaluating others' evidence, arguments, and beliefs	9.2%	22.4%	35.9%	32.5%	
	27	66	106	96	**295**
Solving problems	2.0%	16.6%	32.5%	48.8%	
	6	49	96	144	**295**
Communicating clearly (written and oral) with others	3.4%	20.3%	29.2%	47.1%	
	10	60	86	139	**295**
Collaborating with others effectively and respectfully in diverse teams	7.1%	13.2%	36.9%	42.7%	
	21	39	109	126	**295**
Interacting effectively with others in a respectful and professional manner	3.4%	14.9%	34.6%	47.1%	
	10	44	102	139	**295**
	5.1%	18.3%	35.9%	40.7%	

[13] The Cronbach's alpha reliability for the 23 21st Century items was 0.962.

[14] Independent Samples *t*-test for 21st Century Skills by: FARMS – $t(275)=3.38$, $p=.001$; Race/Ethnicity – $t(285)=3.59$, $p=.000$.

Accessing and evaluating information efficiently (time) and critically (evaluates sources)	15	54	106	120	**295**
Using and managing data accurately, creatively and ethically	6.8%	22.0%	35.3%	35.9%	
	20	65	104	106	**295**
Analyzing media (news) - understanding points of view in the media	15.6%	29.8%	26.4%	28.1%	
	46	88	78	83	**295**
Creating media products like videos, blogs, social media	22.7%	24.7%	25.1%	27.5%	
	67	73	74	81	**295**
Use technology as a tool to research, organize, evaluate, and communicate information	5.8%	16.3%	31.9%	46.1%	
	17	48	94	136	**295**
Adapting to change when things do not go as planned	5.4%	13.9%	31.9%	48.8%	
	16	41	94	144	**295**
Incorporating feedback on my work effectively	4.1%	19.3%	37.6%	39.0%	
	12	57	111	115	**295**
Setting goals and utilizing time wisely	3.7%	16.3%	35.3%	44.7%	
	11	48	104	132	**295**
Working independently and completing tasks on time	3.7%	12.2%	33.6%	50.5%	
	11	36	99	149	**295**
Taking initiative and doing work without being told to	4.1%	17.3%	34.2%	44.4%	
	12	51	101	131	**295**
Prioritizing, planning, and managing projects to achieve completion	3.7%	14.6%	34.6%	47.1%	
	11	43	102	139	**295**
Producing results - sticking with a task until it is finished	3.1%	14.9%	33.9%	48.1%	
	9	44	100	142	**295**
Leading and guiding others in a team or group	10.8%	21.7%	31.5%	35.9%	
	32	64	93	106	**295**
Being responsible to others - thinking about the larger community	6.8%	16.3%	29.8%	47.1%	
	20	48	88	139	**295**

STEM Identity and Confidence

For students to see themselves as capable of succeeding in STEM and pursuing future educational pathways towards STEM careers, they need to develop deep knowledge and skills in STEM fields when they are young.[15] To better understand how students believed Unite impacted their STEM identity, or personal capabilities in STEM, students were asked to rate their gains on a series of items related to STEM identity (Table 18). Approximately 70% or more of students (70%-80%) reported at least medium gains across STEM identity items. Items with three-quarters or more of students reporting medium or large gains were: feeling prepared for more challenging STEM activities (79%); confidence to try out new ideas/procedures on their own in a STEM project (75%); and desire to build relationships with mentors who work in STEM (75%).

A composite score for STEM identity was created from these items[16] and used to compare responses by underserved classification and across subgroups. There were no differences in reported gains in STEM identity by overall underserved classification. But there were significant differences in STEM identity by FARMS (FARMS students reported greater gains; small effect size of d=0.330) and race/ethnicity (minority students reported greater gains; small effect size of d=0.321)[17].

Table 18. Student Report of Impacts on Student Identity (n=295)

	No gain	Small gain	Medium gain	Large gain	Response Total
Interest in a new STEM topic	7.8%	19.7%	32.5%	40.0%	
	23	58	96	118	**295**
Interest in pursuing a STEM career	10.2%	20.3%	25.4%	44.1%	
	30	60	75	130	**295**
Sense of accomplishment from my work in STEM	5.1%	14.6%	32.5%	47.8%	
	15	43	96	141	**295**
Feeling prepared for more challenging STEM activities	6.1%	14.6%	35.9%	43.4%	
	18	43	106	128	**295**
	6.1%	19.0%	31.5%	43.4%	

[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 6 STEM Identity items was 0.915.
[17] Independent Samples *t*-test for STEM Identity by: FARMS – $t(275)=2.74$, $p=.007$; Race/Ethnicity – $t(285)=2.71$, $p=.007$.

Confidence to try out new ideas or procedures on my own in a STEM project	18	56	93	128	**295**
Desire to build relationships with mentors who work in STEM	3.7%	21.7%	26.4%	48.1%	
	11	64	78	142	**295**

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 19-23). 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.

[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.

Mentors were asked about strategies they used to assist in making learning activities relevant to students (Table 19). More than two-thirds (69%-90%) indicated implementing all strategies. The most frequently reported strategies were helping students become aware of the role(s) STEM plays in their everyday lives (90%) and becoming familiar with students' background and interests at the beginning of the Unite experience (87%).

Table 19. Mentors Using Strategies to Establish Relevance of Learning Activities (n=62)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Becoming familiar with my student(s) background and interests at the beginning of the Unite experience	87.1%	12.9%	
	54	8	**62**
Giving students real-life problems to investigate or solve	83.9%	16.1%	
	52	10	**62**
Selecting readings or activities that relate to students' backgrounds	69.4%	30.6%	
	43	19	**62**
Encouraging students to suggest new readings, activities, or projects	80.6%	19.4%	
	50	12	**62**
Helping students become aware of the role(s) that STEM plays in their everyday lives	90.3%	9.7%	
	56	6	**62**
Helping students understand how STEM can help them improve their own community	85.5%	14.5%	
	53	9	**62**
Asking students to relate real-life events or activities to topics covered in Unite	83.9%	16.1%	
	52	10	**62**

More than 70% of mentors (71%-94%) reported using all strategies to support the diverse needs of students as learners (Table 20). Strategies employed most frequently were: interacting with students and other personnel the same way regardless of their background (94%); using a variety of teaching and/or mentoring activities to meet the needs of all students (89%); and directing students to other individuals or programs for additional support as needed (86%).

Table 20. Mentors Using Strategies to Support Diverse Needs of Students as Learners (n=62)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Identifying the different learning styles that my students may have at the beginning of the Unite experience	71.0%	29.0%	
	44	18	**62**
Interacting with students and other personnel the same way regardless of their background	93.5%	6.5%	
	58	4	**62**
Using a variety of teaching and/or mentoring activities to meet the needs of all students	88.7%	11.3%	
	55	7	**62**
Integrating ideas from education literature to teach/mentor students from groups underrepresented in STEM	71.0%	29.0%	
	44	18	**62**
Providing extra readings, activities, or learning support for students who lack essential background knowledge or skills	74.2%	25.8%	
	46	16	**62**
Directing students to other individuals or programs for additional support as needed	85.5%	14.5%	
	53	9	**62**
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	72.6%	27.4%	
	45	17	**62**

More than 70% of mentors (71%-88%) reported implementing all strategies across the domain of supporting the development of collaboration and interpersonal skills within students (Table 21). Mentors most frequently reported using the strategies of having students listen to the ideas of others with an open mind (89%) and having students exchange ideas with others whose backgrounds/viewpoints are different from their own (89%).

Table 21. Mentors Using Strategies to Support Student Development of Collaboration and Interpersonal Skills (n=62)

	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	71.0%	29.0%	
	44	18	**62**
Having my students explain difficult ideas to others	74.2%	25.8%	
	46	16	**62**

Having my students listen to the ideas of others with an open mind	88.7%	11.3%	
	55	7	**62**
Having my students exchange ideas with others whose backgrounds or viewpoints are different from their own	88.7%	11.3%	
	55	7	**62**
Having my students give and receive constructive feedback with others	75.8%	24.2%	
	47	15	**62**
Having students work on collaborative activities or projects as a member of a team	77.4%	22.6%	
	48	14	**62**
Allowing my students to resolve conflicts and reach agreement within their team	74.2%	25.8%	
	46	16	**62**

Two-thirds or more of mentors (68%-95%) reported using all strategies listed in Table 22 to support student engagement in authentic STEM activities. Nearly 90% of mentors reported using the following strategies: allowing students to work independently to improve self-management abilities (95%); providing students with constructive feedback to improve STEM competencies (87%); and encouraging students to seek support from other team members (86%).

