Army Educational Outreach Program

Junior Solar Sprint

2014 Annual Program Evaluation Report

ARMY EDUCATIONAL OUTREACH PROGRAM

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Executive Summary

Junior Solar Sprint (JSS), managed by the Technology Student Association (TSA), is an Army Educational Outreach Program (AEOP) science, technology, engineering, and mathematics (STEM) education program where 5th-8th grade students apply scientific understanding, creativity, experimentation, and teamwork to design, build, and race solar electric vehicles. JSS activities occur nationwide, in classrooms and schools, through extracurricular clubs and student associations, and as community-based events that are independently hosted and sponsored. The AEOP's JSS programming is designed to support the instruction of STEM in categories such as alternative fuels, engineering design, and aerodynamics. Through JSS, students develop teamwork and problem-solving abilities, investigate environmental issues, gain hands-on engineering skills, and use principles of science and math to create the fastest, most interesting, and best crafted vehicle possible. Students have the opportunity to participate in JSS through TSA chapters and Army-hosted locations across the country.

This report documents the evaluation of the FY14 JSS program. The evaluation addressed questions related to program strengths and challenges, benefits to participants, and overall effectiveness in meeting AEOP and program objectives. The assessment strategy for JSS included questionnaires for students and mentors, 2 focus groups with students, 1 focus group with mentors, rapid interviews with 8 students and 10 mentors, and an annual program report compiled by TSA.

In 2014, students participated in JSS through TSA-affiliated competitions in 19 states, 3 regional Army-hosted locations, and a national competition in the Washington, D.C. area.

2014 JSS Fast Facts	
Description	STEM Competition - Solar car competition regional events at 3 Army laboratories and at 19 TSA state events, 1 national event hosted in conjunction with the TSA national conference
Participant Population	5th–8th grade students
No. of Applicants	891
No. of Students	891
Placement Rate	N/A (all students who registered were participants)
No. of Adults (Mentors and Volunteers – incl. Teachers and Army S&Es)	341
No. of Army S&Es	10
No. of Army Research Laboratories	3
No. of K-12 Schools	71
No. of K-12 Schools – Title I	31

No. of Other Collaborating Organizations	21
Total Cost	$145,535
Scholarships/Awards Cost	$6,964
Stipend Cost	$500
Administrative Cost to TSA	$138,071
Cost Per Student Participant	$163

It is important to note that the response rates for the student and mentor surveys were 9% and 5%, respectively. Thus, caution is needed when interpreting these data as the responses may not be representative of the student and mentor populations participating in the JSS program.

Summary of Findings

The FY14 evaluation of JSS 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.

2014 JSS Evaluation Findings	
Participant Profiles	
JSS has more work to do in terms of serving students of historically underrepresented and underserved populations.	• JSS has room to improve when it comes to attracting female participants—a population that is historically underrepresented and underserved in STEM fields. Student questionnaire respondents included more males (71%) than females (29%).
	• JSS had limited success in providing outreach to students from historically underrepresented and underserved races/ethnicities and low-income groups. Only a small percentage of questionnaire respondents identified as Black or African American (10%) or Hispanic or Latino (3%). Only 14% of students responding to the questionnaire reported qualifying for free or reduced-price lunch (FRL).
	• JSS served students across a range of school contexts. The vast majority of student questionnaire respondents attended public schools (97%). A third attended schools in urban or rural settings, which tend to have larger populations of students from underrepresented and underserved groups.
JSS engages a diverse group of adult participants as STEM mentors.	• In total, 341 adults, mostly teachers, were involved in JSS. Additional STEM professionals from a range of business sectors participated in career day activities at the TSA-hosted JSS sites.
Actionable Program Evaluation	

JSS uses multiple avenues to market the program.	• JSS employed multi-pronged efforts to market the program to and recruit students. These efforts included providing printed promotional materials to Army-hosted sites, the distribution of solar car kits to middle school TSA advisors and Army-hosted sites, and social media.
	• Students most frequently learned about JSS from the TSA website (72%); teachers/professors (54%); friends (28%); a school newsletter/email/website (15%); and past participants (13%).
JSS students are motivated by multiple factors.	• Students were most frequently motivated to participate in JSS by the desire to have fun (64%), because of their interest in STEM (62%), and because of teacher or professional encouragement (50%).
JSS engages students in meaningful STEM learning, through team-based and hands-on activities.	• Most students (55-59%) report communicating with other students about STEM and learning about new STEM topics on most days or every day of their JSS experience.
	• Most students had opportunities to engage in a variety of STEM practices during their JSS experience. For example, 81% reported working as part of a team, 67% building or simulating something, and 64% participating in hands-on activities on most days or every day.
	• Large proportions of mentors report using strategies to help make learning activities to students relevant, support the needs of diverse learners, develop students' collaboration and interpersonal skills, and engage students in "authentic" STEM activities.
JSS promotes DoD STEM research and careers at TSA-based sites but can improve marketing of other AEOP opportunities.	• Many mentors had a history of participating in other AEOPs besides JSS. In addition, although most students reported an increase in awareness of other AEOPs, a substantial proportion reported never hearing about any of the other programs. Mentors reported explicitly discussing only two other AEOP programs with students: eCYBERMISSION and GEMS.
	• TSA-based JSS sites offered a variety of activities for promoting STEM, including participation in STEM leadership activities and STEM breakouts at conferences. All of the three Army-based JSS sites engaged Army engineers and/or Army research facilities in their events. Two Army scientist and engineers participated in the national JSS event.
The JSS experience is greatly valued by students and mentors.	• All responding students indicated being satisfied with their JSS experience, highlighting the opportunity to learn about STEM and the chance to have fun.
	• The vast majority of responding mentors indicated having a positive experience. Further, many commented on the benefits the program provides students, including deepening their knowledge about STEM and their confidence.
Outcomes Evaluation	
JSS had positive impacts on students' STEM knowledge and competencies.	• A majority of students reported at least some gains in their knowledge of what everyday research work is like in STEM, research conducted in a STEM topic or field, a STEM topic or field in depth, how professionals work on real problems in STEM, and the research processes, ethics, and rules for conduct in STEM. Females reported greater gains in these areas than males.

	• Twenty-nine to 44% of responding students reported large or extreme gains in their abilities to do STEM, including such things as making a model that represents the key features or functions of an object, process, or system, communicating information about their investigations in different formats, applying knowledge, logic, and creativity to propose solutions that can be tested with investigations, and supporting a scientific explanation or engineering solution with relevant scientific, mathematical, and/or engineering knowledge. Female and minority students reported greater gains in these areas than males and non-minority students, respectively.
JSS had positive impacts on students' 21st Century Skills.	• A majority of students reported large or extreme gains in their 21st Century Skills, including their ability to work collaboratively with a team, sticking with a task until it is complete, and including others' perspectives when making a decision. Minority students and FRL-eligible students reported greater gains in these areas than non-minority/non-eligible students.
JSS positively impacted students' confidence and identity in STEM, as well as their interest in future STEM engagement.	• The majority of students reported a large or extreme gain in their confidence to do well in their ability to think creatively about a STEM project or activity (53%) and preparedness for more challenging STEM activities (52%). Slightly less than half reported a large or extreme gain in their sense of accomplishing something in STEM (46%), confidence to do well in future STEM courses (46%), and confidence to contribute to STEM (44%).
	• Students also reported on the likelihood that they would engage in additional STEM activities outside of school. A majority of students indicated that as a result of JSS they were more likely to tinker with mechanical or electrical devices, participate in a STEM club, association, or professional organization, take an elective STEM class, participate in a STEM camp, fair, or competition, and work on math/science puzzles.
JSS succeeded in raising students' education aspirations, though did not change their career aspirations.	• After participating in JSS, students indicated being more likely to go further in their schooling than they would have before JSS, with the greatest change being in the proportion of students who expected to continue their education beyond a Bachelor's degree (42% before JSS, 57% after).
	• Students were asked to indicate what kind of work they expected to be doing at age 30, and the data were coded as STEM-related or non-STEM-related. Although many students indicated interest in a STEM-related career, there was not a statistically significant difference from before JSS to after.
JSS students are largely unaware of AEOP initiatives, but students show substantial interest in future AEOP opportunities.	• Student were largely unaware of other AEOP initiatives, but 64% of students indicated that JSS made them more aware of other AEOPs, and 60% credited JSS with increasing their interest in participating in other programs.

JSS raised student awareness and appreciation of DoD STEM research and careers, as well as their interest in pursuing a STEM career with the DoD.	• A majority of students reported that they had a greater awareness (57%) and appreciation (53%) of DoD STEM research and careers. In addition, 53% indicated that JSS raised their interest in pursuing a STEM career with the DoD.

Recommendations

1. AEOP programs have the goal of broadening the talent pool in STEM fields, yet, overall, JSS continues to be challenged by attracting students from groups historically underrepresented and underserved in these fields. As was recommended in the 2013 evaluation report, the program may want to consider doing more to recruit students from schools serving historically underrepresented and underserved groups, and work towards increasing the likelihood that the program has a long-term impact on the number of students who pursue STEM, especially given the findings that females and minority students tended to report larger impacts of participation than males and non-minority students. As many students come to the program via state-level TSA competitions, it will be important to consider additional ways to reach out to a broader range of schools and students through both the TSA-hosted (as TSA structure allows) and Army-hosted events.

2. In order for students to progress from JSS into other AEOP programs, it will be necessary to provide opportunities for students see the connection between JSS and other AEOP programs as well as opportunities in Army/DoD STEM fields. In 2014, only a third of mentors recommended AEOPs to students that align with students' educational goals. In addition, mentors indicated explicitly discussing only two other AEOPs with students: eCYBERMISSION and GEMS. Although a recommendation was made in the 2013 report to increase students' exposure to other AEOP opportunities, no improvement was seen between 2013 and 2014. Further, although many students expressed interest in participating in other AEOP programs, a substantial proportion indicated having no interest. Given the small proportion of students who reported learning about other AEOPs from the JSS program and their mentor, and that most mentors reported never hearing about most of the AEOPs, the program may want to work with each site to ensure that all students have access to structured opportunities that both describe the other AEOPs and provide information to students on how they can apply to them. In addition, given the limited use of the AEOP website, print materials, and social media, the program should consider how these materials could be adjusted to provide students with more information and facilitate their enrollment in other AEOPs.

3. Additional efforts should be undertaken to improve participation in evaluation activities, as the low response rates for both the student and mentor questionnaires raise questions about the representativeness of the results, especially across Army-hosted regional events and TSA-hosted regional events. Further, most of the respondents (73 of 78 students and 14 of 16 mentors) to the FY14 survey participated in the JSS national event at the National

TSA conference. Improved communication with the individual program sites about expectations for the evaluation may help. In addition, the evaluation instruments may need to be streamlined as perceived response burden can affect participation. In particular, consideration should be given to whether the parallel nature of the student and mentor questionnaires is necessary, with items being asked only of the most appropriate data source.

