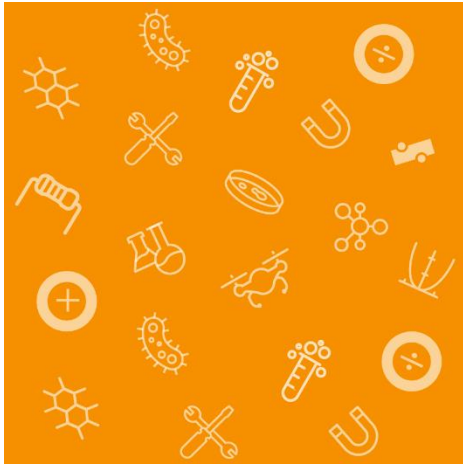


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ARMY EDUCATIONAL OUTREACH PROGRAM

FY23 eCYBERMISSION Evaluation Report Summative Findings

June 2024



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Executive Summary

The Army Educational Outreach Program (AEOP) offers students and teachers science, technology, engineering, and mathematics (STEM) programming that is designed to attract, develop, and mentor team advisor the next generation of the nation’s diverse talent through United States (U.S.) Army educational outreach programs.

Key findings from the evaluation are presented below.

Overview of Participants

In FY23, eCYBERMISSION served 7,600 individuals, with students making up 95% (7,320) of participants¹ and adults—including team advisors many of whom are educators—constituting the remaining 5% (280). Significantly, 60% of the students met two or more criteria for being considered underserved according to AEOP standards, while another 25% met one criterion.² This underscores eCYBERMISSION’s focus on inclusivity, targeting those often underrepresented in STEM. AEOP’s definition for underserved includes students from diverse geographic and socioeconomic backgrounds, females, racial/ethnic minorities, ELLs, first-generation college students, individuals with disabilities, and military families. This approach aligns with AEOP’s goal to encourage broad participation in STEM education and careers.

Participant Experience and Outcomes

Development of STEM Knowledge and Skills:

Students significantly improved their STEM knowledge and skills, as reflected by widespread reports from both students and team advisors. Specifically, 96% of students and 100% of team advisors recognized gains in understanding how scientists and engineers address real-world problems, with notable advancements in executing experiments and comprehending research processes—skills crucial for future success in STEM fields.

Development of 21st Century Skills

Students experienced significant growth in 21st-century skills, with students and team advisors reporting improvements in problem-solving, collaboration, and communication.

A critical survey finding shows that 97% of students and 100% of team advisors noted advancements in solving problems individually and in team settings. This development in critical 21st century skills reflects the program’s success in preparing students for future collaborative and impactful endeavors in STEM fields, emphasizing the essential role of communication and teamwork in addressing real-world scientific and technological challenges.

¹ Student participant counts include only those registered to a complete team (Number of Mission Folders submitted = 1,804).

² Data regarding underserved status includes all students who registered for eCYBERMISSION, not only those who were part of a complete team.

Interest in STEM and STEM Careers

The eCYBERMISSION program has significantly boosted students' confidence in STEM and encouraged a more profound interest in STEM education and careers. Students and team advisors reported marked increases in students' confidence in STEM disciplines, with 78% affirming enhanced self-assurance and 100% of team advisors observing this growth in their students. This heightened confidence is aligned with a greater willingness among students to engage in STEM-related activities, with a substantial number expressing a likelihood of future participation in STEM projects, classes, and extracurricular activities. Furthermore, 62% of students reported an increase in students' interest in pursuing STEM classes, indicating eCYBERMISSION's pivotal role in fostering not only immediate engagement with STEM activities but also a sustained interest in STEM educational paths and career opportunities.

Perceptions of DoD

AEOP's influence on students' perceptions of DoD research and related careers is profound, with clear numerical evidence underscoring their appreciation and interest.

The survey data reveal that 90% of students value DoD research's societal contributions, including 32% who strongly agree. Additionally, recognizing DoD's problem-solving in real-world contexts is substantial, with 88% agreement among students. Furthermore, 85% of students acknowledge DoD's role in pioneering new technologies, and 83% recognize its advancements in science and engineering.

Impact of Team Advisors

Team Advisors play a pivotal role in AEOP's success, providing structured advice that fosters collaborative learning and practical application of STEM skills. For instance, 90% of students felt supported in team activities, a sentiment echoed by 97% of team advisors. Furthermore, the program's emphasis on community enhancement through STEM was acknowledged by 84% of students, with 94% of team advisors observing a similar impact. Additionally, the successful application of diverse teaching strategies reported by 88% of team advisors showcases their effectiveness in nurturing an awareness of STEM's role in everyday life and its potential for community betterment.

Future Interest AEOP and Other STEM Programs

Interest in ongoing participation in AEOP and other STEM initiatives is evident, with at least one-fifth of students—20% to 32%—expressing enthusiasm for engaging in further AEOP activities or comparable programs. This indicates a positive inclination towards continuing STEM education and experiences. Nonetheless, there is potential to elevate awareness about the variety of programs AEOP offers, as over one-third of students currently lack complete knowledge of these opportunities. Enhancing outreach and information dissemination could substantially increase student engagement and enrich their STEM educational journey.

Recommendations

This report distills evaluation findings as they align with AEOP’s overarching research questions. Data collected for this evaluation are not necessarily representative of the entire program; however, based on the results presented above, we offer the following recommendations:

Programmatic Considerations

Consider improving team advisor training: Focus on specialized training for team advisors, particularly in areas where student and team advisor perceptions diverge, such as STEM career education opportunities. While students and team advisors reported structured learning environments, the perception gap around career guidance suggests an area ripe for improvement. Tailored team advisor development sessions can bridge this gap, ensuring team advisors have the resources and knowledge to guide students effectively toward STEM opportunities, including careers within the DoD.

Consider developing a user-friendly website and digital tools: Responses to the survey indicate the need to improve the eCYBERMISSION website’s user interface and accessibility. The redesign efforts could focus on ease of use, with special attention to the login process and mission folder accessibility. These changes can create a more intuitive digital experience for students, facilitating smoother engagement with program content and resources.

Continue to focus on broadening STEM career exposure: It is important to expand program content to include more comprehensive information on STEM careers, particularly highlighting roles within the DoD. This could involve leveraging existing activities (e.g., CyberGuide Evening Live Chats, Classroom Live Chats with CyberGuides, and Team Chats with CyberGuides). Such efforts can spark interest in STEM fields and provide valuable insights into the range of career opportunities available.

Evaluation Considerations

Consider options to increase survey response rates: Address the challenge of low response rates in student and team advisor surveys to ensure data representativeness and reliability. Some strategies could include tailoring outreach strategies, such as personalized communications and targeted reminders. The program team could also analyze response patterns to identify specific barriers to participation that can be addressed in future cycles.