Table 22. Mentors Using Strategies to Support Student Engagement in "Authentic" STEM Activities (n=62)

	Yes - I used this strategy	No - I did not use this strategy	Response Total
Teaching (or assigning readings) about specific STEM subject matter	69.4%	30.6%	
	43	19	**62**
Having my students search for and review technical research to support their work	72.6%	27.4%	
	45	17	**62**
Demonstrating laboratory/field techniques, procedures, and tools for my student(s)	69.4%	30.6%	
	43	19	**62**
Supervising my students while they practice STEM research skills	67.7%	32.3%	
	42	20	**62**
Providing my students with constructive feedback to improve their STEM competencies	87.1%	12.9%	
	54	8	**62**
	95.2%	4.8%	

Allowing students to work independently to improve their self-management abilities	59	3	**62**
Encouraging students to learn collaboratively (team projects, team meetings, journal clubs, etc.)	80.6%	19.4%	
	50	12	**62**
Encouraging students to seek support from other team members	85.5%	14.5%	
	53	9	**62**

Half or more of mentors (50%-87%) reported implementing all strategies listed in Table 23 to support students' STEM education and career pathways. More than 80% of mentors said they provided guidance about educational pathways to prepare students for STEM careers (87%) and asked students about their educational and/or career goals (82%).

Table 23. Mentors Using Strategies to Support Student STEM Education and Career Pathways (n=62)

	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	82.3%	17.7%	
	51	11	**62**
Recommending extracurricular programs that align with students' goals	71.0%	29.0%	
	44	18	**62**
Recommending Army Educational Outreach Programs that align with students' goals	56.5%	43.5%	
	35	27	**62**
Providing guidance about educational pathways that will prepare my students for a STEM career	87.1%	12.9%	
	54	8	**62**
Discussing STEM career opportunities within the DoD or other government agencies	58.1%	41.9%	
	36	26	**62**
Discussing STEM career opportunities in private industry or academia	72.6%	27.4%	
	45	17	**62**
Discussing the economic, political, ethical, and/or social context of a STEM career	64.5%	35.5%	
	40	22	**62**
Recommending student and professional organizations in STEM to my students	61.3%	38.7%	
	38	24	**62**
	59.7%	40.3%	

Helping students build a professional network in a STEM field	37	25	**62**
Helping my students with their resume, application, personal statement, and/or interview preparations	50.0%	50.0%	
	31	31	**62**

Unite students were also asked about the use of teaching and mentoring strategies by their mentors during their program (Table 24). Almost two thirds or more of students reported their Unite mentor used each strategy (65%-93%). The most frequently reported strategies with more than 90% of students endorsing include: Giving extra support when needed (93%); Using a variety of learning strategies (91%); Helping students become aware of STEM in everyday life (91%); Helping students learn/practice a variety of STEM skills (91%); and Giving students feedback to help them improve in STEM (91%).

Table 24. Student Reports of Teaching and Mentoring Strategies used by Unite Mentors (n=295)

	Yes – my mentor used this strategy	**No – my mentor did not use this strategy**	**Response Total**
Helped me become aware of STEM in my everyday life	90.8%	9.2%	
	268	27	**295**
Helped me understand how I can use STEM to improve my community	89.5%	10.5%	
	264	31	**295**
Used a variety of strategies to help me learn	91.2%	8.8%	
	269	26	**295**
Gave me extra support when I needed it	92.9%	7.1%	
	274	21	**295**
Encouraged me to share ideas with others who have different backgrounds or viewpoints than I do	85.4%	14.6%	
	252	43	**295**
Allowed me to work on a team project or activity	86.4%	13.6%	
	255	40	**295**
Helped me learn or practice a variety of STEM skills	90.8%	9.2%	
	268	27	**295**
Gave me feedback to help me improve in STEM	90.8%	9.2%	
	268	27	**295**

Talked to me about the education I need for a STEM career	86.1%	13.9%	
	254	41	**295**
Recommended Army Educational Outreach Programs that match my interests	64.7%	35.3%	
	191	104	**295**
Discussed STEM careers with the DoD or government	67.5%	32.5%	
	199	96	**295**

Program Features and Feedback/Satisfaction

Both Unite students and mentors were asked to report on their satisfaction level with a number of program features. More than half of students reported high levels of satisfaction (somewhat to very much satisfied) across the items, and more than 90% of students (92%-96%) were at least somewhat satisfied with all features except for two (Table 25). Over a third of students (38%) had not experienced field trips or laboratory tours and nearly a third (32%) reported not experiencing the physical location of Unite activities.

Table 25. Student Satisfaction with Unite Program Features (n=295)

	Did not experience	Not at all	Somewhat	Very much	Response Total
Applying or registering for the program	3.1%	2.4%	32.2%	62.4%	
	9	7	95	184	**295**
Communicating with your Unite host site organizers	6.1%	2.4%	30.5%	61.0%	
	18	7	90	180	**295**
The physical location(s) of Unite activities	31.5%	8.1%	30.8%	29.5%	
	93	24	91	87	**295**
The variety of STEM topics available to you in Unite	4.4%	4.1%	30.5%	61.0%	
	13	12	90	180	**295**
Teaching or mentoring provided during Unite activities	3.1%	4.4%	28.1%	64.4%	
	9	13	83	190	**295**
Stipends (payment)	6.1%	2.0%	18.3%	73.6%	
	18	6	54	217	**295**

Educational materials (e.g., workbooks, online resources, etc.) used during program activities	1.7%	2.4%	27.5%	68.5%	
	5	7	81	202	**295**
Invited speakers or career events	4.1%	2.4%	25.8%	67.8%	
	12	7	76	200	**295**
Field trips or laboratory tours	38.0%	7.1%	25.1%	29.8%	
	112	21	74	88	**295**

In an open-ended item on the questionnaire, Unite students were asked to comment on their overall satisfaction with their experiences in the program. Of the 100 responses sampled, all but three respondents (97%) had something positive to say about Unite. Students who provided details about their satisfaction commented on the hands-on learning they experienced, the mentoring they received, the college and career information they received, increases in their interest in or motivation for STEM, the stipend, and the opportunity to make friends and to have fun. Students said, for example,

> *"I am very happy with this experience, I was able to meet new people, learning about the different opportunities that are given to us, and hearing about other's experiences. I am very grateful that I was given this opportunity."* (Unite Student)

> *"I really love the Unite program! I love participating in research and classes with new friends. Doing research is fun, and all of the teachers are super nice. I like learning about college from this perspective."* (Unite Student)

> *"In this Unite program I have gained many kinds of experiences such as how to communicate well with each other, learn more about engineering, have become more interested in science and technology and have become interested in doing something better in the future."* (Unite Student)

> *"My experience has been great with Unite. Overall, I've learned more about what to expect in college and adult tasks. The program has helped support me in school and where I plan to go. I've experienced awesome activities and learning opportunities. I've also made new friends and found a mentor who is really there for me."* (Unite Student)

> *"My Unite experience so far has been one of the best experiences of my life. I have learned so much and met some of the greatest people in my life. The money has allowed me to begin saving up for college which this program has taught me so much about and has shown me how important a college education can be."* (Unite Student)

Eight respondents (8%) added caveats to their positive comments. Most of these caveats were related to the online format of Unite in 2020. Other comments these students made focused on a perceived lack of

support from instructors, experiencing stress during the program, and a perception that the program did not challenge them academically. For example,

> *"I liked learning about the environment and learning new things I could do to help improve the environment. I definitely would retake this class just because I would rather be face to face learning rather than being online."* (Unite Student)

> *"The [Unite] camp was fun, but it wasn't for higher level students this summer."* Unite Student)

Three respondents (3%) had nothing positive to say about Unite, commenting on the online format, lack of organization, and the stress they experienced during the program. These students said, for example,

> *"This year, I was not satisfied with most of the experiences with the program. I know COVID played a huge role in staff issues but I found it unfair for certain classmates who are failing something that wasn't talked much about to them and don't get correct feedback or answers in time. Doing everything online was hard and some of the classes took up more time than it should have."* (Unite Student)

> *"I feel this summer was a letdown big time because it was very unorganized and stressful when it didn't need to be as stressful as it was."* (Unite Student)

Students were also asked to list three benefits of participating in Unite in an open-ended questionnaire item. Among the 100 student responses sampled, the most frequently mentioned benefits were STEM learning (49%), the career information they received (33%), and the STEM skills they acquired, (32%). Eighteen students (18%) noted that the college information they received was a benefit, 17% noted the opportunity to acquire communication skills was a benefit, and 13% cited each of the following as a benefit of participating in Unite: the teaching and support they received, teamwork, and increases in their interest in or motivation for STEM. Other benefits, each mentioned by 4%-9% of respondents, included:

- developing work ethic
- developing confidence
- connecting with like-minded peers
- developing time management skills
- developing problem solving skills
- guest speakers.