4. A number of students suggested the JSS program could be improved by clarifying rules and adding more guidance. Mentors also expressed a need for more resources to help students. To help ensure a high-quality experience across sites, the program should continue to clarify the existing rules and making them easier to interpret. In addition, participants would welcome additional resources, such as pictures/videos of cars from previous years' competitions to get a sense of the wide range of possibilities for a car's design. An easy-to-locate schedule for each event and stricter adherence to the schedule would also be appreciated.

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 them 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 Goals

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, Junior Solar Sprint (JSS). JSS is administered on behalf of the Army by the Technology Student Association (TSA). The evaluation study was performed by Virginia Tech, the Lead Organization (LO) in the AEOP CA consortium. Data analyses and reports were prepared in collaboration with Horizon Research, Inc.

Program Overview

JSS is a STEM education activity where 5th- 8th grade students apply scientific understanding, creativity, experimentation, and teamwork to design, build, and race a model solar car. JSS activities occur nationwide, in classrooms and schools, through extracurricular clubs and student associations, and as community-based events that are independently hosted and sponsored. The AEOP's investment in JSS-based programming is managed by TSA. The AEOP's JSS programming is designed to support the instruction of STEM in categories such as alternative fuels, engineering design, and aerodynamics. Through JSS, students develop teamwork and problem-solving abilities, investigate environmental issues, gain hands-on engineering skills, and use principles of science and math to create the fastest, most interesting, and best crafted vehicle possible.

Based on direction it received from the Army, TSA revised the original program plan in 2014 and focused on JSS competitions taking place in the TSA community at state competitions and at Army-hosted locations. TSA provided resources and support to TSA and Army locations rather than focusing resources on "at-large" regional competitions.

In 2014, students participated in JSS through TSA-affiliated competitions in 19 states, 3 regional Army-hosted locations, and a national competition in the Washington, D.C. area. In 2014, the AEOP's contributions to JSS programming were guided by the following priorities:

1. Create a national infrastructure to manage local, regional, and national JSS events and increase participation;
2. Enhance training opportunities and resources for teachers/mentors;
3. Coordinate tracking and evaluation opportunities for student and teacher participation in JSS; and
4. Leverage AEOP through cross-program marketing efforts.

Participation in JSS was substantially higher in 2014 than in 2013. In 2014, 891 students participated, an increase in enrollment of 156% over the 348 students estimated to have participated in 2013. Table 1 summarizes 2014 enrollment by site.

Table 1. 2014 JSS Site Enrollment Numbers	
2014 JSS Site	**No. of Enrolled Students**
National TSA Conference (Washington, DC) - June 27th through July 1st, 2014	225
U.S. Army Research Laboratory (ARL) at Aberdeen Proving Ground (Aberdeen, MD) - June 7th, 2014	21
U.S. Armament Research, Development, and Engineering Center (ARDEC) at Picatinny Arsenal (New Jersey) - May 19th, 2014	48
U.S. Army Aviation and Missile Research Development and Engineering Center (AMRDEC) at Redstone Arsenal (Huntsville, AL) - May 17th, 2014	14
Alabama TSA state JSS competition	70
Colorado TSA state JSS competition	40
Florida TSA state JSS competition	63
Georgia TSA state JSS competition	33
Iowa TSA state JSS competition	35
Kentucky TSA state JSS competition	3
Mississippi TSA state JSS competition	36
Missouri TSA state JSS competition	6
New Hampshire TSA state JSS competition	26
New Jersey TSA state JSS competition	20
North Carolina TSA state JSS competition	23
Oklahoma TSA state JSS competition	40
Pennsylvania TSA state JSS competition	30
Tennessee TSA state JSS competition	10
Texas TSA state JSS competition	5
Utah TSA state JSS competition	25
Virginia TSA state JSS competition	98
Washington TSA state JSS competition	10
West Virginia TSA state JSS competition	10
TOTAL	**891**

JSS programs also engaged 341 adult participants in day-to-day program activities, including teachers, chaperones, and 10 Army Scientists and Engineers (S&Es) who supported students as they prepared for or participated in a JSS event and played important roles as "mentors" to JSS students (see Table 2). Mentor enrollment numbers in 2014 were also higher than in 2013, when there were 80 teachers, 21 event hosts, and 19 volunteers.

Table 2. 2014 JSS Participation	
JSS Site	**Teachers/Adults**
National TSA Conference	14
ARL at APG	6
ARDEC at Picatinny	13
AMRDEC	6
State TSA JSS Competitions	302
TOTAL	**341**

The total cost of the 2014 JSS program was $145,535. The average cost per participant was $163. Table 3 summarizes these and other 2014 JSS program costs.

Table 3. 2014 JSS Program Costs	
2014 JSS - Cost Per Participant	
Total Participants	891
Total Cost	$145,535
Cost Per Participant	**$163**
2014 JSS - Cost Breakdown	
Average Administrative Cost to TSA	$138,071
Total Scholarships/Awards (15) Cost	$6,964
Total Stipend Cost	$500
Total Cost	**$145,535**

Evidence-Based Program Change

The AEOP funds programs that are tasked with achieving three broad priorities: (1) STEM Literate Citizenry – Broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industry Base; (2) STEM Savvy Educators – Support and empower educators with unique Army research and technology resources; and (3) Sustainable Infrastructure – Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army. TSA initiated the following program changes/additions to the FY14 administration of the JSS program in light of programmatic recommendations from the Army, the FY13 JSS evaluation study, and site visits conducted by TSA and the Army, and Virginia Tech:

I. **STEM Literate Citizenry** – ***Broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industry Base.***

a. Revised program plan per Army guidance directing TSA to bring JSS to both TSA and Army-hosted events. This change would allow the AEOP to take advantage of the network of students who are already engaged with STEM through TSA as well as introduce the competition to communities surrounding Army labs.
b. Provided marketing materials and support to Army-hosted sites
c. Promotion of JSS on social media before and after national JSS competition
d. Facilitated distribution of solar car kits to middle school TSA advisors and Army-hosted sites
e. State JSS competitions held at state TSA conferences and at the national TSA conference

II. STEM Savvy Educators – Support and empower educators with unique Army research and technology resources.

a. Addition of Next Generation Science Standards (NGSS) and Common Core State Standards (CCSS) to JSS website and alignment of JSS program with both NGSS and CCSS
b. TSA represented JSS and AEOP at four teacher/industry conferences
c. Heavily marketed JSS competition to 800 middle school TSA advisors (teachers)
d. Distributed AEOP-branded items to 1000+ TSA teachers at national event

III. Sustainable Infrastructure – *Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army*.

a. Hosted first national AEOP-sponsored JSS competition at the TSA national conference
b. Race day banners, trophies, and other AEOP materials provided to Army-hosted sites
c. JSS training and two special interest sessions were provided at national TSA conference for those interested in JSS and other AEOP programs
d. With the VT, administered post-event AEOP evaluation surveys, interviews, and focus groups with JSS adult and youth participants at Army and national JSS competitions

FY14 Evaluation At-A-Glance

Virginia Tech, in collaboration with TSA, conducted a developmental evaluation study of the AEOP's JSS program. The logic model below presents a summary of the expected outputs and outcomes for the JSS program in relation to the AEOP and JSS-specific priorities. This logic model provided guidance for the overall JSS evaluation strategy.

Inputs	Activities	Outputs	Outcomes (Short term)	Impact (Long Term)
• Army sponsorship • TSA providing —capacity to establish national network of JSS participants —online JSS educational and event resources —national JSS competition • JSS Participants, inclusive of local event hosts, educators, and students seeking resources and event information • Awards for student winner(s) of national JSS competition • Centralized branding and comprehensive marketing of AEOP • Centralized evaluation	• Event hosts, educators, and students access and use JSS educational and event resources • Students build, test, and register solar car in state, Army, and national JSS competitions • TSA-selected judges evaluate solar cars at JSS competitions and select winner(s) • Program activities that expose students to AEOP programs and/or STEM careers in the Army or DoD	• Number of event hosts, educators, and students using online JSS educational and event resources • Number and diversity of students participating in national JSS competition • Number of and Title 1 status of schools served through event host, educator, or student engagement • Event hosts, educators, students, others, and TSA contributing to evaluation	• Increased student knowledge, skills and abilities, and confidence in STEM • Increased student interest in future STEM engagement • Increased "participant" awareness of and interest in other AEOP opportunities • Increased "participant" awareness of and interest in Army/DoD STEM research and careers • Implementation of evidence-based recommendations to improve TSA's JSS offerings	• Increased "participant" engagement in other AEOP opportunities and Army/DoD-sponsored 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 JSS

The JSS evaluation gathered information from multiple participant groups about JSS 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 JSS program objectives.

Key Evaluation Questions

- What aspects of JSS programs motivate participation?
- What aspects of JSS program structure and processes are working well?
- What aspects of JSS programs could be improved?
- Did participation in JSS programs:
  - Increase students' STEM competencies?
  - Increase students' positive attitudes toward STEM?
  - Increase students' interest in future STEM learning?
  - Increase students' awareness of and interest in other AEOP opportunities?
  - Increase students' awareness of and interest in Armv/DoD STEM careers?

The assessment strategy for JSS included student and mentor questionnaires, 2 focus groups with students, 1 focus group with mentors, rapid interviews with eight students, rapid interviews with 10 mentors, and an Annual Program Report

(APR) prepared by TSA using data from all JSS sites. Tables 4-10 outline the information collected in student and instructor questionnaires, focus groups and rapid interviews, as well as information from the APR that is relevant to this evaluation report.

Table 4. 2014 Student Questionnaires	
Category	**Description**
Profile	**Demographics:** Participant gender, grade level, race/ethnicity, and socioeconomic status indicators
	Education Intentions: Degree level, confidence to achieve educational goals, field sought
AEOP Goal 1	**Capturing the Student Experience:** In-school vs. in-program experience
	STEM Competencies: Gains in knowledge of STEM, science & engineering practices; contribution of AEOP
	Transferrable Competencies: Gains in 21st Century Skills
	STEM Identity: Gains in STEM identity, intentions to participate in STEM, and STEM-oriented education and career aspirations; contribution of AEOP
	AEOP Opportunities: Past participation, awareness of, and interest in participating in other AEOP programs; contribution of AEOP, impact of AEOP resources
	Army/DoD STEM: Exposure to Army/DoD STEM jobs, attitudes toward Army/DoD STEM research and careers, change in interest for STEM and Army/DoD STEM jobs; contribution of AEOP, impact of AEOP resources
AEOP Goal 2 and 3	**Mentor Capacity:** Perceptions of mentor/teaching strategies (students respond to a subset)
	Comprehensive Marketing Strategy: How students learn about AEOP, motivating factors for participation, impact of AEOP resources on awareness of AEOPs and Army/DoD STEM research and careers
	Program Specific Online Resources: Usefulness of online resources for participating in AEOP
Satisfaction & Suggestions	Benefits to participants, suggestions for improving programs, overall satisfaction