1 Introduction

1.1 AEOP Priorities & Goals

The Army Educational Outreach Program (AEOP) mission is to provide an accessible pathway of science, technology, engineering, and mathematics (STEM) opportunities to attract, develop, and mentor the next generation of our nation’s diverse talent through United States (U.S.) Army educational outreach programs.

AEOP has three priorities:

1. **STEM Literate Citizenry.** Broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industry Base (DIB).
2. **STEM Savvy Educators.** Support and empower educators with unique Army research and technology resources.
3. **Sustainable Infrastructure.** Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army.

eCYBERMISSION directly supports the AEOP mission and priorities by offering a web-based STEM competition for students in grades 6–9 that promotes self-discovery and empowers students to recognize the real-life applications of STEM.

1.2 Overview of Participants

In FY23, eCYBERMISSION served 7,600 participants – 95% were students and the remaining 5% were team advisors.

AEOP has a focus on reaching students who have more limited access to STEM learning opportunities and/or who are from groups that are underserved in STEM education and careers. AEOP defines underserved students as those who possess at least two of the following characteristics: attend a rural, urban, or frontier/tribal school; identify as female; identify as racial/ethnic minority in STEM (i.e., Alaska Native, Native American, Black or African American, Hispanic, Native Hawaiian and other Pacific Islander, other); receive free or reduced meals price at school; speak English as a second language (ELL); first generation college student; students with disabilities; or a dependent of a military service member or veteran (referred to hereafter as Underserved).

Of the student participants in eCYBERMISSION, 60% met two or more of the AEOP criteria for being underserved, while an additional 25% met one AEOP criterion for underserved status.³

³ Data regarding underserved status includes all students who registered for eCYBERMISSION, not only those who were part of a complete team.

2 Evaluation Approach

Education Development Center, Inc. (EDC) is AEOP’s external evaluation partner. The primary tools for data collection were post-surveys for students and team advisors. These surveys were designed to evaluate the benefits of participation, program strengths and challenges, and overall effectiveness in meeting AEOP and program objectives. eCYBERMISSION program personnel helped promote these online surveys to students and their team advisors upon completion of the program activities.

Table 1. Research Questions Addressed in This Report

AEOP Priority	Research Questions Regarding Participants
<p>STEM Literate Citizenry: Broaden, deepen, and diversify the pool of STEM talent to support our defense industry base.</p>	<p><i>Participant Research Question #1</i> - To what extent do participants report growth in interest and engagement in STEM?</p> <hr/> <p><i>Research Question #2a</i> - To what extent do participants report increased STEM competencies, 21st Century/STEM skills, STEM knowledge, STEM abilities, and STEM confidence?</p> <hr/> <p><i>Research Question #2b</i> – To what extent do participants demonstrate use of and growth in 21st Century skills?</p> <hr/> <p><i>Participant Research Question #3</i> - To what extent do participants and mentors report increased participant interest in STEM research and careers?</p> <hr/> <p><i>Participant Research Question #4</i> - To what extent do participants and mentors report increased awareness of and interest in Army/DoD STEM research and careers?</p> <hr/> <p><i>Research Question #5</i> - To what extent do participants report increased enrollment, achievement, and completion of STEM degree programs?</p>
<p>STEM Savvy Educators: Support and empower educators with unique Army research and technology resources.</p>	<p><i>Research Question #6</i> - What is the impact of scientist and engineer (S&E) mentors on AEOP participants?</p> <hr/> <p><i>Research Question #7</i> - To what extent do teacher participants report increased use of new approaches to teaching research concepts within STEM practices and infusion of careers?</p>
<p>Sustainable Infrastructure: Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army.</p>	<p><i>Research Question #8</i> - To what extent do participants report growth in awareness of and/or interest in AEOP opportunities?</p>

2.1 Survey Respondents

This report describes results from student and team advisor surveys (Table 2).

Table 2. Participant and Team Advisor Survey Response Rates

Program	Participant Surveys		Team Advisor Surveys	
	Count	Response Rate	Count	Response Rate
eCYBERMISSION	520	7%	35	13%

2.2 Limitations

It is important to recognize that results only reflect those individuals who completed the surveys. The low response rates for students (7%) and team advisors (13%) means that these results may not accurately represent the broader population involved in the programs. The report includes some understanding of the eCYBERMISSION program but should be interpreted with caution.

2.3 Report Organization

Evaluation findings presented below are guided by the research questions and organized thematically by topic. Sections include the following:

- Development of STEM Knowledge and Skills
- Development of 21st Century Skills
- Interest in STEM and STEM Careers
- Perceptions of DoD
- Impact of Team Advisors on AEOP students
- Overall Experience
- Recommendations

3 Development of STEM Knowledge and Skills

Students demonstrated notable improvement in STEM knowledge and skills through their engagement in eCYBERMISSION. Both students and team advisors reported progress in students' understanding of scientific concepts and their practical applications. In addition, hands-on activities and experiential learning played a crucial role in improving students' STEM proficiency. These findings suggest that the program enhances students' understanding of core STEM concepts and research methodologies. Furthermore, the observed trend of team advisors reporting more considerable learning gains for students highlights the valuable role of their advice and guidance in facilitating students' educational growth within the program. Overall, these results underscore the importance of AEOP in fostering a robust STEM learning environment and preparing students for future success in STEM-related fields.

Most students and team advisors reported substantial growth in students' understanding of various STEM concepts and research practices. In the surveys, students were asked to rate their learning in specific topics ranging from "did not learn anything new" to "learned a lot." Table 3 reflects a consistent pattern of reported learning gain. Specifically, 96% of students affirmed they gained knowledge on how scientists and engineers tackle real-world problems in STEM, with 37% acknowledging they learned a lot. Regarding gaining an in-depth understanding of STEM topics, 95% of student participants reported learning, with 31% stating they learned a lot. Similarly, 95% noted an improvement in their understanding of research processes in STEM, with 38% indicating they learned a lot. Furthermore, 94% of students reported increased familiarity with what everyday research work entails in STEM fields, with 39% reporting they learned a lot. Team advisors observed even more significant learning gains, with 100% noting advances across all areas. These responses underscore eCYBERMISSION's effectiveness in bolstering STEM education and skill development, as both students and team advisors observe notable progress in critical areas of STEM learning.