Unite students participating in interviews echoed these themes and added that their learning in Unite gave them an academic "head start" for the upcoming school year. Students said, for example,

> *"Most of the classes that I'm taking [next school year] correspond with the courses that I took [in Unite] ...So, I felt like I got like a head start."* (Unite Student)

"There were a lot of careers in this program I have never heard about. For example, there's another course that we're taking that's called actuarial science...Although I don't think I'll pursue it, it's good to at least have a basic understanding and...I feel like it will contribute with whatever I choose in the future." (Unite Student)

"I get the experience of meeting new people from like all across the country so I really like that." (Unite Student)

"[In Unite, I] got to learn more about SATs and like ways to help me with college and to…learn more about scholarships. And I also ...got to learn the different fields of engineering and how much they help us to get better insight into the military." (Unite Student)

"One of the major [benefits of Unite] is how I can better prepare for career and college readiness - I originally had a plan of what I wanted to do, but now thanks to exploring other fields, I now have a broader range of what I might want to do." (Unite Student)

"[I gained] a much deeper understanding about the different areas and aspects of the STEM field and how it is truly used in everyday life and how it's not just people on computers or in a mechanic shop, there's so many different aspects to it." (Unite Student)

Students participating in phone interviews were asked to comment on their experiences with the virtual format of Unite. All students had something positive to say about the experience, although the consensus was that they would prefer to participate in Unite in an in-person format. Some students commented that they were able to work in groups using group chat functions and tools such as Google Meet and that they had been able to connect with peers, and one student noted that instructors adjusted instruction to accommodate the online format. Three students mentioned having internet connectivity issues or technical problems, one student who had participated in Unite previously noted regretting missing out on tours and field trips. Student comments on the virtual format included the following:

"I think [Unite] handled it well…having to transition it online virtually…I think they tried their best trying to make sure that we all felt connected and welcomed in the program." (Unite Student)

"[The virtual format] took some of the fun out of [Unite]…but it was still easy to understand and participate and reach out to teachers for help." (Unite Student)

"[The virtual format of Unite is] going great...At first, I thought [the online format] was going to kind of be difficult... but it's just like it's in-person. We still have like time to talk to each other, so I really enjoy that and they're always there to help." (Unite Student)

"[In previous years, Unite] was just a lot of firsthand experiences that you really can't get online." (Unite Student)

> *"[The virtual format of Unite has] been good. I'd rather be in-person because it's…easier to see stuff in-person compared to like doing it online, but...they broke stuff down way more than if we were in-person."* (Unite Student)

Students were also asked to respond to an open-ended questionnaire item asking them to list three ways that Unite could be improved. A wide variety of improvements were suggested in the 100 student responses sampled. The most frequently mentioned improvements were related to teaching (34%), including suggestions that instructors provide more help or clearer instructions, that content be delivered more slowly, that teaching be more exciting or engaging, that teaching be more interactive or discussion-based, that instruction be more in-depth, or that the program provide more teacher or mentors. Another 29% of students suggested providing more hands-on activities, and 27% suggested providing more or different topics or emphasis on different topics during Unite. Sixteen student (16%) suggested improving the program's organization and/or communication. Other improvements, mentioned by 7%-12% of respondents included:

- providing more speakers
- holding the program in-person instead of virtually
- making the program longer or providing more time for student work
- providing field trips or more field trips
- improving teamwork, including providing more opportunities for teamwork or altering the size of small groups (smaller or larger)
- including more students in the program
- shortening presentations by instructors or guest speakers
- reducing the amount of student work
- providing more career information or information about a wider variety of careers
- providing more time for students to interact with peers.

Students participating in phone interviews were also asked for their suggestions of ways to improve Unite. Over half of these students made no suggestions. The five student interview participants who made suggestions for improvement made comments similar to those mentioned above, including providing more interactive activities and increasing the number of students by increasing outreach or publicity for Unite. Students said, for example,

> *"I wish [Unite] had more…groups and stuff and games for us to…learn from also, not just that class aspect of it."* (Unite Student)

> *"I don't like the fact that we talk about engineering and honestly, I feel like there's more to STEM than just that…I want to be a doctor. I want to hear more about the science part of STEM or the math part, like not just the technology engineer part."* (Unite Student)

Students also suggested improvements to the schedule (e.g., having classes meet every day), and one student suggested a way to broaden the topical diversity of Unite, suggesting that during each of the four weeks of the program one of the core STEM disciplines could be addressed. In her words,

> *"One week, we [could] talk about science and like also like SAT prep and college…awareness and how you can get to be ready for your dream school. And then the next week we could do engineering and then bring in other stuff about…the military - how do they acquire engineering into the military. Then the next week, we could do math. And then at the end of the week, we could do more hands-on stuff with technology. So… more parts of STEM. We should break the four weeks into the four parts of STEM."* (Unite Student)

More than half of mentors (58%-68%) reported being at least somewhat satisfied with all features of Unite (see Table 26) except for the following three that many mentors had not experienced: field trips/ laboratory tours (31% satisfaction; 65% did not experience); physical location of Unite (44% satisfied; 53% did not experience); and communicating with TSA (45% satisfied; 50% did not experience).

Table 26. Mentor Satisfaction with Unite Program Features (n=62)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Application or registration process	27.4%	3.2%	8.1%	14.5%	46.8%	
	17	2	5	9	29	**62**
Communicating with Technology Student Association (TSA)	50.0%	1.6%	3.2%	8.1%	37.1%	
	31	1	2	5	23	**62**
Communicating with Unite site coordinators	30.6%	1.6%	8.1%	6.5%	53.2%	
	19	1	5	4	33	**62**
The physical location(s) of Unite's activities	53.2%	1.6%	1.6%	6.5%	37.1%	
	33	1	1	4	23	**62**
Support for instruction or mentorship during program activities	27.4%	0.0%	4.8%	6.5%	61.3%	
	17	0	3	4	38	**62**
Stipends (payment)	35.5%	0.0%	3.2%	6.5%	54.8%	
	22	0	2	4	34	**62**
Invited speakers or career events	40.3%	0.0%	1.6%	8.1%	50.0%	
	25	0	1	5	31	**62**
Field trips or laboratory tours	64.5%	0.0%	4.8%	8.1%	22.6%	

	40	0	3	5	14	**62**

The mentor questionnaire also included open-ended items asking for mentors' opinions about Unite. In response to an item asking mentors to comment on their overall satisfaction with Unite, all of the 30 mentors who responded to this item had something positive to say. Mentors cited students' exposure to STEM learning; the college and career information students receive; the program's focus on underserved students; students' opportunities to acquire technology, problem solving, and communication skills; and Unite's leadership as sources of their satisfaction. Mentors said, for example,

> *"Unite is fantastic. Our program specifically focused on technology and this year was conducted in a virtual environment due to COVID-19. The students benefited by improving their technology skills, but also strengthening communication, analytical, problem-solving, and leadership competencies. Participation by our career center, military personnel, and industry representatives also heightened awareness about the program, technology and computing fields, and possible career choices."* (Unite Mentor)

> *"We love working with Hillary Lee. She has been incredibly supportive during this difficult time. We didn't think we could do a virtual program, but she talked us into it and we ended up having a great program, being able to reach more rural students and able to double the number of students we have ever reached before. Webinar[s] with other universities gave us great ideas especially about making ways for students to connect virtually with one another and with assigning mentors for smaller groups. There was a steep learning curve and there were definitely difficulties, but we felt very supported all around."* (Unite Mentor)

> *I found the [Unite] experience to be phenomenal, despite the limitations imposed by the pandemic situation. Our administrative support was spectacular, our teaching staff operated like an integrated highly functional family focused on the same 6-week goal. It was an honor to be part of the program this summer. Thank you for the opportunity!"* (Unite Mentor)

Six of the mentors made positive comments but also offered some caveats. These caveats focused on limitations imposed by the virtual format of Unite, including difficulties in supporting student teamwork and personal connections, the lack of hands-on content, the lack of field trips, and the lack of an on-campus college experience. Mentors also noted that more publicity would improve the program, and one mentor felt unprepared for working with Unite. Mentors wrote, for example,

> *"This was a unique summer for our programming. I was able to offer a remote educational engineering workshop using Unite funding to provide the necessary equipment and resources. I feel that the students missed out on the team work and [the] being on campus experience, but it did provide hands-on learning and they had to learn to research and explore solutions if they were having problems with guided help. I hope it made them more self-sufficient and less dependent on*

someone giving them the answers or fixing issues they were experiencing with the equipment." (Unite Mentor)