Table 5. 2014 Mentor Questionnaires	
Category	**Description**
Profile	**Demographics:** Participant gender, race/ethnicity, occupation, past participation
Satisfaction & Suggestions	Awareness of JSS, motivating factors for participation, satisfaction with and suggestions for improving JSS programs, benefits to participants
AEOP Goal 1	**Capturing the Student Experience:** In-program experience
	STEM Competencies: Gains in knowledge of STEM, science & engineering practices; contribution of AEOP
	Transferrable Competencies: Gains in 21st Century Skills
	AEOP Opportunities: Past participation, awareness of other AEOP programs; efforts to expose students to AEOPs, impact of AEOP resources on efforts; contribution of AEOP in changing student AEOP metrics
	Army/DoD STEM: Attitudes toward Army/DoD STEM research and careers, 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:** Perceptions of mentor/teaching strategies
	Comprehensive Marketing Strategy: How mentors learn about AEOP, usefulness of AEOP resources on awareness of AEOPs and Army/DoD STEM research and careers
	Program Specific Online Resources: Usefulness of online resources for supporting students in participating in AEOP

Table 6. 2014 Student Focus Groups	
Category	**Description**
Profile	Gender, race/ethnicity, grade level, past participation in JSS, past participation in other AEOP programs
Satisfaction & Suggestions	Awareness of JSS, motivating factors for participation, interest in participating in other STEM programs, satisfaction with and suggestions for improving JSS 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 knew JSS was sponsored by the Army, extent to which students were exposed to STEM and Army/DoD STEM jobs

Table 7. 2014 Mentor Focus Groups	
Category	**Description**
Profile	Gender, race/ethnicity, occupation, organization, role in JSS, past participation in JSS, past participation in other AEOP programs
Satisfaction & Suggestions	Perceived value of JSS, benefits to participants, suggestions for improving JSS 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 JSS

Table 8. 2014 Student Rapid Interviews	
Category	**Description**
Profile	Role in JSS, gender, race/ethnicity
Satisfaction & Suggestions	Extent to which student would recommend JSS, suggestions for improvement

Table 9. 2014 Mentor Rapid Interviews	
Category	**Description**
Profile	Role in JSS, gender, race/ethnicity
Satisfaction & Suggestions	Extent to which mentor would recommend JSS, suggestions for improvement

Table 10. 2014 Annual Program Report	
Category	**Description**
Program	Description of program, activities, academic level (grades 5 through 8), STEM tie-in, and benefits of participation
AEOP Goal 1 and 2 Program Efforts	**Partnering with Teachers and Schools –** Mechanisms for marketing to and recruitment of students
	Army STEM: AEOP Opportunities – Marketing other AEOP programs
	Mentor Capacity: Local Educators – Steps to enhance training opportunities and resources

Detailed information about methods and instrumentation, sampling and data collection, and analysis are described in Appendix A, the evaluation plan. 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. Questionnaires and respective data summaries are provided in Appendix B (student) and Appendix C (mentor). Focus group protocols are provided in Appendix D (students) and Appendix E (mentors); the APR template is located in Appendix F. Major trends in data and analyses are reported herein.

Study Sample

Students from the three Army-hosted JSS event and the national JSS event responded to questionnaires, as did mentors from 3 of the 4 events. Table 11 shows the number of student and mentor (including teacher, event host, and volunteer) respondents by site.

Table 11. 2014 JSS Event Survey Respondent Numbers

2014 JSS Event	Students		Mentors	
	No. of Participants	No. of Survey Respondents	No. of Participants	No. of Survey Respondents
National TSA Conference	225	73	14	14
ARL at APG	21	3	6	1
ARDEC at Picatinny	48	2	13	0
AMRDEC	14	1	6	1
State TSA JSS Competitions	583	0	302	1
Unspecified†		2		
TOTAL	**891**	**78‡**	**341**	**16‡**

† Two students did not indicate which JSS event they attended.

‡ Survey respondents were allowed to select more than one event; thus, the sum of respondents across sites is greater than the total number of survey respondents.

Table 12 provides an analysis of student and mentor participation in the JSS questionnaires, the response rate, and the margin of error at the 95% confidence level (a measure of how representative the sample is of the population). The margin of error for both the student and mentor surveys is larger than generally acceptable, indicating that the samples may not be representative of their respective populations. Note that the mentor response rate is a bit lower than in 2013 (which had a response rate of 13%). There was no student survey in 2013, but with a student response rate of 9%, there is much room for improvement.

Table 12. 2014 JSS Questionnaire Participation

Participant Group	Respondents (Sample)	Total Participants (Population)	Participation Rate	Margin of Error @ 95% Confidence[1]
Students	78	891	9%	±10.6%
Mentors	16	341	5%	±24.0%

[1] "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 you had asked the question to 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.

Two student focus groups were conducted that included 8 students (2 females, 6 males), 7 of whom were rising 9th graders (one student was a rising 6th grader). A series of student rapid interviews was also conducted that included eight students (3 females, 5 males). One mentor focus group and a series of rapid interviews were also conducted. The mentor focus group included one male teacher. The rapid interviews sampled 10 adults (4 females, 6 males), including 5 event staff/Army scientists and engineers, 3 parents, and 2 community group leaders. Focus groups were not intended to yield generalizable findings; rather they were intended to provide additional evidence of, explanation for, or illustrations of student questionnaire data. They add to the overall narrative of JSS' efforts and impact, and highlight areas for future exploration in programming and evaluation.

Respondent Profiles

Student Demographics

Demographic information collected from JSS questionnaire respondents is summarized in Table 13.[2] More males (71%) than females (29%) completed the questionnaire. More responding students identified with the race/ethnicity category of White (69%) than any other single race/ethnicity category. Half were 8th graders; the remaining students who answered this item were mostly 7th or 9th graders (the national JSS event takes place during the summer, so students who identified as 9th grade had begun the JSS season in their 8th grade year). Seventy-eight percent of respondents reported not qualifying for FRL. As can be seen in Table 14, almost all respondents attended public schools (97%); most attended schools in suburban areas (66%). (The APR does not contain population demographic data to allow for comparison between survey respondents and the population.)

In summary, JSS could be more successful in attracting participation from female students—a population that is historically underrepresented and underserved in many STEM fields. JSS also has room to improve when it comes to providing outreach to students from historically underrepresented and underserved race/ethnicity and low-income groups. Because representation at the JSS national event reflects participation at the TSA state-level events, it would likely be beneficial for JSS to encourage TSA sites to recruit students who regularly attend school in urban, rural, or frontier settings, which historically have lower or limited resources than suburban schools.

[2] In FY15 the AEOP developed and implemented a new application tool through the vendor, Cvent. This centralized tool will facilitate accurate and improved collection of demographic information from participants across the portfolio of AEOP initiatives.

Table 13. 2014 JSS Student Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 78)		
Female	23	29%
Male	55	71%
Respondent Race/Ethnicity (n = 78)		
Asian	8	10%
Black or African American	8	10%
Hispanic or Latino	2	3%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	54	69%
Other race or ethnicity, (specify):†	5	6%
Choose not to report	1	1%
Respondent Grade Level (n = 78)		
6th	1	1%
7th	13	17%
8th	38	49%
9th‡	26	33%
Respondent Eligible for FRL (n = 78)		
Yes	11	14%
No	61	78%
Choose not to report	6	8%

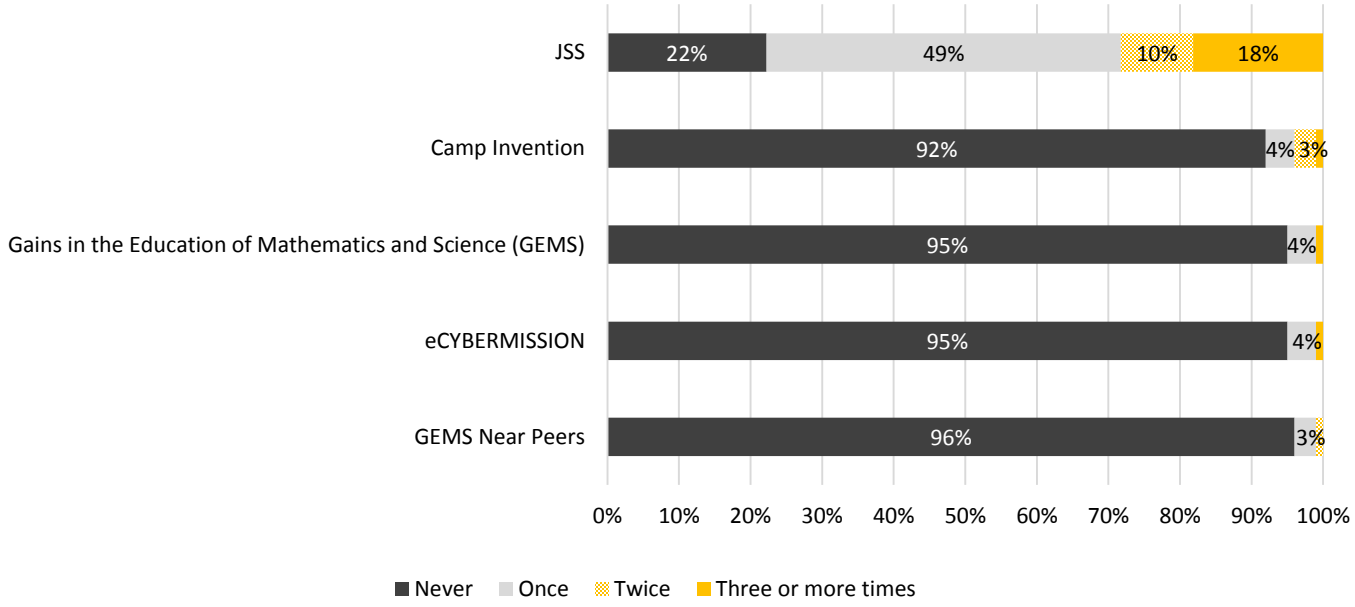
† Other = "Greek," "Asian + White," "Arab," "Jewish," and "Human."

‡ Students who indicated being in the 9th grade started their participation in JSS during their 8th grade year. JSS is a program for 5th through 8th graders.

Table 14. 2014 JSS Student Respondent School Information		
Demographic Category	**Questionnaire Respondents**	
Respondent School Location (n = 77)		
Suburban	51	66%
Urban (city)	17	22%
Rural (country)	9	12%
Frontier or tribal school	0	0%
Respondent School Type (n = 77)		
Public school	75	97%
Private school	2	3%

In addition, students were asked how many times they participated in each of the AEOP programs. As can be seen in Chart 1, 77% of responding students reported participating in JSS at least once. Few students (13% or less) reported participating in any of the other AEOP programs.

Chart 1: Student Participation in AEOP Programs (n = 76-77)



Mentor Demographics

The 2014 Mentor Questionnaire collected more extensive demographic information on the mentors than past years, which are summarized in Table 15. Slightly more responding mentors were male than female (56% vs. 44%). Similar to the responding students, over two-thirds of the responding mentors identified themselves as White (69%). The vast majority of mentors were teachers. In the JSS program, the majority of responding mentors served as competition advisors (81%); 13% served as chaperones. Additional characteristics of the mentors are included in Appendix C.