Table 3. Students and Team Advisors Reported Increased STEM Knowledge

Response		I/they didn't learn anything new	I/they learned a little	I/they learned more than a little	I/they learned a lot	Overall learning
Knowledge of how scientists and engineers work on real problems in STEM	Student	5%	29%	29%	37%	96%
	Team Advisor	0%	3%	49%	49%	100%
In-depth knowledge of a STEM topic(s)	Student	5%	24%	40%	31%	95%
	Team Advisor	0%	6%	34%	60%	100%
Knowledge of research processes used in STEM*	Student	5%	23%	34%	38%	95%
	Team Advisor	0%	3%	34%	63%	100%
Knowledge of what everyday research work is like in STEM	Student	6%	28%	27%	39%	94%
	Team Advisor	0%	11%	31%	57%	100%

Due to rounding, totals may vary.
 Student Survey (n = 80)
 Team Advisor Survey (n = 35)

“[One thing I learned is] thinking about how I can impact a large community because during eCYBERMISSION, we built a device that can detect fires or earthquakes and alert the surrounding community.” - Student

“I learned to solve problems with a team since my eCYBERMISSION group faced some problems, but we were able to overcome them by working together.” - Student

Students and team advisors reported substantial learning gains in various STEM skills.

Survey results captured in Table 4 illustrate a clear trend of knowledge acquisition and skill improvement across essential STEM domains. For instance, a substantial portion of respondents indicated that students learned “a lot” in conducting experiments (49% of students and 68% of team advisors) and in substantiating explanations with STEM knowledge or data from experiments (37% of students and 49% of team advisors). Team Advisors consistently observed higher levels of student learning across all skill areas compared to the students’ assessments. Given that team advisors typically possess a more comprehensive viewpoint and deeper insight into the STEM subject matter, they are likely to identify and value the progress in students’ learning that the students themselves may not fully recognize or express.

Table 4. Students and Team Advisors Reported Improvements in Students’ Skills in STEM Research Methods and Tools

Response		I/they didn't learn anything new	I/they learned a little	I/they learned more than a little	I/they learned a lot	Overall Learning
How to carry out an experiment	Student	6%	15%	30%	49%	94%
	Team Advisor	23%	10%	0%	68%	78%
How to record data accurately	Student	6%	17%	31%	46%	94%
	Team Advisor	6%	15%	24%	55%	94%
How to support an explanation with my STEM knowledge or data from experiments	Student	7%	19%	36%	37%	93%
	Team Advisor	3%	12%	36%	49%	97%
How to identify the limitations of the methods and tools used for collecting data	Student	7%	24%	38%	31%	93%
	Team Advisor	6%	12%	32%	50%	94%
How to present an argument that uses data and/or findings from an experiment	Student	8%	22%	31%	38%	92%
	Team Advisor	3%	16%	38%	44%	98%
How to make a model to show how something works	Student	9%	24%	33%	34%	91%
	Team Advisor	0%	3%	45%	52%	100%
How to create charts or graphs to display data and find patterns	Student	10%	18%	35%	37%	90%
	Team Advisor	7%	19%	26%	48%	93%

Due to rounding, totals may vary.
 Student Survey (n = 355)
 Team Advisor Survey (n = 34)

4 Development of 21st Century Skills

Students demonstrated significant progress in acquiring 21st Century Skills, particularly in the realms of problem-solving, communication, and societal impact awareness. Across the board, both students and team advisors acknowledged improvements in students' abilities to tackle problems individually or in collaboration and communicate effectively and professionally. Notably, team advisors observed considerable advancements in these competencies, highlighting the students' substantial growth in areas often challenging to self-assess, such as teamwork and nuanced communication skills. Moreover, the data revealed an increased consciousness among students regarding the broader implications of their work, which underscores a developing perspective on their role within the larger community. These findings suggest that the educational experiences captured in the surveys have been instrumental in equipping students with critical skills and perspectives, which prepares them for future collaborative and impactful endeavors, particularly in STEM fields.

The surveys asked about 21st Century skills across three main domains, shown in Table 5. Results from each of these domains are described in the following sections.

Table 5. 21st Century Skills Assessed through the Evaluation

21 st Century Areas	Description
Problem-solving and collaboration	<ul style="list-style-type: none">• Solving problems individually or with a team• Working collaboratively with others• Leading and guiding others in a team
Communicating and interacting with others	<ul style="list-style-type: none">• Communicate clearly with others orally• Communicate clearly with others in writing• Interacting with others in a respectful and professional
Community and real-world connections	<ul style="list-style-type: none">• Thinking about how their work impacts the larger community

4.1 Problem Solving and Collaboration

Overall, students reported gains in their problem-solving and collaboration skills.

Specifically, they gained skills when solving problems individually or within a team (95% reported at least a “small increase”) and working collaboratively with others (93% of students). However, when it came to leading or guiding others in a group context, the reported growth slightly dropped, with 87% of students acknowledging some level of improvement in these leadership skills. See Table 6 below for the full range of responses to these items.

Table 6. Students Improved their Problem-Solving and Collaboration Skills

Response		No increase	Small increase	Medium increase	Large increase	Overall Learning
Solving problems individually or with a team	Student	3%	18%	41%	39%	97%
	Team Advisor	0%	12%	29%	59%	100%
Working collaboratively with others	Student	8%	18%	33%	42%	92%
	Team Advisor	0%	17%	29%	54%	100%
Leading and guiding others in a team or group	Student	9%	16%	36%	40%	92%
	Team Advisor	0%	24%	27%	50%	100%

Due to rounding, totals may vary.
 Student Survey (n = 358)
 Team Advisor Survey (n = 35)

eCYBERMISSION students emphasized teamwork and collaboration as pivotal 21st-century skills they developed through participation, which reflects the program’s focus on group endeavors and collaborative problem-solving, including designing, building, and testing in team settings. Furthermore, eCYBERMISSION engagement was crucial for fostering students’ critical thinking and problem-solving skills. They detailed overcoming various challenges, individually and collaboratively, from debugging software to crafting innovative solutions for engineering challenges and executing scientific experiments. These experiences solidify theoretical knowledge and advance the practical skills essential for addressing real-world scientific and technological issues.

Through real-world projects like designing safety devices and environmental solutions, students improved their STEM skills and community awareness. They learned to apply technical knowledge innovatively, collaborate on impactful solutions, and realize their projects’ significance in improving community well-being.

“*For leading others in a team, I got way better at that after our club president stopped showing up as often and I started to take her place while she was gone.*” - Student

“*Originally, my team had to scrap our idea since it had multiple solutions beforehand. We had to communicate, use creative thinking, and we had to make major decisions to decide on a better project.*” - Student

4.2 Communicating and Interacting with Others

Students markedly improved their communication skills. Specifically, an impressive 95% of students reported at least a “small increase” in their ability to communicate clearly with others orally, a skill further corroborated by team advisors. Similarly, 94% of students reported gains in their proficiency in interacting with others respectfully and professionally.

Table 7. Students Improved Various Communication Skills

Response		No increase	Small increase	Medium increase	Large increase	Overall Learning
Communicating clearly with others orally	Student	5%	16%	38%	41%	95%
	Team Advisor	0%	27%	18%	56%	100%
Interacting with others in a respectful and professional manner	Student	6%	19%	34%	41%	94%
	Team Advisor	0%	11%	40%	49%	100%

Due to rounding, totals may vary.