"*I think that the UNITE program did the best it could regarding the circumstances of COVID-19. I think the students still enjoyed the class and the activities but it was difficult to focus on anything team-building or group work related."* (Unite Mentor)

"Unite was an interesting and enriching experience. I feel that most of the students got valuable STEM exposure out of it. The virtual nature of the course this year prevented us from doing most of the activities, labs, and field trips that we had planned, however. The students lost the opportunity to conduct their own research and present it, as well as personal interaction with the instructors and other students." (Unite Mentor)

Mentors participating in phone interviews were asked to comment on their experiences with the virtual format of Unite. The three mentors who made comments were all positive about the virtual format. One mentor noted that she appreciated the flexibility of the virtual format and felt that It prepared students for a future in which online work could be the norm. Mentors said the following:

"[The virtual format is] going wonderfully…better than expected." (Unite Mentor)

"I love [the virtual format]…I feel like this is just as effective [as in person]…there's more flexibility with it, where you're able to probably add more and do more just because everything's online compared to if you're in-person….I think it helps gear towards the future where a lot of companies [are] already kind of moving towards more technology and online tools." (Unite Mentor)

"Surprisingly, it has gone really well…I'm very proud of the students for them being able to log in and just participate…The facilitators…were able to come in and make it engaging and beneficial for them…[and] grab their attention cause, you know, sometimes it's a little difficult to grab attention of high schoolers. So, I think [the presenters] did a phenomenal job." (Unite Mentor)

Mentors were also asked to list three strengths of Unite in an open-ended questionnaire item. Thirty-four mentors listed at least one strength of the program. The most frequently mentioned strength, mentioned by 35% (12) mentors, was students' exposure to STEM and STEM learning. Over a quarter (ten mentors, or 29%) cited the career information students received in Unite as a strength, and nine (26%) mentioned each of the following program strengths: the real-world connections and hands-on learning in Unite, the funding that Unite provides, and the program's focus on underserved students. Eight mentors (24%) mentioned the program content and resources as a strength of Unite, and seven (21%) mentioned students' opportunities to gain communication skills, and students' exposure to STEM professionals as role models. Other strengths, mentioned by 6%-15% of respondents included:

- Unite's organization and program leadership
- teamwork
- the teaching in Unite

- the flexibility to adapt the program to local settings
- the opportunity for students to connect with like-minded peers
- students' opportunity to develop problem solving skills
- the DoD and/or AEOP information students receive.

Mentors participating in phone interviews echoed these themes, and added that increases in students' motivation for STEM is a program strength. As one mentor said,

> *"I think it gives students an opportunity to essentially have the gateway to learning new information and getting ahead of themselves in their educational career. Unite is definitely a great help towards that."* (Unite Mentor)

Mentors participating in phone interviews also mentioned benefits that they experience personally as a result of participating in Unite. These mentors noted that they learned from students, enjoyed working in an informal setting that permits student interaction, enjoyed working with motivated students, and appreciated the opportunity to work with students from diverse backgrounds. One mentor who commented on his own learning said,

> *"There's some great information that I received [in Unite] that I wasn't even aware of…so I can take the same information and provide it to the next generation or the next group of students that comes through."* (Unite Mentor)

Mentors were also asked in an open-ended questionnaire item to list three ways in which Unite could be improved for future participants. A total of 25 mentors provided at least one suggestion. These mentors offered a wide variety of suggestions. The most frequent suggestions, made by six mentors (24%) were to provide a longer program or more time for student work, and to provide more outreach or publicity (one mentor suggested hiring Unite alumni to conduct outreach at their schools). No other single suggestion was made by more than three mentors (12%). Improvements suggested by two or three mentors (8%-12%) included:

- providing more hands-on content
- improvements to materials, including providing materials such as games and apps and allowing students to keep materials
- providing more funding for field trips, for teaching, or to allow teaching or tutoring for students throughout the school year
- providing more opportunities for teamwork or social interaction between participants
- focusing on communication skills and/or soft skills
- providing more DoD and/or AEOP information.

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

To better understand the impact of program recruitment methods, students were asked to identify all of the ways they had learned about AEOP (see Table 27). Sources identified by more than 20% of Unite participants were: school or university newsletter, email, or website (34%); someone who works at the school/university they attend (25%); someone who works with the program (24%); and community group/program (21%).

Table 27. How Students Learned About AEOP (n=216)

	Response Percent	Response Total
Army Educational Outreach Program (AEOP) Website	2.8%	6
AEOP on Facebook, Twitter, Instagram, or other social media	<1%	1
School or university newsletter, email, or website	33.8%	73
Past participant of program	10.6%	23
Friend	8.3%	18
Family Member	7.4%	16
Someone who works at the school or university I attend	24.5%	53
Someone who works with the program	23.6%	51
Someone who works with the DoD (Army, Navy, Air Force, etc.)	<1%	1
Community group or program	20.8%	45
Choose Not to Report	<1%	2

Students participating in phone interviews were asked how they learned about Unite. These students had learned about the program through their schools, through personal connections (friend or relative), from a TRIO talent search email, and through prior participation in GEMS.

Students participating in phone interviews were asked to discuss why they chose to participate in Unite. Students cited the STEM learning opportunities, their interest in the topic, career information, interest in the host university, having fun, and having a structured activity for the summer as motivators for participating in Unite. Students said, for example,

> *"My research coordinator recommended [Unite] to me and…it has math which is a topic I really enjoy. So, I thought why not try it."* (Unite Student)

> *"[Unite] was an opportunity to take calc, which I will be taking next year and I wanted to get a head start on that. Also I had trouble last year, so I wanted to kind of fill some holes that I had [in my] understanding."* (Unite Student)

Mentors were also asked to indicate how they learned about AEOP (Table 28). Three sources of information were reported most frequently – by more than 20% of mentors: someone who works at their school or university (31%); school or university newsletter, email, or website (25%); and someone who works with the program (22%).

Table 28. How Mentors Learned About AEOP (n=36)

	Response Percent	Response Total
Army Educational Outreach Program (AEOP) Website	8.3%	3
AEOP on Facebook, Twitter, Instagram, or other social media	2.8%	1
School or university newsletter, email, or website	25.0%	9
Past participant of program	13.9%	5
Friend	2.8%	1
Family Member	0%	0
Someone who works at the school or university I attend	30.6%	11
Someone who works with the program	22.2%	8
Someone who works with the DoD (Army, Navy, Air Force, etc.)	0%	0
Community group or program	2.8%	1
Choose Not to Report	5.6%	2

Students were asked to report on why they chose to participate in Unite (Table 29). The two most commonly reported motivators were interest in STEM (60%) and the desire to learn something new or interesting (57%).

Table 29. Factors Motivating Students to Participate in Unite (n=216)

	Response Percent	Response Total
Teacher or professor encouragement	19.0%	41
An academic requirement or school grade	4.6%	10
Desire to learn something new or interesting	56.5%	122
The mentor(s)	10.2%	22
Building college application or résumé	42.6%	92
Networking opportunities	18.1%	39
Interest in science, technology, engineering, or mathematics (STEM)	60.6%	131
Interest in STEM careers with the Army	9.3%	20
Having fun	26.4%	57
Earning stipends or awards for doing STEM	16.7%	36
Opportunity to do something with friends	7.4%	16
Opportunity to use advanced laboratory technology	11.6%	25
Desire to expand laboratory or research skills	16.7%	36
Learning in ways that are not possible in school	25.0%	54
Serving the community or country	8.3%	18
Exploring a unique work environment	16.2%	35
Figuring out education or career goals	29.2%	63
Seeing how school learning applies to real life	17.6%	38
Recommendations of past participants	5.6%	12
Choose not to report	0%	0

Previous Program Participation & Future Interest

Table 30 presents data on students' prior AEOP participation. Nearly a third (30%) of students said they had previously participated in Unite, and approximately a half (51%) indicated having never participated in any AEOP in the past, although 21% reported they had previously participated in other STEM programs.

Table 30. Student Participation in AEOP Programs (n=216)

	Response Percent	Response Total
Camp Invention	<1%	2
eCYBERMISSION	<1%	1
Junior Solar Sprint (JSS)	0%	0
Gains in the Education of Mathematics and Science (GEMS)	<1%	1
Unite	29.6%	64
Junior Science & Humanities Symposium (JSHS)	0%	0
Science & Engineering Apprenticeship Program (SEAP)	0%	0
Research & Engineering Apprenticeship Program (REAP)	<1%	2
High School Apprenticeship Program (HSAP)	<1%	1
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	51.4%	111
Other STEM Program	20.8%	45

Developing a continuous pipeline of AEOP is a program priority. Thus, mentors were asked which AEOP they had directly discussed with their students during Unite (Table 31). Almost three-quarters of mentors reported discussing Unite with their students (71%). Large proportion of mentors (71%-87%) reported not having discussed any of the other specific AEOP with students. Approximately half (52%) reported discussing AEOP in general with their students, but without reference to any specific programs.