Table 15. 2014 JSS Mentor Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 16)		
Female	7	44%
Male	9	56%
Respondent Race/Ethnicity (n = 16)		
Asian	0	0%
Black or African American	2	13%
Hispanic or Latino	1	6%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	11	69%
Other race or ethnicity, (specify):[†]	1	6%
Choose not to report	1	6%
Respondent Occupation (n = 16)		
Teacher	14	88%
Other, (specify):[‡]	2	13%
Respondent Role in JSS (n = 16)		
Competition advisor	13	81%
Chaperone	2	13%
Event coordinator or staff	0	0%
Other, (specify)[§]	1	6%

[†] Other = "Black/White."
[‡] Other = "retired RN stem club volunteer" and "Parent."
[§] Other = "STEM club volunteer."

Actionable Program Evaluation

Actionable Program Evaluation is intended to provide assessment and evaluation of program processes, resources, and activities for the purpose of recommending improvements as the program moves forward. This section highlights information outlined in the Satisfaction & Suggestions sections of Tables 4-10.

A focus of the Actionable Program Evaluation is efforts toward the long-term goal of JSS 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. Outreach to underrepresented and underserved populations may not be a key objective of JSS hosts and educators nationwide, but it is an Army priority across AEOPs. Thus, it is important to consider how JSS is marketed to and ultimately recruits student participants, the factors that motivate students to participate in JSS, participants' perceptions of and satisfaction with

activities, what value participants place on program activities, and what recommendations participants have for program improvement. The following sections report perceptions of students and mentors that pertain to current programmatic efforts and recommend evidence-based improvements to help JSS achieve outcomes related to AEOP programs and objectives, specifically, to help JSS contribute to expand participation from and support STEM education for students from underrepresented and underserved groups.

Marketing to and Recruiting Underrepresented and Underserved Populations

The JSS program employed multi-pronged efforts to market events to students, though not necessarily students from schools identified as serving large populations of traditionally underrepresented and underserved students. JSS marketed its program in a variety of ways:

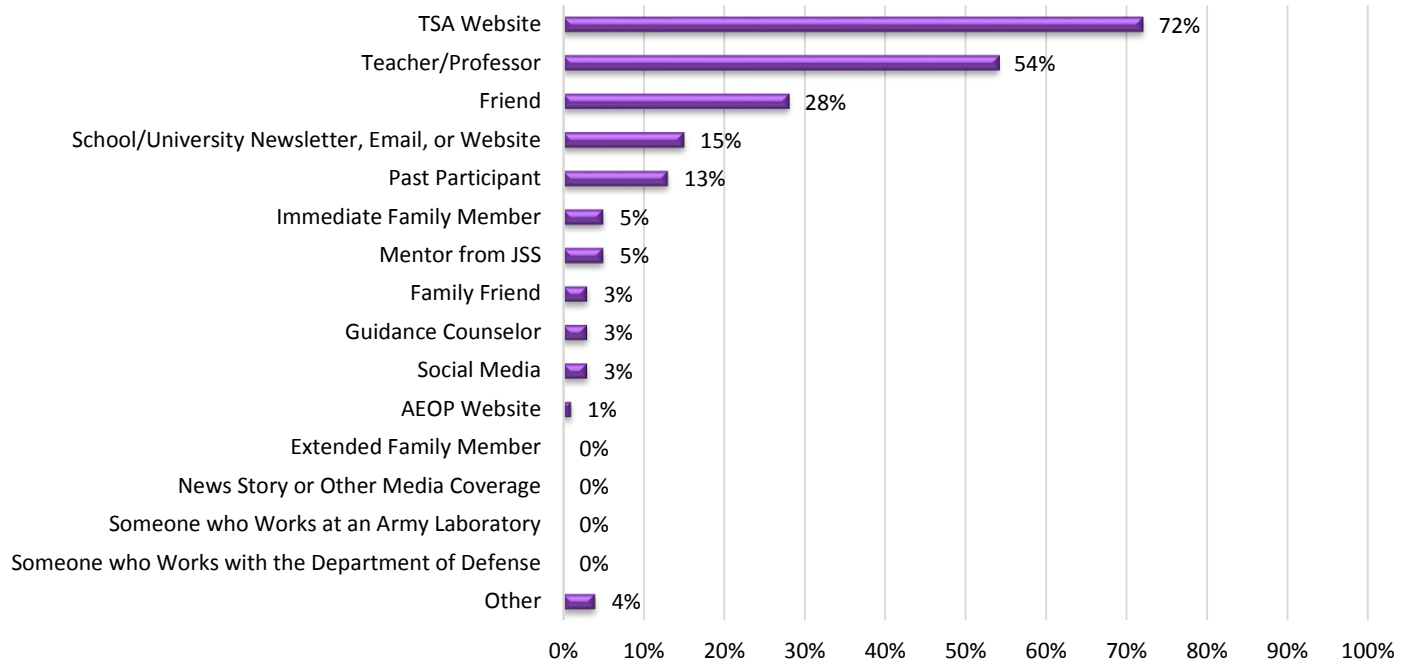
- Provided marketing materials and support to Army-hosted sites;
- Facilitated distribution of solar car kits to middle school TSA advisors and Army-hosted sites; and
- Used social media, including 2 news releases, 42 tweets, and 24 Facebook posts.

In order to understand which recruitment methods are most effective, the questionnaire asked students to select all of the different ways they heard about JSS. Chart 2 summarizes students' responses. The most frequently mentioned source of information the JSS program was the TSA website (72%). Other sources mentioned relatively frequently were teachers or professors (54%), friends (28%), a school newsletter/email/website (15%) and past participants (13%). The "Other" category included references to an advisor (n = 2) and a student's local TSA group.

These data were analyzed by student sub-groups to determine if different groups of youth learned about the JSS program in a different matter. The analyses examined gender, race/ethnicity (minority vs. non-minority students), FRL status, and school location (urban or rural vs. suburban location).[3] No meaningful differences were found among student sub-groups in how they learned about JSS by any of these factors. Taken together, these findings suggest that the multi-pronged approach is helpful in student recruitment for students from all sub-groups.

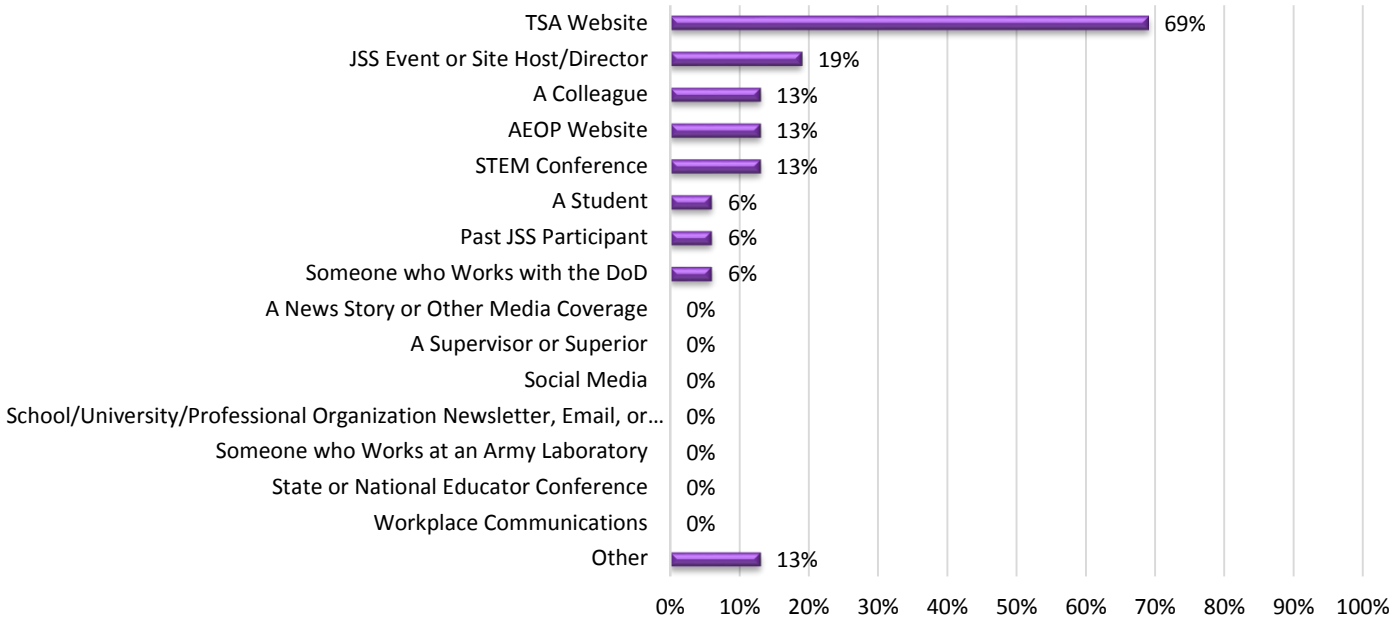
[3] Item-level tests were conducted without a Type I error control, increasing the possibility of false positives (i.e., detecting a significant difference when no difference truly exists).

Chart 2: How Students Learned about JSS (n = 77)



Mentors were also asked how they learned about JSS (see Chart 3). The majority of responding mentors learned about JSS through the TSA website (69%). A JSS event or site host/director (19%), a colleague (13%), the AEOP website (13%), and a STEM conference (13%) were also relatively frequently identified.

Chart 3: How Mentors Learned about JSS (n = 16)



To examine whether mentors are expanding their participation in AEOP programs, the questionnaire asked how many times they participated in each of the AEOP programs. All responding mentors indicated participating in JSS at least once. A few indicated prior participation in GEMS (19%), eCYBERMISSION (12%), and Camp Invention (12%). Mentors did not indicate participating in any other AEOP program. In addition, the majority indicated never hearing about the following programs: HSAP (69%), NDSEG (69%), REAP (69%), SMART (69%), URAP (69%), CQL (63%), JSHS (63%) and SEAP (56%).

Factors Motivating Student Participation

Student questionnaires and focus groups included questions to explore what motivated students to participate in JSS. Specifically, the questionnaire asked how motivating a number of factors were in their decision to participate. As can be seen in Table 16, more than 6 in 10 responding students indicated that having fun (64%) and an interest in STEM (64%) were "very much" motivating. Half of the students reported teacher or professor encouragement as a strong motivator, 44% the desire to learn something new or interesting and 35% the opportunity to do something with friends. The other factors asked about were not seen as very motivating to most students.