Student Survey (n = 351)

Team Advisor Survey (n = 35)

Participant and Team Advisor responses include those who reported “small,” “medium increase,” and “large increase.”

Students observed the improvement of communication skills through team discussions, project documentation, and presentations in competitions. This development was marked by clearer articulation of ideas, effective listening, and evidence-based argumentation. Through these activities, students learned to communicate effectively across different settings, from small group interactions to larger competitive stages.

“ *I learned to interact with others in a respectful and professional manner. My group and I had to practice our presentation skills and how to speak respectfully with the judges.* - Student

“ *One thing I noted above was that I had an increase in the skill of solving problems with a team. For example, I am now able to come up with solutions to a problem with my teammates.* - Student

“ *I learned how to involve others in decision making because everyone voted on what problem we were going to be trying to solve during eCYBERMISSION.* Student

4.3 Community and Real-World Connections

Students developed their ability to consider the broader impact of their work on the community. Almost all students noticed at least a “small increase” in their thoughtfulness regarding their work’s community impact, a clear indication of improved awareness and responsibility among students (see Table 8). Team advisors echoed this sentiment and observed some improvement, with a majority noting “medium” to “large” increases.

Table 8. Students Showed Improved Awareness of Their Work’s Impact on the Community

Response		No increase	Small increase	Medium increase	Large increase	Overall Learning
Thinking about how your work could impact the larger community	Student	6%	16%	33%	45%	94%
	Team Advisor	0%	9%	41%	50%	100%

Due to rounding, totals may vary.
Student Survey (n = 359)

Team Advisor Survey (n = 35)

Participant and Team Advisor responses include those who reported “small,” “medium increase,” and “large increase.”

Students highlighted their projects’ impact on community and environmental issues, such as creating disaster alert devices and addressing local wildlife challenges by building duck habitats. These experiences demonstrate the practical application of STEM learning to real-world problems.

“ *I noted that the work we did could impact a larger community; for example, our project was detecting toxins in oil that could help our community.* - Student

“ *The problem we are attempting to solve in our community is the duck’s problem in our school playground... We are going to use the engineering design process to build a habitat for these animals.* - Student

5 Interest in STEM and STEM Careers

The evaluation results underscore eCYBERMISSION’s impact on students’ confidence in STEM and interest in STEM-related pursuits. Both students and team advisors overwhelmingly agreed on the program’s success in boosting students’ confidence in their STEM knowledge and skills. In addition, a noteworthy percentage of students indicated a greater likelihood of participation in STEM projects, classes, and extracurricular activities in the future. Moreover, the results suggest eCYBERMISSION ignites students’ aspirations for future involvement in STEM education and career paths, with team advisors particularly noting higher interest rates among students.

5.1 STEM Confidence

Most students and team advisors reported that participation in the program significantly improved students’ STEM confidence. Both groups were asked to rate their agreement with a statement about confidence in STEM knowledge, skills, and abilities. A notable 78% of students (combining those who agree and strongly agree) affirmed an increase in their confidence, which indicates the program’s effectiveness in fostering self-assurance within STEM disciplines. Team advisors even more emphatically supported this sentiment, with a remarkable 100% acknowledging the growth in students’ confidence.

Table 9. Participation in eCYBERMISSION Increased Students’ STEM Confidence

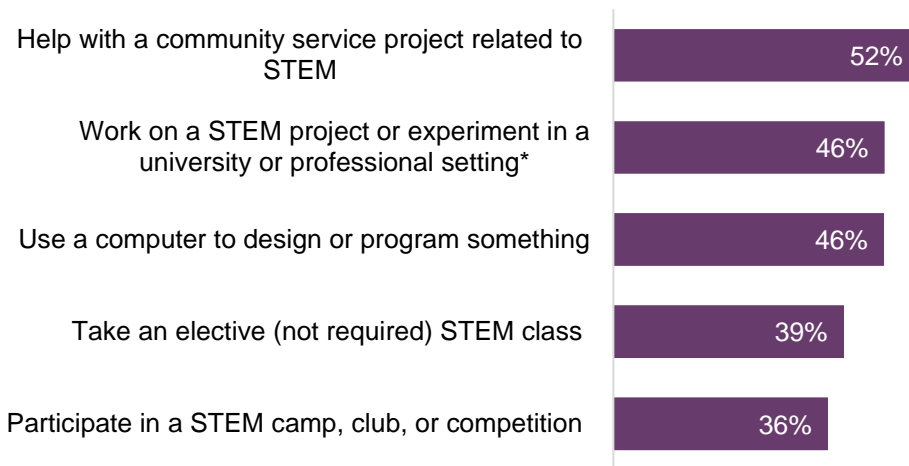
Response		Strongly Disagree	Disagree	Agree	Strongly Agree	Agree overall
I am/They are more confident in STEM knowledge, skills, and abilities	Student	7%	15%	54%	24%	78%
	Team Advisor	0%	0%	48%	52%	100%

Due to rounding, totals may not equal 100%.
 Student Survey (n = 349)
 Team Advisor Survey (n = 35)

5.2 Interest in STEM-related Activities

eCYBERMISSION positively impacts nurturing students’ continued interest in STEM activities. A significant proportion of students expressed an increased likelihood to pursue STEM-related initiatives. Specifically, three-fifths of the students said they were “more likely” or “much more likely” to help with a community service project related to STEM, indicating a 52% likelihood of further engagement in community-focused STEM activities. Similar enthusiasm was seen for more academically rigorous pursuits, with 46% of students inclined to work on a STEM project or experiment in a university or professional environment and an equal percentage showing interest in using computers for design or programming tasks. In addition, 39% of students were keen on expanding their academic horizons through elective STEM classes, while 36% were motivated to participate in extracurricular STEM camps, clubs, or competitions (Figure 1).

Figure 1. Student Had Higher Likelihood of Continued Engagement in STEM Activities Post-AEOP Experience