Table 31. Mentors Explicitly Discussing AEOP with Students (n=62)

	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)	27.4%	72.6%	
	17	45	62
Unite	71.0%	29.0%	
	44	18	62
Junior Science & Humanities Symposium (JSHS)	21.0%	79.0%	
	13	49	62
Science & Engineering Apprenticeship Program (SEAP)	21.0%	79.0%	
	13	49	62
Research & Engineering Apprenticeship Program (REAP)	29.0%	71.0%	
	18	44	62
High School Apprenticeship Program (HSAP)	22.6%	77.4%	
	14	48	62
College Qualified Leaders (CQL)	17.7%	82.3%	
	11	51	62
GEMS Near Peer Mentor Program	12.9%	87.1%	
	8	54	62
Undergraduate Research Apprenticeship Program (URAP)	19.4%	80.6%	
	12	50	62
Science Mathematics, and Research for Transformation (SMART) College Scholarship	27.4%	72.6%	
	17	45	62
National Defense Science & Engineering Graduate (NDSEG) Fellowship	21.0%	79.0%	
	13	49	62
I discussed AEOP with my student(s) but did not discuss any specific program	51.6%	48.4%	
	32	30	62

Awareness of STEM Careers & DoD STEM Careers & Research

One of Unite's goals is to increase the number of underserved students who pursue STEM careers. As such, students are asked on the evaluation survey how many jobs/careers (both STEM and DoD STEM) they learned about during Unite (Table 32). Large proportions of Unite students (97%) reported learning about at least one or more STEM jobs/careers in general, and more than three-quarters (80%) said they learned about three or more. Proportions were smaller for Unite student reports of learning about DoD specific STEM jobs/careers (1 or more – 75%; 3 or more – 41%).

Table 32. Number of STEM Jobs/Careers Students Learned About During Unite in 2018 (n = 295)

	STEM Jobs/Careers	DoD STEM Jobs/Careers
None	3.4%	25.1%
1	5.4%	16.3%
2	10.8%	17.3%
3	15.9%	17.3%
4	9.8%	6.4%
5 or more	54.7%	17.6%

Students participating in interviews were asked what they learned about STEM careers in the Army or DoD and how they had learned about these careers. About half of interview participants noted that they had learned about careers generally but not careers specifically within the DoD. Those that had learned about STEM careers in the Army or DoD indicated that they had learned about these primarily through guest speakers, although one participant noted that he had been assigned career research as a homework assignment. Students said, for example,

> *"We actually got to talk with some people…[who] were in the sort of STEM part of the Air Force where they worked with the technology on the different aircraft and worked in the computer areas…That was really cool."* (Unite Student)

> *"They had two people from the Army talk to us about what they do and we had to come up with questions to ask them their experience in the military and how they liked it, how did they get into doing the military and what their job…was and what it consists of."* (Unite Student)

Mentors participating in phone interviews noted that students received general career information, and two of the participants noted that students had received information specifically about STEM careers in

the Army or DoD. This exposure was through a video at the opening ceremony for one program, and through interactive workshops with military personnel. One mentor spoke to the value of this first-hand career information, saying,

"[Students] may ask us questions that we may not know the answer to, especially for those that may not be military affiliated like myself. So, I thought it was really helpful...to hear someone that's active that's in this role. And that can answer [students'] questions." (Unite Mentor)

It is important for students to have a positive perspective about DoD research and researchers to maintain a continued interest in and potential involvement in future DoD STEM careers. Unite students were asked to rate their level of agreement with various statements related to DoD research and researchers (Table 33). Nearly all students (96%-98%) agreed or strongly agreed with each item.

Table 33. Student Opinions about DoD Researchers and Research (n=295)

	Strongly Disagree	Disagree	Agree	Strongly Agree	Response Total
DoD researchers advance science and engineering fields	1.4%	1.0%	69.5%	28.1%	
	4	3	205	83	**295**
DoD researchers develop new, cutting edge technologies	1.0%	3.4%	64.4%	31.2%	
	3	10	190	92	**295**
DoD researchers solve real-world problems	1.0%	2.7%	53.9%	42.4%	
	3	8	159	125	**295**
DoD research is valuable to society	1.4%	2.7%	55.6%	40.3%	
	4	8	164	119	**295**

Interest & Future Engagement in STEM

Developing a STEM-literate citizenry is a key goal of AEOP. To reach this goal, students must be engaged with high quality STEM activities both in and out of school. To examine the impact of Unite on students' interest in future STEM engagement, students reported changes in the likelihood that they would engage in STEM activities outside of required school activities (Table 34). Approximately three-quarters or more of Unite students reported an increased likelihood of engaging in each STEM activity (74%-87%). Over three-quarters of Unite students said they were more likely to engage in the following tasks: talk with friends or family about STEM (87%) and take an elective STEM class (87%).

A composite score was created from the Future STEM Engagement items.[19] There were no differences in reported gains in Future STEM Engagement by overall underserved classification. But there were significant differences in Future STEM Engagement by FARMS (FARMS students reported greater gains; small effect size of d=0.287)[20].

Table 34. Change in Likelihood Students Will Engage in STEM Activities Outside of School (n=295)

	Much less likely	Less likely	More likely	Much more likely	Response Total
Watch or read non-fiction STEM	6.8%	19.0%	56.3%	18.0%	
	20	56	166	53	**295**
Tinker (play) with a mechanical or electrical device	3.7%	13.9%	40.7%	41.7%	
	11	41	120	123	**295**
Work on solving mathematical or scientific puzzles	2.4%	12.9%	50.5%	34.2%	
	7	38	149	101	**295**
Use a computer to design or program something	5.8%	13.6%	36.9%	43.7%	
	17	40	109	129	**295**
Talk with friends or family about STEM	2.7%	10.5%	51.5%	35.3%	
	8	31	152	104	**295**
Mentor or teach other students about STEM	5.8%	19.0%	46.1%	29.2%	
	17	56	136	86	**295**
Help with a community service project related to STEM	2.7%	10.5%	48.5%	38.3%	
	8	31	143	113	**295**
Participate in a STEM camp, club, or competition	4.7%	10.5%	43.1%	41.7%	
	14	31	127	123	**295**
Take an elective (not required) STEM class	2.4%	10.8%	42.7%	44.1%	
	7	32	126	130	**295**
Work on a STEM project or experiment in a university or professional setting	3.7%	12.5%	38.6%	45.1%	
	11	37	114	133	**295**

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

[20] Independent Samples *t*-test for Future STEM Engagement by FARMS – $t(275)=2.38$, $p=.018$.

Another AEOP goal is to keep students engaged across the portfolio of programs. Thus, students were asked about their interest in participating in future AEOP (Table 35). Almost all students expressed strong interest (somewhat or very much) in participating in Unite again (90%). More than half of students said they were at least somewhat interested in participating in the following AEOP: SMART (67%), REAP (62%), SEAP (59%), GEMS (57%), and HSAP (54%). Less than half reported being at least somewhat interested in participating in any other AEOP, and more than 40% reported having not heard of them.

Table 35. Student Interest in Future AEOP Programs (n=295)

	I've never heard of this program	Not at all	Somewhat	Very much	Response Total
Gains in the Education of Mathematics and Science (GEMS)	33.2%	10.2%	36.9%	19.7%	
	98	30	109	58	**295**
Unite	5.8%	4.4%	33.9%	55.9%	
	17	13	100	165	**295**
Junior Science & Humanities Symposium (JSHS)	41.4%	12.9%	29.5%	16.3%	
	122	38	87	48	**295**
Science & Engineering Apprenticeship Program (SEAP)	30.2%	11.2%	30.8%	27.8%	
	89	33	91	82	**295**
Research & Engineering Apprenticeship Program (REAP)	25.8%	12.2%	31.9%	30.2%	
	76	36	94	89	**295**
High School Apprenticeship Program (HSAP)	35.3%	10.5%	26.8%	27.5%	
	104	31	79	81	**295**
College Qualified Leaders (CQL)	43.1%	9.2%	23.4%	24.4%	
	127	27	69	72	**295**
GEMS Near Peer Mentor Program	43.1%	14.2%	25.4%	17.3%	
	127	42	75	51	**295**
Undergraduate Research Apprenticeship Program (URAP)	39.3%	11.2%	24.7%	24.7%	
	116	33	73	73	**295**
Science Mathematics, and Research for Transformation (SMART) College Scholarship	27.5%	5.8%	29.5%	37.3%	
	81	17	87	110	**295**
	43.1%	11.9%	24.4%	20.7%	

National Defense Science & Engineering Graduate (NDSEG) Fellowship	127	35	72	61	**295**

Broadening, deepening, and diversifying the pool of STEM talent is a goal of all AEOP – a goal that requires students to pursue STEM educational opportunities. Unite students were thus asked about their educational aspirations after participating in Unite (Table 36). Almost all students intended to finish college (94%), and slightly less than half desired to earn more education after college (44%).