Table 16. Factors Motivating Students "Very Much" to Participate in JSS (n = 76-78)	
Item	**Questionnaire Respondents**
Having fun	64%
Interest in STEM	64%
Teacher or professor encouragement	50%
Desire to learn something new or interesting	44%
Opportunity to do something with friends	35%
Learning in ways that are not possible in school	29%
Parent encouragement	26%
Exploring a unique work environment	23%
Opportunity to use advanced laboratory technology	22%
Building college application or résumé	21%
Desire to expand laboratory or research skills	18%
The program mentor(s)	18%
Networking opportunities	13%
Serving the community or country	10%
Interest in STEM careers with the Army	9%
An academic requirement or school grade	8%
Earning stipend or award while doing STEM	5%

Having fun and teacher encouragement were also mentioned in the student focus groups. As four students said when asked why they chose to participate in JSS:

> *I think it sounded fun. Racing the car and building it from the little kit.* (JSS Student)

> *My advisor [name] usually does this as a class project, the class does it and goes and competes. But his class time was cut short this year and he didn't do it in class, but suggested that we do it in TSA. So we did it at the state conference and got first place in speed and decided to do it here.* (JSS Student)

> *I heard about it from a teacher, it looked like fun. You get to go to Washington if you win…we thought it was a fun family thing.* (JSS Student)

For each item in Table 16, differences between females and males, minority students and non-minority students, FRL-eligible students and non-FRL-eligible students, and students attending schools in underrepresented and underserved locations and students attending suburban schools were tested to identify whether different factors were more or less motivating for different student groups. Overall, there were several significant differences. Females were substantially

more likely than males to indicate being motivated by their desire to learn something interesting/new[4] (a relatively large effect size[5] of *d* = 0.757 standard deviations), their desire to explore a unique work environment[6] (*d* = 0.582 standard deviations), and parental encouragement[7] (*d* = 0.542 standard deviations). Minority students were more likely than non-minority students to indicate being motivated by 11 out of the 17 items in Table 16. The most substantial differences were between minority and non-minority students' desire to explore a unique work environment[8] (a very large effect of *d* = 1.700 standard deviations), interest in Army STEM careers[9] (a large effect of *d* = 1.174 standard deviations), and appeal of the opportunity to use advanced laboratory technology[10] (a large effect of *d* = 1.127 standard deviations).

Students eligible for FRL were more much more likely than those not eligible for FRL to be motivated by several factors, including parental encouragement[11] (*d* = 1.007 standard deviations), the opportunity to use advanced laboratory technology[12] (*d* = 0.851 standard deviations), the opportunity to have fun[13] (*d* = 0.808 standard deviations), and networking opportunities[14] (*d* = 0.777 standard deviations). There were no significant differences by school location.

The JSS Experience

The student questionnaire included several items asking about the nature of students' experience in JSS, and how that experience compared to their STEM learning opportunities in school. When asked what field their JSS experience focused on, 64% of responding students selected engineering, 21% technology, 9% science, and 6% mathematics. Students were also asked a series a questions about the nature of their JSS experience. As can be seen in Chart 4, the majority of respondents indicated communicating with other students about STEM and learning about new STEM topics on most or every day of the experience. Fewer students reported applying STEM knowledge to real-life situations, learning about cutting-edge STEM research, learning about different STEM careers, and interacting with STEM professionals on most days

[4] Two-tailed independent samples t-test, $t(75) = 3.00$, $p = 0.004$.

[5] Effect sizes are used to facilitate comparison of the magnitude of differences across different outcomes and/or studies by putting differences on a standardized metric. For difference between means, effect size is calculated as Cohen's d: the difference in means of the two groups divided by the pooled standard deviation. For Cohen's d, effect sizes of about 0.20 are typically considered small, 0.50 medium, and 0.80 large. Cohen, J. (1988). Statistical power analysis for the behavioral sciences. Hillsdale, NJ: Lawrence Erlbaum Associates.

[6] Two-tailed independent samples t-test, $t(76) = 2.31$, $p = 0.023$.

[7] Two-tailed independent samples t-test, $t(76) = 2.15$, $p = 0.034$.

[8] Two-tailed independent samples t-test, $t(76) = 4.96$, $p < 0.001$.

[9] Two-tailed independent samples t-test, $t(76) = 3.42$, $p = 0.001$.

[10] Two-tailed independent samples t-test, $t(74) = 3.13$, $p = 0.002$.

[11] Two-tailed independent samples t-test, $t(70) = 3.03$, $p = 0.003$.

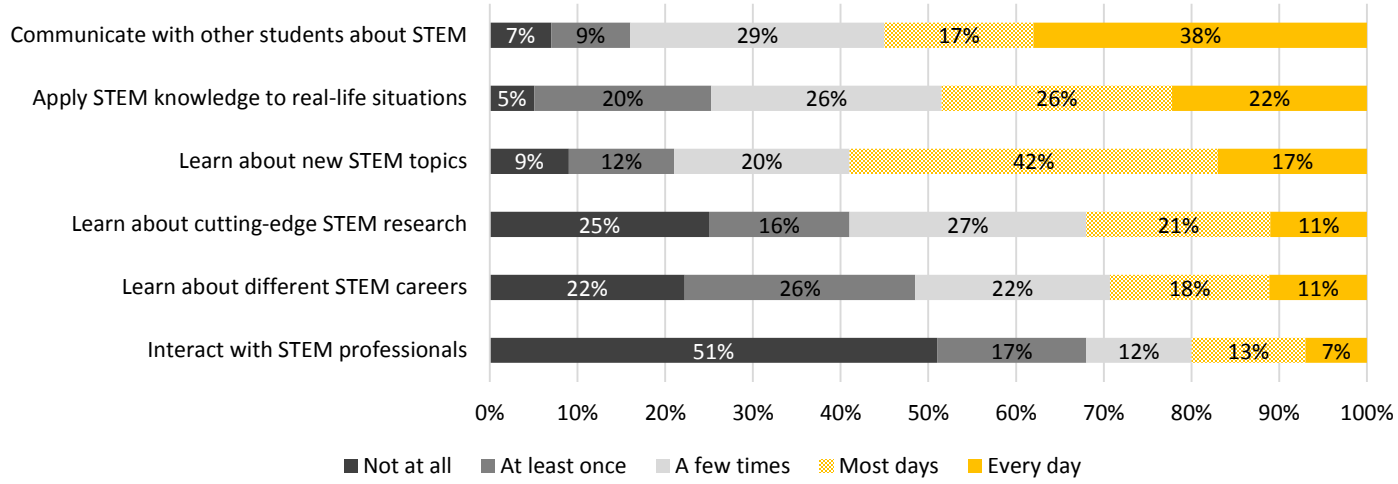
[12] Two-tailed independent samples t-test, $t(69) = 2.46$, $p = 0.016$.

[13] Two-tailed independent samples t-test, $t(70) = 2.43$, $p = 0.018$.

[14] Two-tailed independent samples t-test, $t(70) = 2.34$, $p = 0.022$.

or every day. Mentors were asked similar questions about the nature of their students' experiences. Overall, their responses paint a similar picture of the JSS experience (responses to these items can be found in Appendix C).[15]

Chart 4: Nature of Student Activities in JSS (n = 75-76)



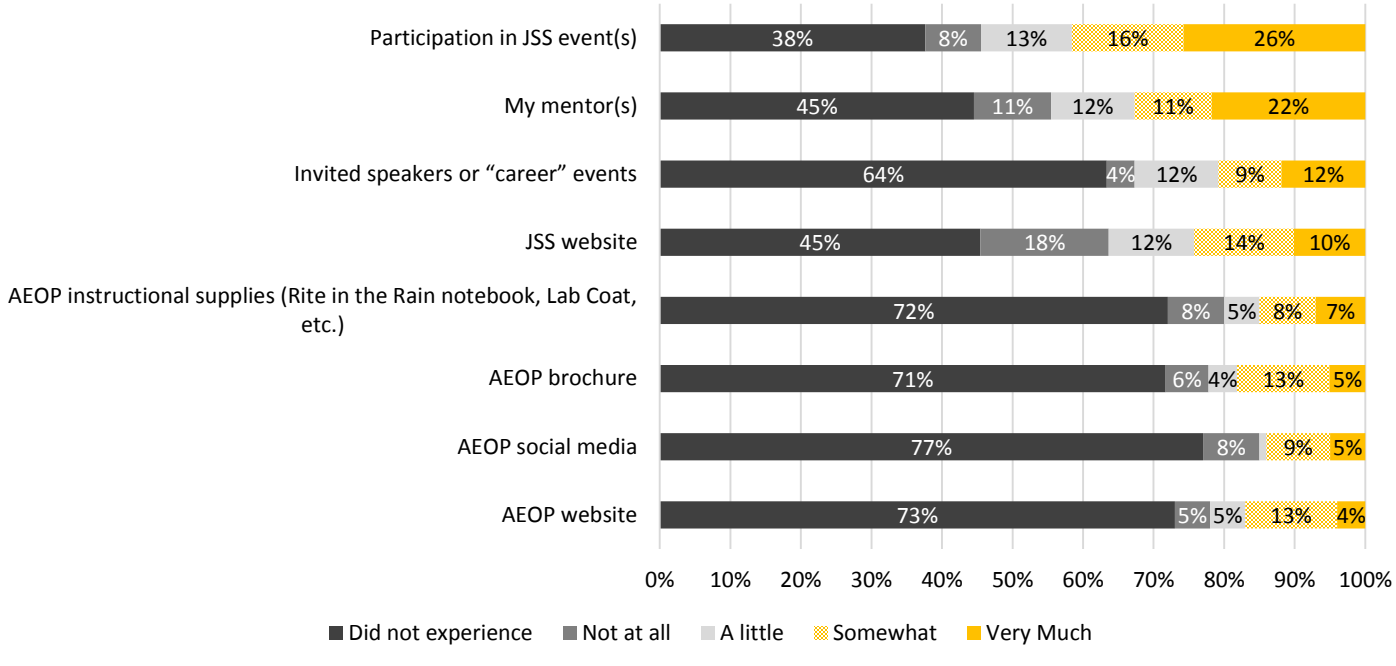
Because increasing the number and diversity of students who pursue STEM careers is one goal of the JSS program, the student questionnaire also asked how many jobs/careers in STEM in general, and STEM jobs/careers in the DoD more specifically, students learned about during their experience. As can be seen in Table 17, 71% of students reported learning about at least one STEM job/career, with 27% learning about five or more. However, responding students were much less likely to indicate learning about DoD STEM jobs/careers. Only 32% of students reported learning about at least one DoD STEM job/career.

[15] Because of the low response rates on both the student and mentor questionnaires, it is impossible to determine whether any differences between the two datasets are real or an artifact of which students and mentors provided data. In addition, as mentors typically worked with multiple students, it is not clear which students mentors were considering when responding to these items.