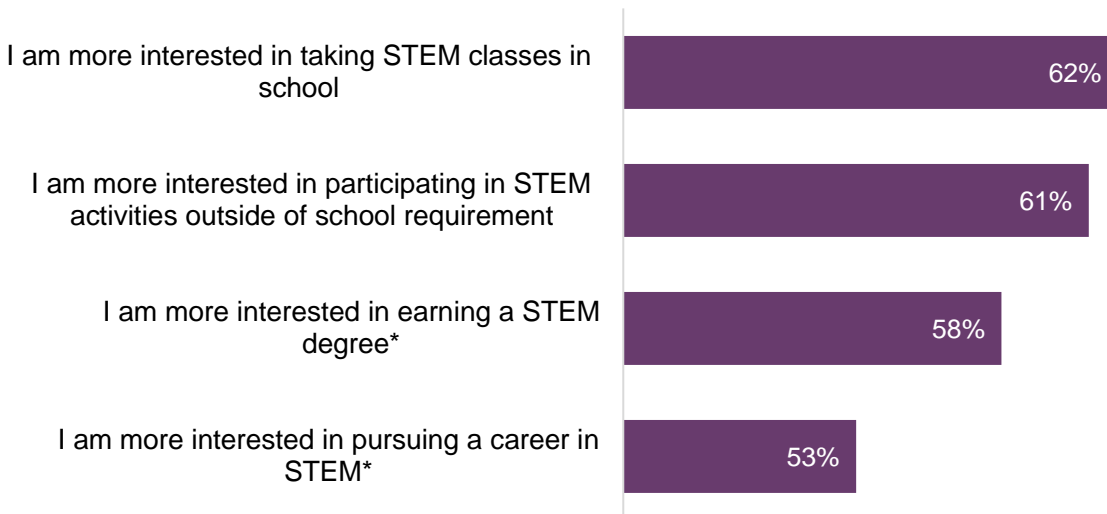


Student Survey (n = 361)
Responses include those who reported “more likely” and “much more likely.”

5.3 Interest in Pursuing STEM Education and Careers

eCYBERMISSION had a positive impact on students’ interest in STEM education and career pathways. As Figure 2 shows, on post-program surveys, the majority of students indicated that they became more interested in various STEM-related pursuits. Most students reported that they were more interested in taking STEM classes in school (62%), and in participating in STEM activities outside of school obligations (61%). Regarding future aspirations, 58% of students were more interested in earning a STEM degree and 53% were more interested in pursuing a career in STEM.

Figure 2. AEOP Had a Positive Effect on Students' Interest in STEM Education and Careers



Student Survey (n = 348)
Responses include those who reported Agree or Strongly Agree.

There is a clear pattern of improved understanding and engagement with STEM through students' involvement in eCYBERMISSION. Through hands-on projects and community-oriented problem-solving, students developed a deeper understanding of the diverse opportunities within STEM fields.

“ *eCYBERMISSION has also taught me how to work and bring solutions for our community.* - Student

“ *eCYBERMISSION has taught me a lot about STEM and how it helps the general population.* - Student

“ *It has help me better understand different STEM jobs and opportunities.*
- Student

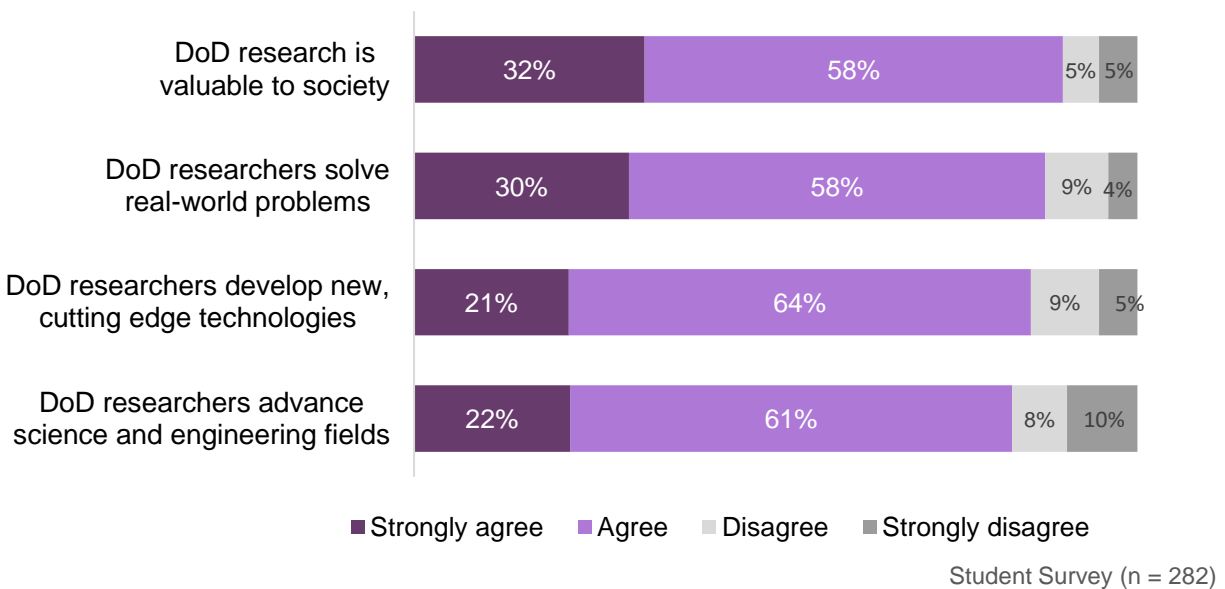
6 Perceptions of DoD

AEOP is instrumental in educating students about the significance of Department of Defense (DoD) research in addressing real-world issues. According to evaluation results, most eCYBERMISSION students recognize the value of DoD research, acknowledging its role in advancing science and engineering, developing innovative technologies, and solving practical problems. These findings underscore the potential of eCYBERMISSION to provide theoretical knowledge and foster an appreciation for the real-world impact of DoD research. In addition, participation in eCYBERMISSION encourages students' interest in pursuing STEM careers within the DoD, as reported by both team advisors and students.

6.1 Understanding of DoD Research

The survey results underscore a strong consensus among students regarding the contributions of DoD researchers to society and their fields. On the survey, eCYBERMISSION students were asked how much they agree or disagree with statements about DoD researchers and research. Most respondents affirmed that DoD research is valuable to society, with 32% strongly agreeing and 58% agreeing. Similarly, the belief that DoD researchers address real-world problems is shared by 88% of the students, which illustrates a widespread appreciation for the practical applications of their work. Regarding the development of new, cutting-edge technologies, 85% of respondents recognized the role of DoD researchers, which indicates a strong belief in their innovative capabilities. Moreover, 83% of students agreed or strongly agreed that DoD researchers advance science and engineering fields, indicating students' respect for researchers' contribution to the progress in these domains.