Table 36. Student Education Aspirations After Participating in Unite (n=295)

Choice	Response Percent	Response Total
Graduate from high school	1.7%	5
Go to a trade or vocational school	<1%	2
Go to college for a little while	3.7%	11
Finish college (get a bachelor's degree)	49.8%	147
Get more education after college	44.1%	130

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 100 student responses sampled, a large majority (97%) indicated that Unite had a positive influence on their interest in STEM careers. These students cited the following as features of their Unite experiences that increased their interest in pursuing STEM careers:

- the career information they received
- the diversity of topics or fields covered
- the real-life application of their learning and learning about how STEM can be used to help the community or environment
- the opportunity to have new experiences or try new things
- the speakers and field trips
- case-based learning
- their general STEM learning
- the fun they experienced in activities
- the opportunities to improve their thinking skills
- increases in their confidence and motivation for STEM generally.

These students said, for example,

"My Unite experience has opened me up to new careers in the STEM field (especially in water/environment field) where I can follow my passion and contribute to helping the environment and helping everyone live more sustainably." (Unite Student)

"The Unite experience really helped to increase my interest in pursuing a career in STEM areas because I had the opportunity to learn so much about computer science and how diligent you must be so that the coding will work. With the circumstances this year I felt more independent when doing my work and solved problems on my own with of course help from my mentors that helped to understand the material better." (Unite Student)

"On field trips when people came in and talked about their experiences made me interested in having it as an option." (Unite Student)

"Despite me already being interested in STEM careers, UNITE did help with broadening my scope in what is possible and what is actually a part of STEM that I didn't think of before." (Unite Student)

Four students (4%) indicated that they were already interested in STEM careers and that Unite did not change their interest, or commented that they found the content interesting but did not intend to pursue a STEM career. Three students indicated that Unite did not increase their interest in pursuing a STEM career but did not provide any explanation.

Resources

Students reported on which program resources impacted their awareness of AEOP (Table 37). More than half indicated all resources were at least somewhat impactful except for AEOP social media (38% at least somewhat impactful; 45% did not experience) and the TSA website (49% at least somewhat impactful; 40% did not experience). Resources students reported to have had the greatest impact (somewhat or very much impactful) were participation in Unite (90%) and their Unite instructors (88%).

Table 37. Impact of Resources on Student Awareness of AEOP (n=295)

	Did not experience	Not at all	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	40.3%	10.8%	34.9%	13.9%	
	119	32	103	41	**295**
Army Educational Outreach Program (AEOP) website	21.0%	6.4%	40.0%	32.5%	
	62	19	118	96	**295**
AEOP on Facebook, Twitter, Pinterest or other social media	45.4%	16.6%	26.1%	11.9%	
	134	49	77	35	**295**
AEOP printed materials	34.9%	13.9%	32.9%	18.3%	

	103	41	97	54	**295**
My Unite instructor(s)	7.5%	4.7%	32.2%	55.6%	
	22	14	95	164	**295**
Invited speakers or career events during Unite	12.2%	8.8%	29.8%	49.2%	
	36	26	88	145	**295**
Participation in Unite	6.4%	4.1%	31.2%	58.3%	
	19	12	92	172	**295**

Students were also asked to indicate the impact of various resources on their awareness of DoD STEM careers (Table 38). Students most often reported that their Unite mentors (82%) and participation in Unite (83%) were most impactful (somewhat or very much) on their awareness of DoD STEM careers. More than 40% of students had not experienced resources such as AEOP on social media (44%) and the TSA website (41%).

Table 38. Impact of Resources on Student Awareness of DoD Careers (n=295)

	Did not experience	Not at all	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	41.4%	12.9%	31.9%	13.9%	
	122	38	94	41	**295**
Army Educational Outreach Program (AEOP) website	23.7%	10.5%	39.3%	26.4%	
	70	31	116	78	**295**
AEOP on Facebook, Twitter, Pinterest or other social media	44.4%	17.3%	25.1%	13.2%	
	131	51	74	39	**295**
AEOP print materials	36.9%	15.3%	31.9%	15.9%	
	109	45	94	47	**295**
My Unite instructor(s)	10.5%	7.5%	32.9%	49.2%	
	31	22	97	145	**295**
Invited speakers or career events during Unite	12.9%	8.5%	30.2%	48.5%	
	38	25	89	143	**295**
Participation in Unite	9.2%	7.5%	29.5%	53.9%	
	27	22	87	159	**295**

Mentors were also asked to report on the usefulness of various resources in exposing students to AEOP (Table 39). A similar pattern of responses as observed for students was found for mentors, with one of

the most useful resource being participation in Unite (83%). Large proportions of mentors also noted Unite program administrators (82%) and invited speakers (79%) as at least somewhat useful resources for exposing students to AEOP. More than half of mentors said they did not experienced AEOP on social media (50%), the TSA website (53%), or AEOP print materials (53%) for this purpose.

Table 39. Usefulness of Resources for Exposing Students to AEOP (n=62)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	53.2%	3.2%	12.9%	11.3%	19.4%	
	33	2	8	7	12	**62**
Army Educational Outreach Program (AEOP) website	35.5%	6.5%	6.5%	11.3%	40.3%	
	22	4	4	7	25	**62**
AEOP on Facebook, Twitter, Pinterest or other social media	50.0%	6.5%	3.2%	16.1%	24.2%	
	31	4	2	10	15	**62**
AEOP print materials	53.2%	4.8%	6.5%	11.3%	24.2%	
	33	3	4	7	15	**62**
Unite program administrator or site coordinator	24.2%	4.8%	4.8%	14.5%	51.6%	
	15	3	3	9	32	**62**
Invited speakers or career events	30.6%	4.8%	4.8%	4.8%	54.8%	
	19	3	3	3	34	**62**
Participation in Unite	14.5%	1.6%	4.8%	9.7%	69.4%	
	9	1	3	6	43	**62**

Mentors were asked to report on the usefulness of the same resources for the purpose of introducing students to DoD STEM careers (Table 40). Response patterns were similar to the previous item, but lesser in magnitude, with mentors most likely to indicate that participation in Unite was at least somewhat useful (66%), followed by the program administrator or site coordinators (57%), and invited speakers or career events (52%). Again, more than 40% of mentors reported not having experienced multiple resources for this purpose: TSA website (57%), AEOP on social media (53%), AEOP print materials (53%), and the AEOP website (45%).

Table 40. Usefulness of Resources in Exposing Students to DoD STEM Careers (n=62)

	Did not experience	Not at all	A little	Somewhat	Very much	Response Total
Technology Student Association (TSA) website	56.5%	3.2%	6.5%	16.1%	17.7%	
	35	2	4	10	11	**62**
Army Educational Outreach Program (AEOP) website	45.2%	3.2%	6.5%	12.9%	32.3%	
	28	2	4	8	20	**62**
AEOP on Facebook, Twitter, Pinterest or other social media	53.2%	6.5%	6.5%	12.9%	21.0%	
	33	4	4	8	13	**62**
AEOP print materials	53.2%	6.5%	6.5%	12.9%	21.0%	
	33	4	4	8	13	**62**
Unite Program administrator or site coordinator	35.5%	3.2%	4.8%	11.3%	45.2%	
	22	2	3	7	28	**62**
Invited speakers or "career" events	40.3%	3.2%	4.8%	8.1%	43.5%	
	25	2	3	5	27	**62**
Participation in Unite	24.2%	1.6%	8.1%	12.9%	53.2%	
	15	1	5	8	33	**62**

Overall Impact

Students reported on Unite's impacts on them more broadly (Table 41). Overall, more than half of students (55%-92%) indicated Unite impacted them in each area listed. Items for which the largest proportions of students reported impact were their confidence in their STEM knowledge, skills, and abilities (92%) and their interest in participating in STEM activities outside of school requirements (84%).