Table 17. Number of STEM Jobs/Careers Students Learned about During JSS (n = 77)		
	STEM Jobs/Careers	DoD STEM Jobs/Careers
None	29%	68%
1	12%	10%
2	18%	9%
3	12%	3%
4	3%	0%
5 or more	27%	10%

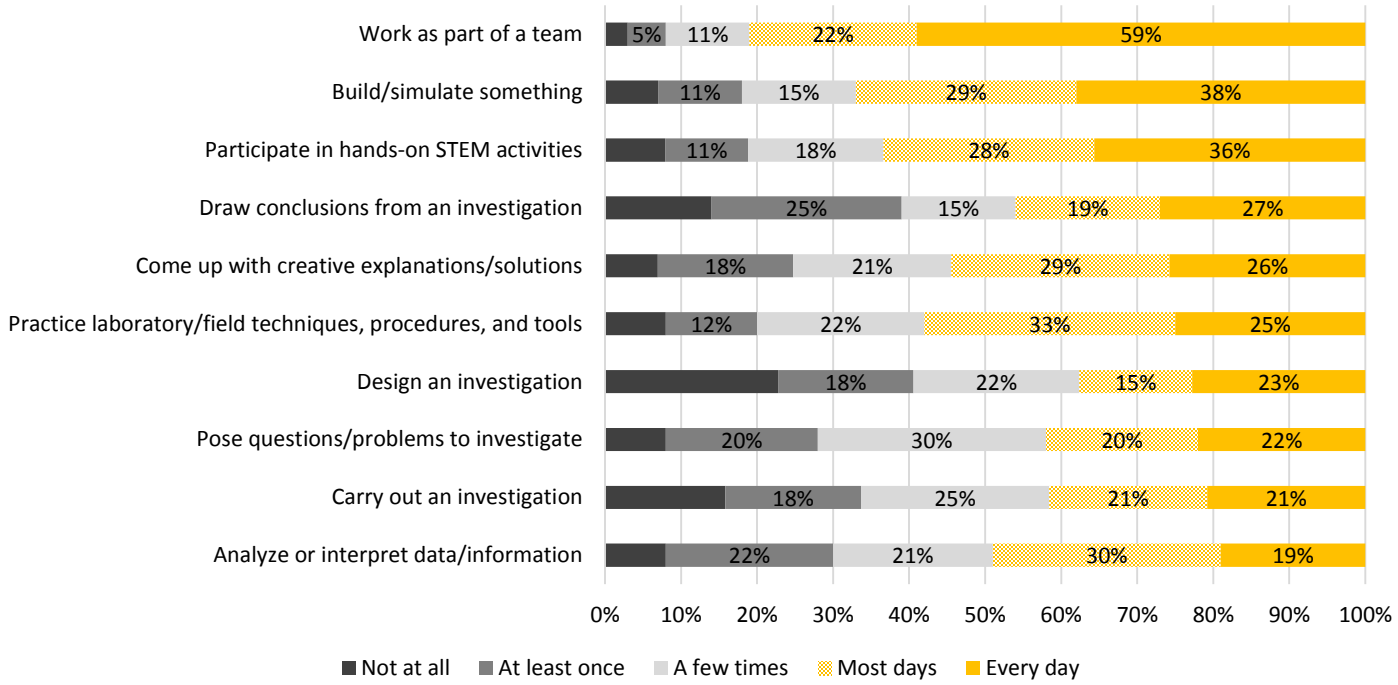
Students were also asked which resources impacted their awareness of DoD STEM careers. Participation in JSS events (42%), students' mentors (33%), and the JSS website (24%) were most often reported as being somewhat or very much responsible for an impact on student awareness of DoD STEM careers (see Chart 5). However, most of the resources asked about were not experienced by a majority of students, including AEOP materials (a range of 71-77%) and invited speakers or career events (64%). Surprisingly, 38% of students reported not experiencing a JSS event, perhaps because it was referred to by a different name.

Chart 5: Impact of Resources on Student Awareness of DoD STEM Careers (n = 76-77)



The questionnaire also asked students how often they engaged in various STEM practices during JSS. Results indicate that students were very actively engaged in doing STEM during the program (see Chart 6). For example, 81% of responding students indicated working as part of a team on most days or every day; 67% reported building/simulating something and 64% reported participating in hands-on activities. Again, data from the mentor questionnaire (shown in Appendix C) are generally aligned with data from the student questionnaire.

Chart 6: Student Engagement in STEM Practices in JSS (n = 73-76)



A composite score[16] was calculated for each of these two sets of items, the first titled "Learning about STEM in JSS,"[17] and the second "Engaging in STEM Practices in JSS."[18] Response categories were converted to a scale of 1 = "Not at all" to 5 = "Every day" and the average across all items in the scale was calculated. The composite scores were used to test whether

[16] 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.

[17] The Cronbach's alpha reliability for these 6 items was 0.891.

[18] The Cronbach's alpha reliability for these 10 items was 0.931.

there were differences in student experiences by gender, race/ethnic group, FRL status, and school location. No significant differences were found, indicating that students, regardless of subgroup, had similar experiences.

To examine how the JSS experience compares to their typical school experience, students were asked how often they engaged in the same activities in school (individual item responses can be found in Appendix B). These responses were also combined into two composite variables: "Learning about STEM in School,"[19] and "Engaging in STEM Practices in School"[20] that are parallel to the ones asking about JSS. There were no significant differences between the "in JSS and "in School" versions of these composites, likely because of the nature of the JSS program—one would not expect students to engage in these activities (e.g., pose questions to investigate, design an investigation) frequently in designing a solar car.

The Role of Mentors

Mentors, typically students' teachers, play a critical role in the JSS program. Mentors design and facilitate learning activities, deliver content through instruction, supervise and support collaboration and teamwork, provide one-on-one support to students, and chaperone students. On average, mentors responding to the mentor questionnaire reported working with 10 students, with a range of 2 to 60 students.

Mentors were asked whether or not they used a number of strategies when working with students. These strategies comprised five main areas of effective mentoring:[21]

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.

Large proportions of responding mentors used several strategies to help make the learning activities relevant to students (see Table 18). For example, the vast majority reported giving students real-life problems and helping students see how

[19] Cronbach's alpha reliability of 0.886.

[20] Cronbach's alpha reliability of 0.935.

[21] 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.

STEM can affect them or their communities (93% each). Fewer selected readings or activities related to students' backgrounds (53%).

Table 18. Mentors Using Strategies to Establish Relevance of Learning Activities (n = 15)	
Item	**Questionnaire Respondents**
Giving students real-life problems to investigate or solve	93%
Helping students become aware of the roles STEM plays in their everyday lives	93%
Helping students understand how STEM can help them improve their communities	93%
Asking students to relate outside events or activities to topics covered in the program	80%
Encouraging students to suggest new readings, activities, or projects	73%
Finding out about students' backgrounds and interests at the beginning of the program	73%
Making explicit provisions for students who wish to carry out independent studies	60%
Selecting readings or activities that relate to students' backgrounds	53%

Similarly, mentors reported using a variety of strategies to support the diverse needs of students as learners. As can be seen in Table 19, all responding mentors reported treating all students the same way, regardless of gender or race/ethnicity and using gender neutral language. The vast majority indicated directing students to other individuals/programs when necessary and using diverse teaching/mentoring activities (87% for both).

Table 19. Mentors Using Strategies to Support the Diverse Needs of Students as Learners (n = 15)	
Item	**Questionnaire Respondents**
Interacting with all students in the same way regardless of their gender or race and ethnicity	100%
Using gender neutral language	100%
Directing students to other individuals or programs if I can only provide limited support	87%
Using diverse teaching/mentoring activities to address a broad spectrum of students	87%
Finding out about students' learning styles at the beginning of the program	80%
Integrating ideas from the literature on pedagogical activities for women and underrepresented students	80%
Providing extra readings, activities, or other support for students who lack essential background knowledge or skills	80%

Mentors reported using many strategies to support students' development of collaboration and interpersonal skills (see Table 20). For example, the strategies of having students: (1) exchange ideas with others whose backgrounds or viewpoints are different from their own, (2) participate in giving and receiving feedback, and (3) work on collaborative activities or projects as a member of a team were each used by 93% of mentors. Having students develop ways to resolve

conflict, explain difficult ideas to others, listen to the ideas of others with an open mind, and pay attention to the feelings of all team members were each used by 87% of responding mentors.

Table 20. Mentors Using Strategies to Support Student Development of Collaboration and Interpersonal Skills (n = 15)	
Item	**Questionnaire Respondents**
Having students exchange ideas with others whose backgrounds or viewpoints are different from their own	93%
Having students participate in giving and receiving feedback	93%
Having students work on collaborative activities or projects as a member of a team	93%
Having students develop ways to resolve conflict and reach agreement among the team	87%
Having students explain difficult ideas to others	87%
Having students listen to the ideas of others with an open mind	87%
Having students pay attention to the feelings of all team members	87%
Having students tell others about their backgrounds and interests	47%

When asked about strategies used to support student engagement in authentic STEM activities, all responding mentors reported demonstrating the use of laboratory or field techniques, procedures, and tools, encouraging opportunities in which students could learn from others, and encouraging students to seek support from other team members (see Table 21). The remaining strategies were also widely used, including allowing students to work independently as appropriate for their self-management abilities/STEM competencies (93%), and giving constructive feedback to improve students' STEM competencies (93%).

Table 21. Mentors Using Strategies to Support Student Engagement in "Authentic" STEM Activities (n = 15)	
Item	**Questionnaire Respondents**
Demonstrating the use of laboratory or field techniques, procedures, and tools students are expected to use	100%
Encouraging opportunities in which students could learn from others (team projects, team meetings, journal clubs)	100%
Encouraging students to seek support from other team members	100%
Allowing students to work independently as appropriate for their self-management abilities and STEM competencies	93%
Giving constructive feedback to improve students' STEM competencies	93%
Having students access and critically review technical texts or media to support their work	87%
Helping students practice STEM skills with supervision	80%
Teaching (or assigning readings) about specific STEM subject matter	73%

The last series of items about mentoring strategies focused on supporting students' STEM educational and career pathways.[22] As can be seen in Table 22, a large majority of responding mentors reported asking students about their educational and career interests (87%), sharing their own experiences, attitudes, and values about STEM (87%), providing guidance to students about educational pathways that would prepare them for a STEM career (80%), and recommending student and professional organizations in STEM (80%).

However, given the AEOP goal of broadening the talent pool in STEM fields, it should be noted that less than half of the responding mentors reported discussing STEM career opportunities with the DoD or other government agencies (47%). In addition, given the interest in having students graduate into other AEOP opportunities, it should also be noted that only 33% of mentors recommended other AEOP programs to students.

[22] The student questionnaire included subset of these items. The student data are similar to the mentor data, and can be found in Appendix B.