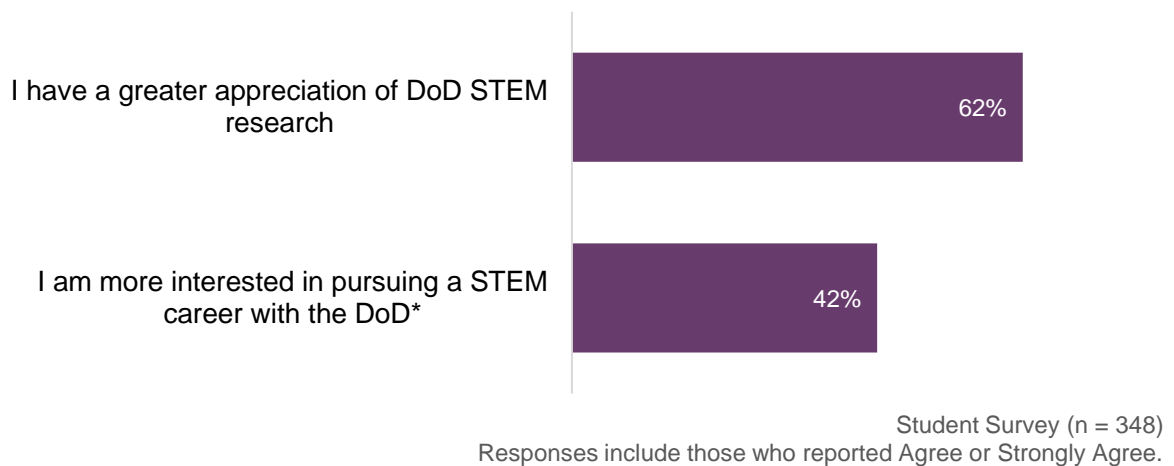
Figure 3. Students Understand that DoD Research is Important



6.2 Interest in DoD STEM Research and Careers

Participating in eCYBERMISSION substantially increased students' appreciation for and interest in pursuing careers associated with DoD STEM research. As Figure 4 shows, 62% of students reported that they developed a greater appreciation for DoD STEM research. In addition, 42% of students indicated students were more interested in pursuing a STEM career within the DoD. These findings illuminate the influential role eCYBERMISSION can play in enhancing students' understanding of the importance of DoD STEM research and inspiring them to consider rewarding careers in the field.

Figure 4. Participating in eCYBERMISSION Promotes Students' Appreciation for and Interest in DoD STEM Research and Careers



7 Impact of Team Advisors on AEOP Students

The responses from students and team advisors strongly affirm the program’s capacity to foster teamwork, improve STEM skills, and connect these skills to community betterment. An impressive 90% of students felt the program facilitated their involvement in team projects or activities, with an even more pronounced perception among team advisors at 97%. Support was also highly praised, with 86% of students satisfied with the extra assistance received, paralleling team advisors’ observation of practical guidance in practicing a variety of STEM skills at 97%. The program’s influence on understanding the role of STEM in community enhancement was recognized by 84% of students, and team advisors reported a similar impact at 94%. Skill development was noted by 82% of students, while team advisors reported application of various teaching and mentoring strategies, affirmed by 88%.

Table 10. Students and Team advisors Reported Common Strategies Used Across AEOP

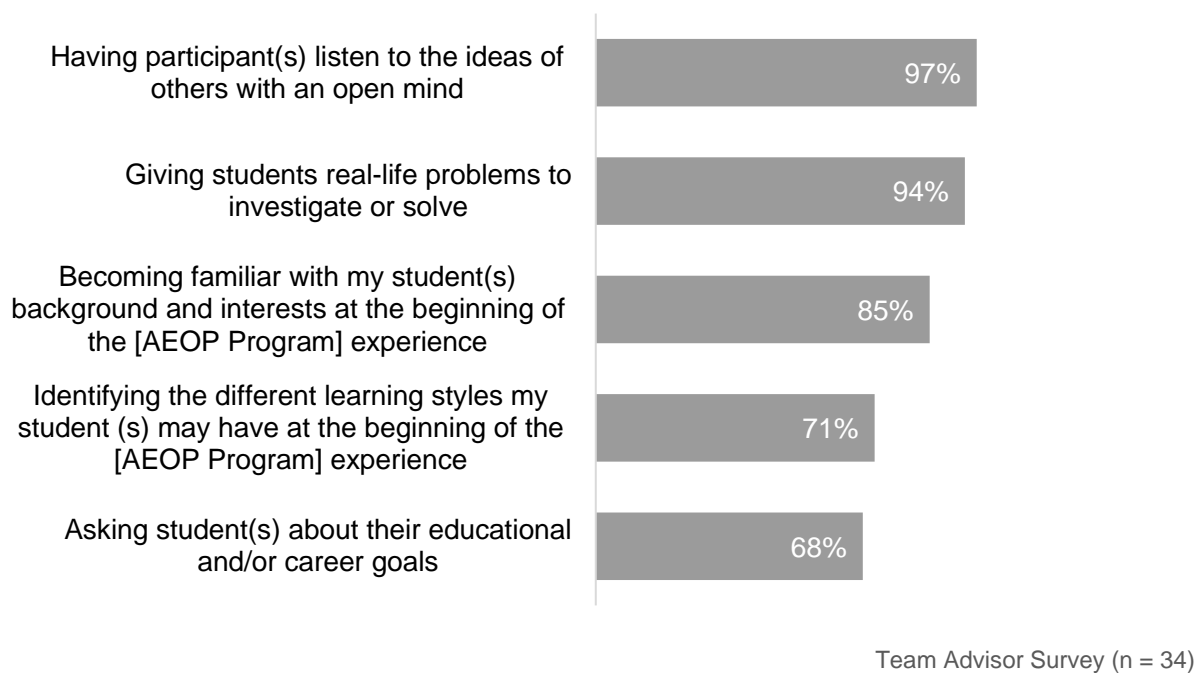
Response		
Allowed me to work on a team project or activity**	Student	90%
Allowed students to work on a team project or activity**	Team Advisor	97%
Gave me extra support when I needed it	Student	86%
Provided guidance to help students practice a variety of STEM skills *	Team Advisor	97%
Helped me understand how I can use STEM to improve my community	Student	84%
Provided additional support to students as needed	Team Advisor	94%
Helped me learn or practice a variety of STEM skills*	Student	82%
Used a variety of teaching and/or mentoring activities to meet the needs of all students**	Team Advisor	88%
Used a variety of strategies to help me learn	Student	81%
Helped students become aware of the role(s) that STEM plays in their everyday lives	Team Advisor	85%
Encouraged me to share ideas with others who have different backgrounds or viewpoints*	Student	79%
Had student(s) exchange ideas with others whose backgrounds or viewpoints are different from their own *	Team Advisor	85%
Helped me become aware of STEM in my everyday life	Student	76%
Helped students understand how STEM can help them improve their own community	Team Advisor	91%
Talked to me about the education I need for a STEM career*	Student	59%
Talked to students about the education they need for STEM careers *	Team Advisor	71%

Student Survey (n = 362)
Team Advisor Survey (n = 34)

Team advisors utilized a range of strategies to cater to the diverse needs of students.

According to the feedback provided, team advisors most frequently reported assigning students real-life problems to tackle, with a notable 94% affirming this approach. Additionally, promoting an ethos of open-mindedness was another area where team advisors excelled, with 97% encouraging students to listen to the perspectives of others. While engaging with students about their future educational and career aspirations was slightly less prevalent, a significant 68% of team advisors made it a point of mentoring. However, understanding students’ personal backgrounds and learning styles—while still acknowledged by a substantial majority—saw relatively lower reporting rates, at 85% and 71%, respectively. These findings suggest avenues for enhancing team advisor training, particularly in areas that involve understanding and integrating students’ individual experiences and preferred learning methods into the STEM education framework.