Overall Unite impact items were combined into a composite variable[21] to test for differences by underserved classification and among underrepresented subgroups of students. There were no differences in reported overall impact by underserved classification. But there were significant differences in Overall Impact by FARMS (FARMS students reported greater gains; small effect size of d=0.367) and race/ethnicity (minority students reported greater gains; small effect size of d=0.270)[22].

[21] The Cronbach's alpha reliability for these 7 Unite Impact items was 0.884.

[22] Independent Samples *t*-test for Overall Impact by: FARMS – $t(275)=3.04$, $p=.003$; Race/Ethnicity – $t(285)=2.28$, $p=.023$.

Table 41. Student Opinions of Unite Impacts (n=295)

	Disagree - This did not happen	Disagree - This happened but not because of Unite	Agree - Unite contributed	Agree - Unite was primary reason	Response Total
I am more confident in my STEM knowledge, skills, and abilities	2.4%	6.1%	61.4%	30.2%	
	7	18	181	89	**295**
I am more interested in participating in STEM activities outside of school requirements	6.4%	9.8%	54.9%	28.8%	
	19	29	162	85	**295**
I am more interested in taking STEM classes in school	5.8%	14.6%	51.5%	28.1%	
	17	43	152	83	**295**
I am more interested in earning a STEM degree	8.5%	16.9%	46.8%	27.8%	
	25	50	138	82	**295**
I am more interested in pursuing a career in STEM	9.5%	17.6%	46.4%	26.4%	
	28	52	137	78	**295**
I have a greater appreciation of Army or DoD STEM research	12.5%	13.9%	43.1%	30.5%	
	37	41	127	90	**295**
I am more interested in pursuing a STEM career with the Army or DoD	29.5%	15.9%	33.9%	20.7%	
	87	47	100	61	**295**

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 100 students whose responses were sampled cited a variety of topics and experiences. The most frequently mentioned topics were related to computer science, programming, or coding (22%), and 16 students mentioned specific technology tools such as MAT Lab, Microbit, AutoCAD, and HTML in their responses. Eighteen students (18%) commented that robotics was the most impressive topic, and 14% cited science generally, or biological and life science topics such as health and environmental science. Twelve students (12%) mentioned engineering as the most impressive topic, and 7% noted that they were most impressed by their work with drones. Another 7% cited the guest speakers as the most impressive element of the program. Five students (5%) indicated that calculus or mathematics content was impressive to them, and 5% cited actuarial science and insurance as impressive topics. Other topics, mentioned by fewer than five students, included website design, digital electronics, college preparation content (including ACT and SAT prep and scholarship information), and general career information.

8

8 | Findings and Recommendations

Summary of Findings

The 2020 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 42 below.

Table 42. 2020 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 previous years.	Unite received applications from 738 students, 448 of whom were enrolled in the program, a 61% placement rate. This represents a 9% decrease in applicants but a 2% increase in enrolled students as compared to the 807 applicants and 440 participants (54% placement rate) in 2019, and a <1% increase in applications and a 4% increase in participants as compared to 2018 when 731 students applied and 429 were enrolled in Unite (59% placement rate).
Unite continues to serve students from groups historically underserved and underrepresented in STEM, although the proportions of participants representing some racial/ethnic minority groups declined in 2020.	As in 2019, a large majority of Unite students (95% in 2020, 94% in 2019, 88% in 2018) met the AEOP definition of underserved (underserved).
	More than half of Unite participants were female (65%), an increase in the proportion of female Unite participants as compared to 2019 (58%) and to 2018 (62%).
	Over a third of students (40%) identified themselves as Black or African American in 2020, a decrease as compared to 2019 (48%) and 2018 (43%). The proportion of Unite students identifying as Hispanic/Latino (17%) also decreased somewhat relative to previous years (20% in 2019; 26% in 2018). The proportion of students identifying themselves as White (22%) increased relative to previous years (17% in 2019; 19% in 2018). The proportion of Asian students (7%) remained steady in 2020 relative to previous years (7% in 2019; 3% in 2018).

	In 2020, a majority of students (73%) indicated that they receive free or reduced-price lunch (FARMS), a commonly used indicator of low-income status (74% in 2019; 71% in 2018). The proportion of students who would be first generation college attenders (53%) increased relative to past years (50% in 2019; 51% in 2018), and a large majority of students (86%) spoke English as their first language (89% in 2019; 81% in 2018).
Students reported engaging in STEM practices more frequently in Unite than in school; low-income students reporting greater engagement in STEM practices than their peers.	Two-thirds or more of students (69%-91%) indicated they engaged in all STEM practices during Unite at least once except for presenting their STEM research to a panel of judges from industry or military (48%). STEM activities in which the most students reported engaging regularly (most days to every day) were working collaboratively as part of a team (62%) and analyzing data and drawing conclusions (61%).
	Student engagement in STEM practices was significantly higher in Unite than in school (medium effect size). This suggests that Unite offers students more intensive STEM learning experiences than they would generally receive in school.
Students reported gains in their STEM knowledge as a result of participating in Unite; low income students and students from racial/ethnic minority groups reported larger gains than their peers.	Approximately 70% or more of student survey respondents reported medium to large gains in their STEM knowledge as a result of participating in Unite. Items with the largest proportion of students reporting medium or large gains were an in depth knowledge of a STEM topic(s) (83%) and knowledge of how scientists and engineers work on real problems in STEM (82%).
	There were no differences in gains in STEM knowledge by overall underserved status, however FARMS students and students from racial/ethnic minority groups reported larger gains than their peers (both small effect sizes).
Students reported gains in their STEM competencies as a result of participating in Unite; low income students and students from racial/ethnic minority groups reported larger gains than their peers.	More than half of Unite students (54%-79%) reported medium or large gains in each STEM competency on the survey. Approximately three-quarters or more of students reported either medium or large gains in the following STEM competencies: using knowledge and creativity to propose a testable solution for a problem (79%) and defining a problem that can be solved by developing a new or improved product or process (75%).
	There were no differences in gains in STEM competencies by overall underserved status, however FARMS students and students from racial/ethnic minority groups reported larger gains than their peers (both small effect sizes).
Students reported that Unite participation had positive impacts on their 21st Century skills; low income students and students	More than half (53%-85%) noted at least medium gains across all 21st Century skills. Items with 85% of students reporting medium to large gains were thinking creatively (85%) and thinking about how systems work and how parts interact with each other (85%).

from racial/ethnic minority groups reported larger gains than their peers.	There were no differences in gains in 21st Century skills by overall underserved status, however FARMS students and students from racial/ethnic minority groups reported larger gains than their peers (both small effect sizes).
Students reported gains in their STEM identities as a result of participating in Unite; low income students and students from racial/ethnic minority groups reported larger gains than their peers.	Approximately 70% or more of students (70%-80%) reported at least medium gains across STEM identity items. Items with three-quarters or more of students reporting medium or large gains were: feeling prepared for more challenging STEM activities (79%); confidence to try out new ideas/procedures on their own in a STEM project (75%); and desire to build relationships with mentors who work in STEM (75%).
	There were no differences in gains in STEM identity by overall underserved status, however FARMS students and students from racial/ethnic minority groups reported larger gains than their peers (both small effect sizes).
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, including the following: 1. More than two-thirds (69%-90%) reported implementing all strategies to assist in making learning activities relevant to students. 2. More than 70% of mentors (71%-94%) reported using all strategies to support the diverse needs of students as learners. 3. More than 70% of mentors (71%-88%) reported implementing all strategies to support the development of collaboration and interpersonal skills within students. 4. Two-thirds or more of mentors (68%-95%) reported using all strategies to support student engagement in authentic STEM activities. 5. Half or more of mentors (50%-87%) reported implementing all strategies 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	More than half of students reported high levels of satisfaction (somewhat to very much satisfied for all program features, and more than 90% of students (92%-96%) were at least somewhat satisfied with all features except for two. Over a third of students (38%) had not experienced field trips or laboratory tours and nearly a third (32%) reported not experiencing the physical location of Unite activities.

