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ARMY EDUCATIONAL OUTREACH PROGRAM

Unite

2020 Annual Program Evaluation Report
Executive Summary

July 2021

ARMY EDUCATIONAL OUTREACH PROGRAM

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Report Unite_03_07122021 has been prepared for the AEOP Cooperative Agreement and the U.S. Army by NC State University College of Education on behalf of Battelle Memorial Institute (Lead Organization) under award W911 SR-15-2-0001.

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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.

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 2020 Fast Facts	
Description	STEM Enrichment Activity - Pre-collegiate, engineering summer program at university host sites, targeting students from groups historically underserved and under-represented in STEM
Participant Population	Rising 9th – rising 12th grade students from groups historically underserved and underrepresented in STEM
Number of Applicants	738
Number of Participants	448
Placement Rate	61%
Number/Percentage of underserved Participants	399/95%
Total Number of Adults	273
Number of Army/DoD S&Es	25
Number of Army DoD Research Laboratories	4
Number of K-12 Teachers	35
Number of University Educators	78
Number of University Student Mentors	43 Undergraduate Students 20 Graduate Students
Number of K-12 Schools	209
Number of K-12 Schools – Title I	108
Number of Colleges/Universities*	29
Number of HBCU/MSIs (e.g., host site, provided resources, etc.)	9
Other Collaborating Organizations	74
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

Note:

* This number is based on Unite sites (which is 18) **and** other higher education institutions that collaborated in some capacity with the 2020 Unite sites (e.g., provided guest speakers, virtual lesson plans, or activities).

** 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.

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 the following table.

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 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	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

engagement in STEM practices than their peers.	(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 from racial/ethnic minority groups reported larger gains than their peers.	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%).
	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	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%).

reported larger gains than their peers.	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 suggestions for program improvement.	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.
	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 likely to report gains in their intentions for future STEM engagement than their peers.	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%).
	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.