Figure 5. Team advisors Used Multiple Strategies to Meet Students’ Needs.



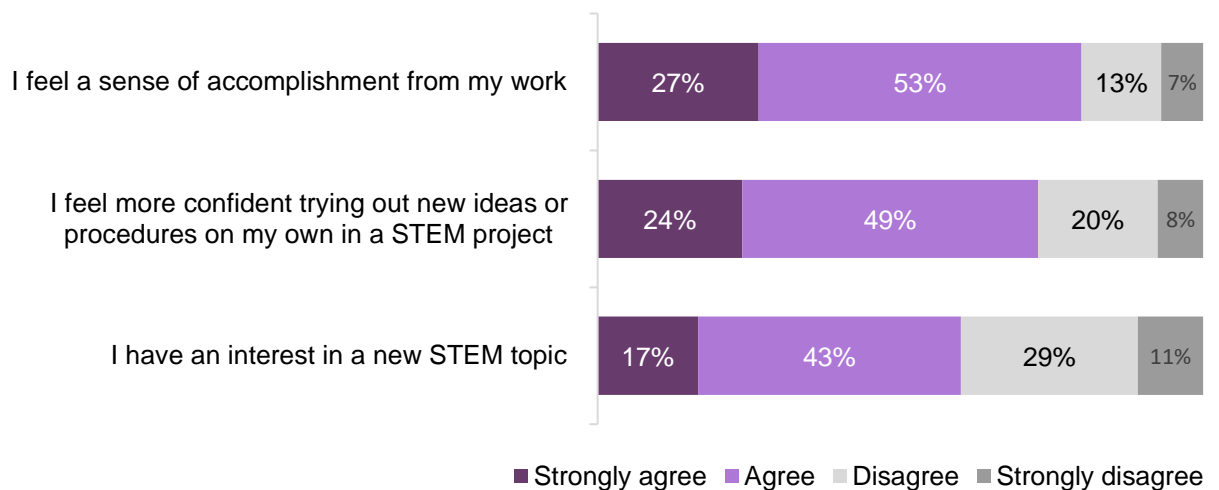
8 Overall Experience

The eCYBERMISSION program received highly positive feedback from students who expressed significant satisfaction in acquiring new STEM skills, engaging in team projects, and networking with STEM professionals. Team advisors, tasked with guiding students, noted their enthusiasm for directly engaging with students, offering hands-on learning experiences, and encouraging peer collaboration. Feedback pointed to areas for improvement, emphasizing the need for better communication. Additionally, specific calls were for a more user-friendly website interface, particularly regarding login procedures and mission folder access. Students also wanted more information on STEM careers and increased interaction with industry professionals.

8.1 Overall Impressions

Students expressed overwhelmingly positive experiences within the eCYBERMISSION program, as depicted in Figure 6. The data reveal that a substantial majority, approximately four-fifths or more, of students conveyed agreement or strong agreement with aspects of their engagement in the program. Specifically, 83% indicated they had developed an interest in a new STEM topic, 87% felt more confident in independently trying out new ideas or procedures in STEM projects, and a notable 91% experienced a sense of accomplishment from their work within AEOP.

Figure 6. Students had Positive Overall Experiences Overall



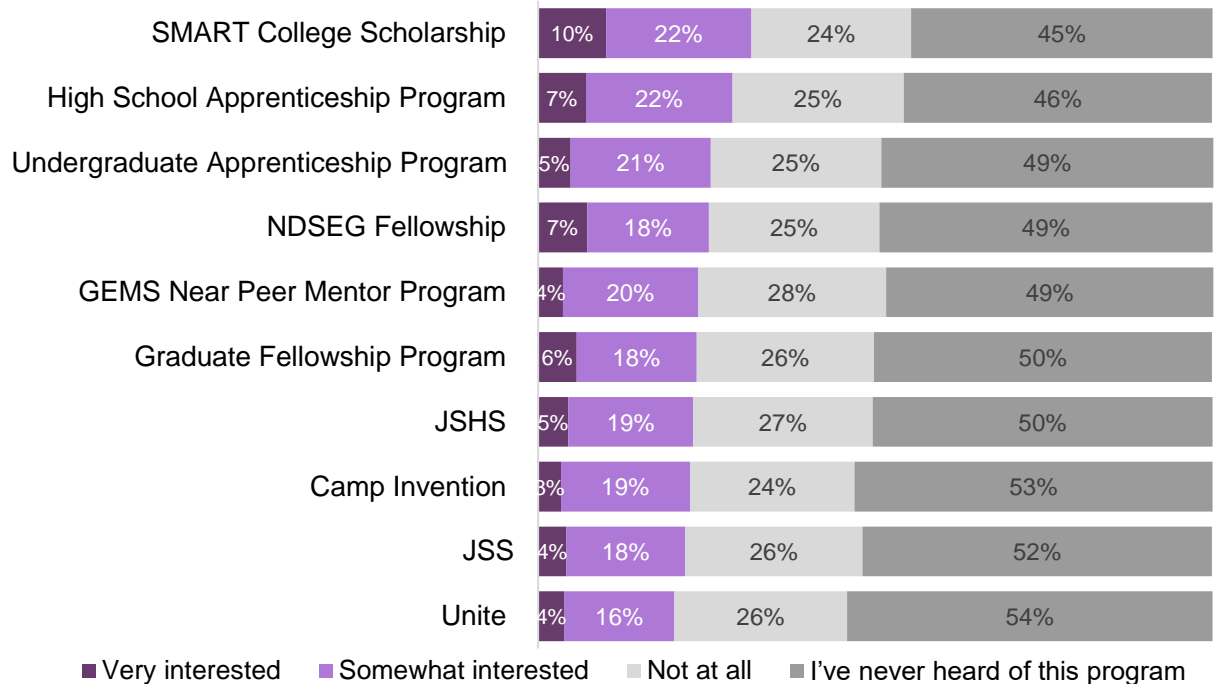
Student Survey (n = 349)

8.2 Future Interest in AEOP and Other STEM Programs

Students were interested in participating in AEOP and other STEM programs, but there is room for greater awareness of these opportunities. Between 20% to 32% of students indicated they were somewhat or very interested in participating in another program within AEOP or a similar STEM-focused initiative in the future (see Figure 7). This enthusiasm serves as a strong foundation for expanding participation within AEOP or other STEM-focused programs. While the current level of interest is high, there is a potential to increase student

familiarity with the breadth of programs available. Approximately one-half of students indicated they were not familiar with each of the programs, highlighting a valuable opportunity for enhanced outreach. This indicates a pathway for eCYBERMISSION to amplify its efforts in disseminating information about its diverse and enriching opportunities, ensuring that students can take full advantage of the programs that foster their growth in STEM fields.