suggestions for program improvement.	Students participating in phone interviews were asked to comment on their experiences with the virtual format of Unite. All students had something positive to say about the experience, although the consensus was that they would prefer to participate in Unite in an in-person format. Some students reported they were able to work in groups using group chat functions and tools such as Google Meet and had been able to connect with peers. Three students mentioned having internet connectivity issues or technical problems.
	The most frequently mentioned benefits of Unite cited by students were STEM learning, the career information they received, and the STEM skills they acquired.
	The most frequently mentioned improvements suggested by students were related to teaching (e.g., suggestions that instructors provide more help or clearer instructions, that content be delivered more slowly, that teaching be more interactive or discussion-based) followed by suggestions to provide more hands-on activities and to provide different topics.
Unite mentors were 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 (58%-68%) reported being at least somewhat satisfied with all features of Unite except for the following three that many mentors had not experienced: field trips/ laboratory tours (31% satisfaction; 65% did not experience); physical location of Unite (44% satisfied; 53% did not experience); and communicating with TSA (45% satisfied; 50% did not experience.
	Mentors participating in phone interviews were asked to comment on their experiences with the virtual format of Unite. Mentors who provided a response were all positive about the virtual format. One mentor noted that she appreciated the flexibility of the virtual format and felt that It prepared students for a future in which online work could be the norm.
	The most frequently mentioned strengths of Unite cited by mentors were students' exposure to STEM and STEM learning, the career information students receive in Unite, the real-world connections and hands-on learning in Unite, the funding that Unite provides, the program's focus on underserved students, and increases in students' motivation in STEM.
	Mentors' most frequent suggestions for improvement were to provide a longer program or more time for student work and to provide more outreach or publicity (one mentor suggested hiring Unite alumni to conduct outreach at their schools).
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 from their schools or workplaces 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/university they attend (25%); someone who works with the program (24%); and community groups/programs (21%).
	Mentors most frequently learned about AEOP through someone who works at their school or university (31%); a school or university newsletter, email, or website (25%); and someone who works with the program (22%).
Students were motivated to participate in Unite primarily by the learning opportunities and their interest in STEM.	The two motivators for participating in Unite most frequently reported by students were interest in STEM (60%) and the desire to learn something new or interesting (57%).
Few students had previously participated in any AEOP other than Unite, however most students were interested in participating in several of the AEOP in the future.	Nearly a third (30%) of students said they had previously participated in Unite, and approximately a half (51%) indicated having never participated in any AEOP in the past, although 21% reported they had previously participated in other STEM programs.
	Almost all students expressed strong interest (somewhat or very much) in participating in Unite again (90%). More than half of students said they were at least somewhat interested in participating in the following AEOP: SMART (67%), REAP (62%), SEAP (59%), GEMS (57%), and HSAP (54%). Less than half reported being at least somewhat interested in participating in any other AEOP, and more than 40% reported not having heard of them.
	More than half of students indicated all resources about which they were asked were at least somewhat impactful on their awareness of AEOP with the exceptions of AEOP social media (38% at least somewhat impactful; 45% did not experience) and the TSA website (49% at least somewhat impactful; 40% did not experience). Resources students reported to have had the greatest impact (somewhat or very much impactful) were participation in Unite (90%) and their Unite instructors (88%).
Most mentors reported discussing AEOP generally with students, however relatively few had discussed any specific programs other than Unite.	Almost three-quarters of mentors reported discussing Unite with their students (71%), however a large proportion of mentors (71%-87%) reported not having discussed any of the other specific AEOP with students. Over a quarter of mentors had discussed GEMS (27%), REAP (29%), and the SMART scholarship (27%) with students. Approximately half (52%) reported discussing AEOP in general with their students, but without reference to any specific programs.
	Mentors were most likely to cite participation in Unite (83%), Unite program administrators (82%) and invited speakers (79%) as at least somewhat useful resources for exposing students to AEOP.

Students learned about STEM careers during Unite, although they learned about more STEM careers generally than STEM careers specifically within the DoD. Students cited a number of Unite features that impacted their interest in STEM careers.	Large proportions of Unite students (97%) reported learning about at least one or more STEM job/career in general, and more than three-quarters (80%) said they learned about three or more. Proportions were smaller for Unite student reports of learning about DoD specific STEM jobs/careers (1 or more – 75%; 3 or more – 41%).
	Students most often reported that their Unite mentors (82%) and participation in Unite (83%) were most impactful (somewhat or very much) on their awareness of DoD STEM careers. More than 40% of students had not experienced resources such as AEOP on social media (44%) and the TSA website (41%).
	In responses to an open-ended survey item, a large majority of students (97%) indicated that participating in Unite had a positive impact on their interest in pursuing STEM careers, citing the following as program features that influenced their interest in STEM careers: • the career information they received • the diversity of topics or fields covered • the real-life application of their learning and learning about how STEM can be used to help the community or environment • the opportunity to have new experiences or try new things • the speakers and field trips • case-based learning • their general STEM learning • the fun they experienced in activities • the opportunities to improve their thinking skills • increases in their confidence and motivation for STEM generally.
	Mentors were most likely to cite participation in Unite (66%), program administrator or site coordinators (57%), and invited speakers or career events (52%) as at least somewhat useful resources for exposing students to DoD STEM careers.. More than 40% of mentors reported not having experienced the following resources for this purpose: TSA website (57%), AEOP on social media (53%), AEOP print materials (53%), and the AEOP website (45%).
Students expressed positive opinions about DoD research and researchers.	Nearly all students (96%-98%) agreed or strongly agreed with each item related to DoD research and researchers, indicating that they view DoD research and researchers positively.
Students reported that they were more likely to engage in various STEM activities in the future after participating in Unite; low income students were significantly more	Approximately three-quarters or more of Unite students reported an increased likelihood of engaging in each STEM activity (74%-87%). Over three-quarters of Unite students said they were more likely to engage in the following tasks: talk with friends or family about STEM (87%) and take an elective STEM class (87%).

likely to report gains in their intentions for future STEM engagement than their peers.	There were no differences in gains in likelihood of future STEM engagement by overall underserved status, however FARMS students reported greater likelihood than their peers of engaging in STEM activities in the future (small effect size).
Most students planned to at least complete a bachelor's degree after participating in Unite.	Almost all students intended to finish college (94%), and slightly less than half desired to earn more education after college (44%).
Unite students reported that participating in the program impacted their confidence in their STEM abilities and their interest in STEM; low income students and students from racial/ethnic minority groups reported larger gains than their peers.	Overall, more than half of students (55%-92%) indicated that Unite impacted them in each area related to their confidence in their STEM abilities and their interest in STEM. Items for which the largest proportions of students reported impacts were confidence in their STEM knowledge, skills, and abilities (92%) and their interest in participating in STEM activities outside of school requirements (84%). Over a quarter (30%) indicated that Unite did not impact their interest in pursuing a STEM career with the Army or DoD.
	There were no differences in overall impact by overall underserved status, however FARMS students and students from racial/ethnic minority groups reported larger impacts than their peers (both small effect sizes).
Unite students identified a number of topics that they perceived as impressive during their program experience.	In response to an open-ended questionnaire item, Unite students were most frequently identified computer science, programming, or coding (including references to specific technology tools) as impressive topics. Students also fairly frequently cited robotics, science or health topics, and engineering topics as the most impressive Unite topics.
Participation in the Unite evaluation remained lower than desired.	Only 23% of mentors/adults completed the FY20 Unite evaluation questionnaire – less than a more desirable rate of ~40%. However, 70% of students participated in completing the survey.

Recommendations for FY21 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.

FY20 was another successful year of programming for Unite, despite challenges of COVID-19 and the rapid shift to a virtual delivery format programming. Unite enabled students to realize growth in their STEM content knowledge, STEM identity, and STEM skills – with students from lower socioeconomic status and rural/urban areas experiencing significantly greater growth than other participants. 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 FY21 and beyond.

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

No recommendations for FY21. Unite has consistently engaged a diverse pool of participants in the program.

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

The evaluation of Unite for FY20 revealed suggestions that the program can utilize to better empower educators who deliver the various Unite site-developed programming to meet the needs of participants. Both mentors as well as students expressed the need more differentiation in the program - including either a longer program duration or more time for student work on specific activities/assignments. The pace of the delivery of programming was too rapid for some students who completed the survey. As in FY19, Unite students again shared they would like the content to be more interactive or discussion-based and for more hands-on activities to be included. This has been a pervasive issue for Unite, and it is recommended for FY21 and beyond that there is more centralized guidance developed and provided to site program leads regarding the expectation to design the program to require active learning pedagogies rather than lecture formats as the predominant delivery strategy.

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

As in the past four years (FY16-FY19), less than half of mentors reported they did not specifically discuss any other AEOP with students. In FY20 this percentage was lower, ranging from 13-29% only who shared information with participants regarding other AEOP. This continues to be a recurring and persistent area of concern for Unite. It is understood that some Unite programs provide an overview of AEOP in their closing ceremonies. However, there is a need to potentially employ additional strategies to address this persistent evaluation finding. Though many Unite participants (30%) indicated they have participated in Unite more than once, and 90% want to participate in this program again, TSA should take concrete steps to implement expectations that funded Unite sites thoroughly introduce the other AEOP opportunities to participants. It is again 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 AEOP within their pipeline.