Table 22. Mentors Using Strategies to Support Student STEM Educational and Career Pathways (n = 15)	
Item	**Questionnaire Respondents**
Asking about students' educational and career interests	87%
Sharing personal experiences, attitudes, and values pertaining to STEM	87%
Providing guidance about educational pathways that would prepare students for a STEM career	80%
Recommending student and professional organizations in STEM	80%
Discussing STEM career opportunities outside of the DoD or other government agencies (private industry, academia)	73%
Helping students build effective STEM networks	73%
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	73%
Recommending extracurricular programs that align with students' educational goals	73%
Discussing non-technical aspects of a STEM career (economic, political, ethical, and/or social issues)	67%
Critically reviewing students' résumé, application, or interview preparations	47%
Discussing STEM career opportunities with the DoD or other government agencies	47%
Recommending AEOPs that align with students' educational goals	33%

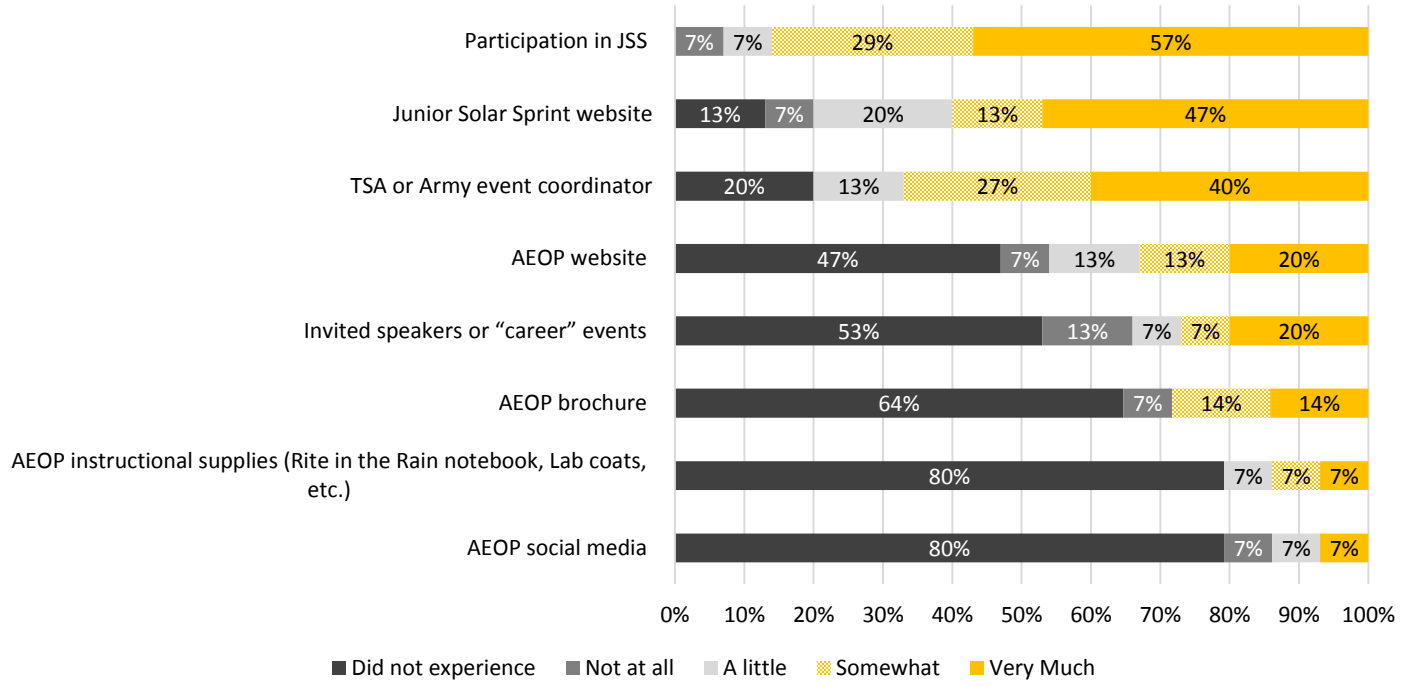
A separate item on the mentor questionnaire asked which of the AEOP programs mentors explicitly discussed with their students during JSS. Three-fifths of the responding mentors indicated discussing at least one other AEOP with students. As can be seen in Table 23, all responding mentors reported explicitly discussing JSS, but the only two other AEOPs discussed that students could participate in the future were eCYBERMISSION (20%) and GEMS (14%). No other AEOPs that students could participate in the future were discussed by responding mentors.[23] This result may be due to the fact that JSS, eCYBERMISSION, and GEMS are open to middle school students and the other AEOPs are intended for high school or college students.

[23] Many mentors reported discussing the WestPoint Bridge Competition (which is no longer part of the AEOP portfolio) and Camp Invention (which is intended for elementary students).

Table 23. Mentors Explicitly Discussing AEOPs with Students (n = 13-15)	
Item	**Questionnaire Respondents**
JSS	100%
eCYBERMISSION	20%
Gains in the Education of Mathematics and Science (GEMS)	14%
College Qualified Leaders (CQL)	0%
GEMS Near Peers	0%
High School Apprenticeship Program (HSAP)	0%
Junior Science & Humanities Symposium (JSHS)	0%
National Defense Science & Engineering Graduate (NDSEG) Fellowship	0%
Research & Engineering Apprenticeship Program (REAP)	0%
Science & Engineering Apprenticeship Program (SEAP)	0%
Science Mathematics, and Research for Transformation (SMART) College Scholarship	0%
Undergraduate Research Apprenticeship Program (URAP)	0%
UNITE	0%

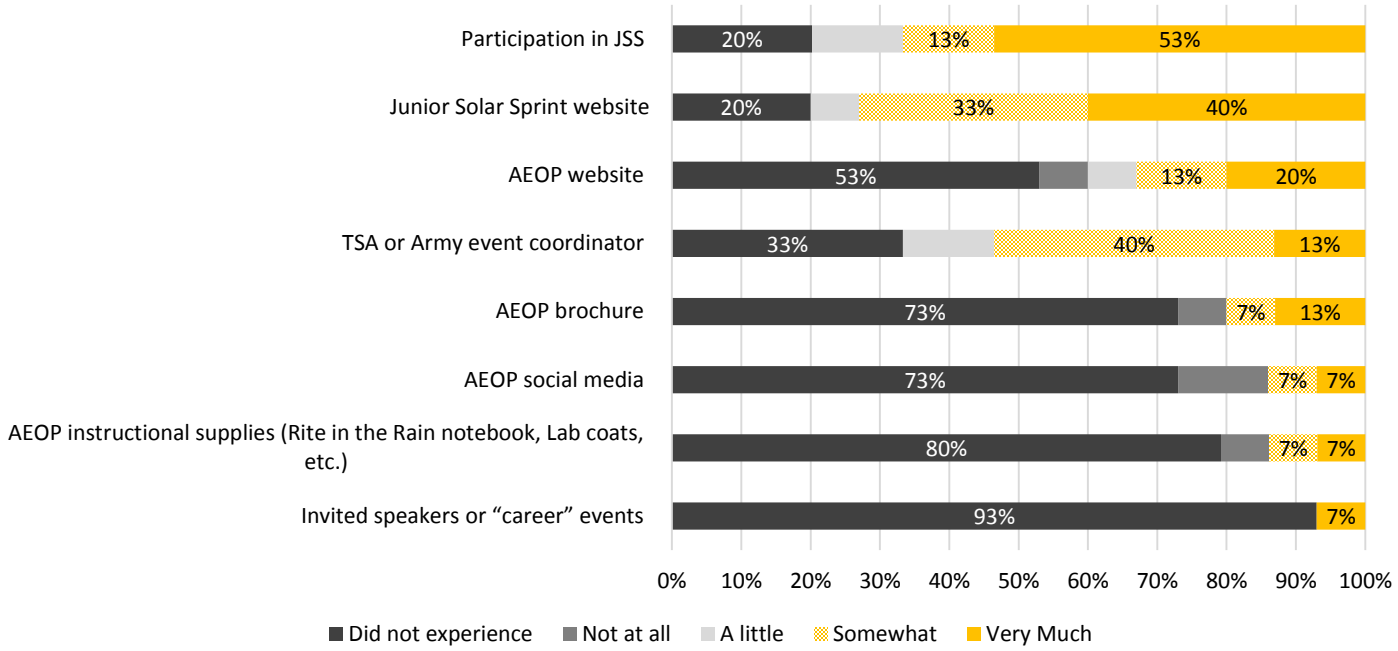
Mentors were also asked how useful various resources were in their efforts to expose students to the different AEOPs. As can be seen in Chart 7, participation in JSS (57%) and the JSS website (47%) were most often rated as "very much" useful; 40% rated the TSA or Army event coordinator as "very much" useful for this purpose. Materials provided by the AEOP program tended not to be seen as very useful, with large proportions of mentors indicating they did not experience these resources. For example, 47% of responding mentors reported not experiencing the AEOP website, and only 20% rated it as "very much" useful. Similarly, about 75% of responding mentors did not experience the AEOP brochure, instructional supplies, or social media; 7-14% found these resources very useful.

Chart 7: Usefulness of Resources for Exposing Students to AEOPs (n = 14-15)



Mentors were also asked how useful these resources were for exposing students to DoD STEM careers (see Chart 8). As with the previous item, mentors were most likely to rate participation in JSS as useful, with 53% selecting "very much." The JSS website (40%) was also seen as very useful by a substantive number of responding mentors. Again, AEOP materials were less likely to be seen as very useful for this purpose (a range of 7-20% selecting "very much").

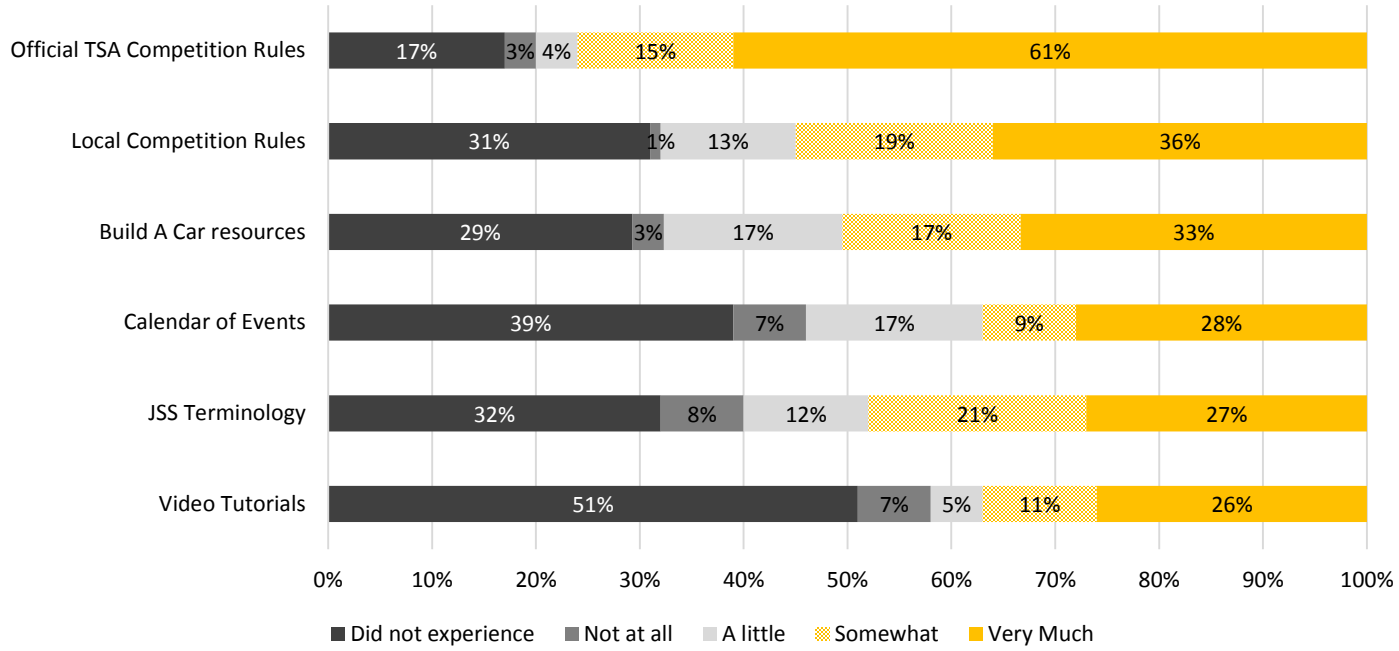
Chart 8: Usefulness of Resources for Exposing Students to DoD STEM Careers (n = 15)



Satisfaction with JSS

Based on which events respondents reported attending, students and mentors were asked how satisfied they were with a number of features of the National TSA Conference and/or the Army JSS event they attended. Regardless of which event they attended, students were asked their opinions on the usefulness of various online resources available to them. As can be seen in Chart 9, over three-fourths of reporting students found the official TSA competition rules somewhat or very much useful. The other resources were found to be somewhat or very much useful by 37-55% of the responding students. Over half of the students reported not experiencing video tutorials on the JSS website, indicating that this resource may need to be made more prominent on the JSS website.