Figure 7. Student Expressed Interest in AEOP and Other STEM Programs with Opportunities for Increased Awareness



Student Survey (n = 358)

8.3 Program Satisfaction

Students reported improved STEM skills and a greater interest in scientific inquiry, as evidenced by their experiences with conducting experiments and contributing to community solutions. The program not only enhanced their ability to use the scientific method, graphing, and data analysis but also fostered enjoyment and deeper engagement in STEM learning.

“ *eCYBERMISSION has also helped me learn how to conduct an experiment with others and take down the data.*” - Student

“ *eCYBERMISSION helped me learn how to correctly do an experiment and be able to help the community with it*” - Student

“ *eCYBERMISSION helped me learn how to properly conduct an eco-audit and fully carry out my experiment using the scientific method, graphing, and most importantly, analyzing data.*”
- Student

8.4 Suggestions for Improvement

8.4.1 Students' Suggestions for Improvement

The participant surveys included a question which asked, “What are two ways [this program] could be improved?” High-level findings are summarized below.⁴

Guidance on Completing Projects. Many students desired explicit instructions and direct support in navigating their projects. Requests included more detailed video tutorials, simplified website navigation, and concise, straightforward directions to help students and advisors understand and fulfill project requirements effectively.

Prototype Development. Significant interest was shown in having opportunities to incorporate prototypes into their projects. This suggests a need for more support in the form of materials, guidance on building models, and possibly workshops or sessions that focus on the practical aspects of creating and testing prototypes.

Feedback from Judges. Some students would like more comprehensive input from judges, including constructive comments that evaluate their current project, and insights and suggestions for future improvements, which would enhance their learning experience and project development skills.

⁴ The following analysis is based on student responses from the student post-program survey. This survey included all students, not just those who participated in the national competition (approximately 100 out of 7,320 students). Some student comments may reference the competition experience, even though the survey itself was designed for the broader program experience.

Time Constraints. Several students highlighted the issue of limited time for project completion and the duration of certain program activities. Suggestions included extending deadlines, allowing more time for research and development, and adjusting schedules to accommodate deeper engagement with the material and activities.

Practice and Downtime. Students requested additional structured time for practice and informal learning, indicating that they value the learning process's structured and freeform aspects. To address both needs, it is important to consider structured downtime activities that still encourage learning and creativity but in a more relaxed setting.

Social and Recreational Activities. Requests for extended excursions or increased social time highlight the importance of the social dimension of the eCYBERMISSION experience. Students appreciate the balance between academic and recreational activities, suggesting a need for more comprehensive planning that incorporates both elements.

Longer Activity Duration. Some students wanted more extended periods dedicated to specific activities. This could mean allocating more time to certain phases of the project cycle, such as research or prototype development, or extending the duration of educational and recreational activities to allow for a more immersive experience.

8.4.2 Team Advisors' Suggestions for Improvement

In response to the open-ended question, team advisors shared a multitude of valuable suggestions, indicating areas of improvement to enhance the eCYBERMISSION experience for both educators and students. The feedback ranged from practical considerations to pedagogical enhancements, all aimed at fostering a more enriching and effective learning environment.

Enhanced communication channels. Team advisors expressed a need for improved avenues of communication, emphasizing the importance of seamless interaction with students and fellow educators. This includes facilitating online participation and providing platforms for effective collaboration.

Empowering creative problem-solving. An overwhelming consensus emerged regarding the desire to nurture students' ability to creatively tackle challenges. Advisors emphasized the importance of providing opportunities for students to bring their ideas to completion, fostering a culture of innovation and problem-solving.

Community impact and engagement. The emphasis on helping the community resonated strongly among advisors. They stressed the significance of integrating projects that address real-world issues, encouraging students to actively engage with their communities and understand the broader implications of their work.

Structured program implementation. Many advisors underscored the importance of having detailed and structured programs that are easily implementable within busy educational schedules. Clear guidelines and resources were highlighted as an important component for facilitating educators' engagement with the program.

STEM skill development. A central theme in the feedback was the importance of developing STEM and communication skills among students. Advisors advocated for programs that not only improve technical competencies but also emphasize written and oral communication, preparing students for future academic and professional endeavors.

Enhanced access and ease of use. Improving ease of access to resources and ensuring the simplicity of program materials were cited as key areas for improvement. Advisors emphasized the importance of user-friendly interfaces and easily navigable content to facilitate engagement with the curriculum.

Emphasis on collaboration and teamwork. Collaboration emerged as a recurring theme, with advisors emphasizing its role in improving teamwork, leadership, and critical thinking skills among students. They highlighted the need for structured activities that promote collaborative problem-solving and encourage peer learning.

Real-world relevance and application. Advisors emphasized the value of exposing students to real-world design challenges and encouraging them to apply STEM concepts to solve tangible problems. They stressed the importance of projects that resonate with students' interests and demonstrate the practical relevance of STEM education.

Utilization of resources. Lastly, advisors expressed a need for enhanced utilization of available resources, including leveraging previous projects for inspiration and guidance. Providing comprehensive support materials and access to online repositories emerged as strategies to enrich the learning experience.

9 Recommendations

This report distills evaluation findings as they align with AEOP's overarching research questions. Data collected for this evaluation are not necessarily representative of the entire program; however, based on the results presented above, we offer the following recommendations:

Programmatic Considerations

- **Consider improving team advisor training:** This includes focusing on specialized training for team advisors, particularly in areas where student and team advisor perceptions diverge, such as STEM career education opportunities. While students and team advisors reported structured learning environments, the perception gap around career guidance suggests an area ripe for improvement. Tailored team advisor development sessions can bridge this gap, ensuring team advisors have the resources and knowledge to guide students effectively toward STEM opportunities, including careers within the DoD.
- **Consider developing a user-friendly website and digital tools:** Responses to the survey indicate the need to improve the eCYBERMISSION website's user interface and accessibility. The redesign efforts could focus on ease of use, with special attention to the login process and mission folder accessibility. These changes can create a more intuitive digital experience for students, facilitating smoother engagement with program content and resources.
- **Continue to focus on broadening STEM career exposure:** It is important to expand program content to include more comprehensive information on STEM careers, particularly highlighting roles within the DoD. This could involve leveraging existing activities (e.g., CyberGuide Evening Live Chats, Classroom Live Chats with CyberGuides, and Team Chats with CyberGuides). Such efforts can spark interest in STEM fields and provide valuable insights into the range of career opportunities available.

Evaluation Considerations

- **Consider options to increase survey response rates:** Address the challenge of low response rates in student and team advisor surveys to ensure data representativeness and reliability. Some strategies could include tailoring outreach strategies, such as personalized communications and targeted reminders. The team could also analyze response patterns to identify specific barriers to participation that can be addressed in future cycles.