Chart 9: Student Satisfaction with JSS Online Supports (n = 73-75)



The items in Chart 9 were combined into a composite variable titled "Satisfaction with Website Resources."[24] The composite was used to test for differential impacts across sub-groups of students. Female students found the resources more useful than male students[25] (a large effect of d = 0.915 standard deviations), as did minority students over non-minority students[26] (a large effect of d = 0.918 standard deviations), FRL-eligible students over non-FRL-eligible students[27] (a small effect, d = 0.265 standard deviations), and students attending schools in underserved and underrepresented locations than students attending suburban schools[28] (a moderately large effect of d = 0.754 standard deviations).

As a follow-up to the question about the usefulness of these resources, an open-ended item asked students which resources were most useful for their participation in JSS. Of the 69 students who answered this question, 11 (16%) reported not using any resources. Of those who did report using a resource, the most common answer, given by 40 students (69% of those who reported using a resource) was the official TSA competition rules or the TSA website. Other

[24] The Cronbach's alpha reliability for these 6 items was 0.857.
[25] Two-tailed independent samples t-test, $t(62) = 3.34$, $p = 0.001$.
[26] Two-tailed independent samples t-test, $t(62) = 2.51$, $p = 0.015$.
[27] Two-tailed independent samples t-test, $t(62) = 2.51$, $p = 0.015$.
[28] Two-tailed independent samples t-test, $t(61) = 2.78$, $p = 0.007$.

common responses included YouTube/videos in general (16% of those who reported using a resource) and the JSS website (14% of those who reported using a resource).

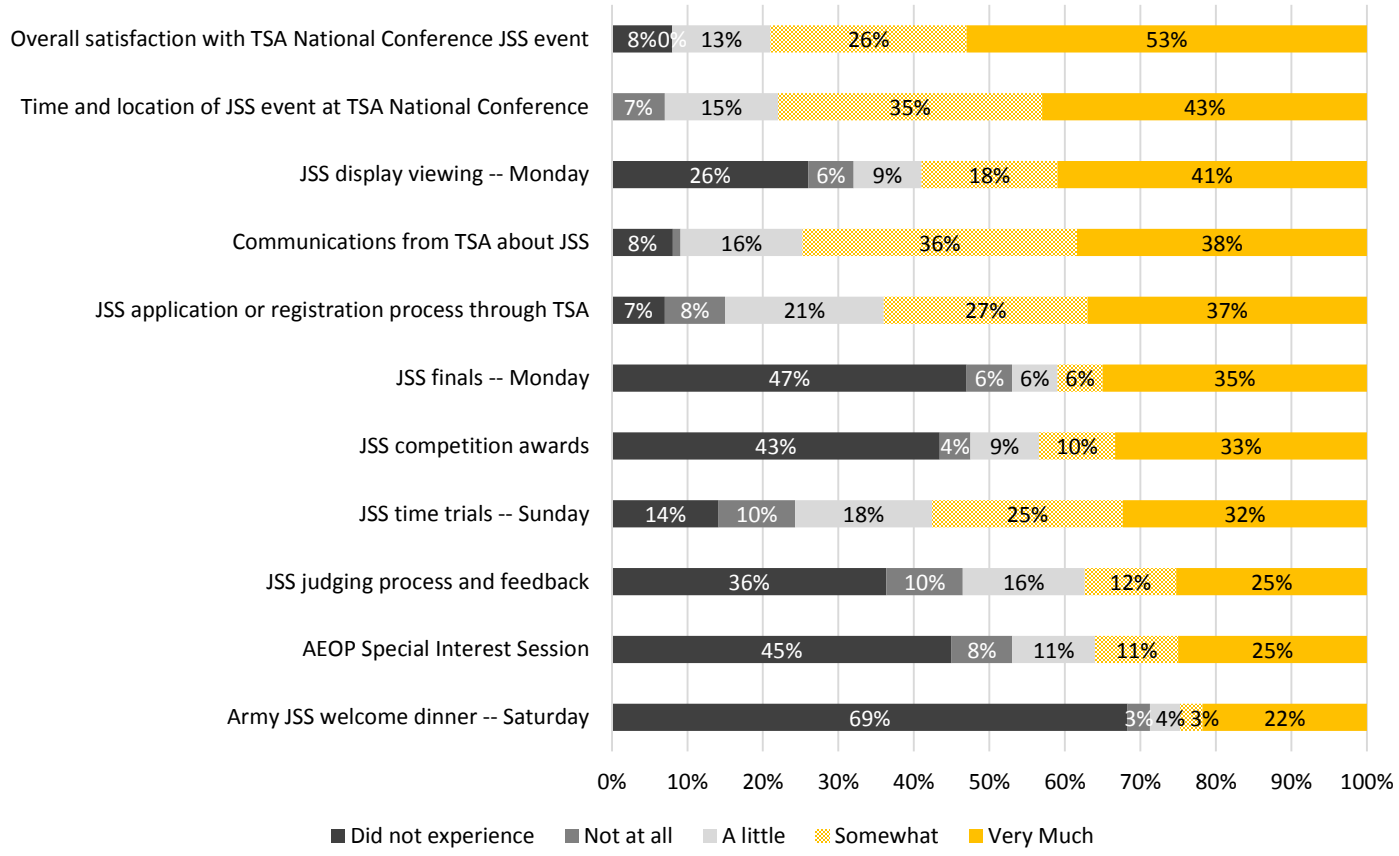
Students were also asked how resources could be improved; 50 students responded to this item. Sixteen students (32% of those who responded) did not have a suggestion. Of the 34 students who did provide a suggestion, 10 (29%) asked for a clearer set of rules and regulations in order to better anticipate the competition set-up. For example, students wanted to know in advance what material the track would be made of and where the guide wire would be. The second and third most common responses, each reported by eight students (24%) were requests for better video tutorials/images and better written guides/suggestions. Less common responses involved improvements to the website (18%) and to the schedule or calendar of events (9%).

The number of requests for better car-building guides suggests that the existing Build a Car resource was not sufficient. Indeed, only two students mentioned the Build a Car resource when asked about the resource most useful to them. One student even wrote about how the Build a Car resource led him/her astray during the state competition:

> *[The most useful resource was the] official TSA competition regulations. I used TSA to make sure I got all the points I could get. I used "build a car" for the state conference and I missed a significant amount of points (in documentation mostly).* (JSS Student)

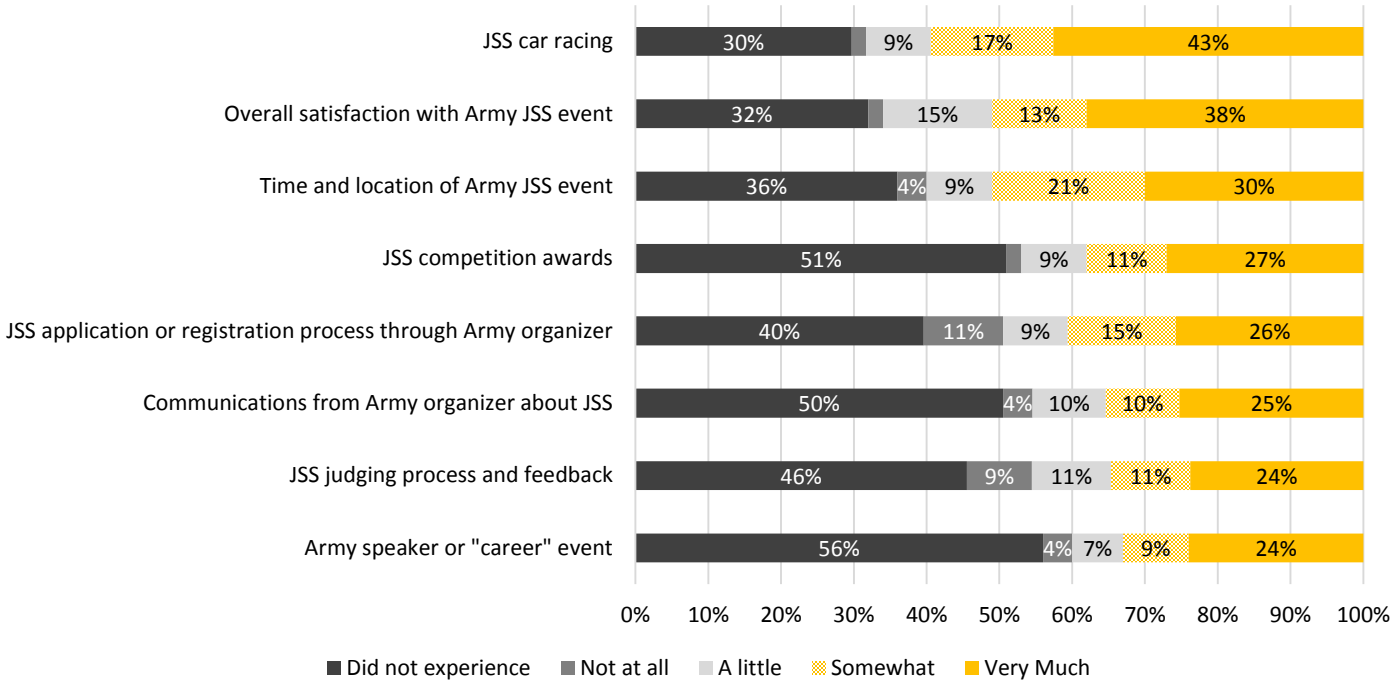
Students were also asked a series of items about their satisfaction with each of a number of conference features. As can be seen in Chart 10, 79% of students who attended the National TSA Conference were somewhat or very much satisfied overall. The majority of responding students were somewhat or very much satisfied with the JSS event's time/location (78%), communications from TSA (74%), the application/registration process (64%), the Monday display viewing (59%), and the Sunday time trials (57%).

Chart 10: Student Satisfaction with National TSA Conference Features (n = 66-74)



About half of the students who attended an Army-hosted regional JSS event were somewhat or very much satisfied overall (51%). The majority were somewhat or very much satisfied with the car racing aspect of the event (60%) and the time/location (51%). Only a third were somewhat or very much satisfied with an Army speaker or "career" event; over half did not experience this feature (see Chart 11).

Chart 11: Student Satisfaction with Army JSS Event Features (n = 45-48)



The items in Chart 10 were combined into a composite variable titled "National TSA Satisfaction"[29] (which quantified student satisfaction with National TSA Conference features). The items in Chart 11 were combined into a composite variable titled "General Satisfaction"[30] (which quantified student satisfaction with regional Army-hosted JSS event features). The two composites were used to test for differential impacts across sub-groups of students. FRL-eligible students reported greater overall satisfaction with the National TSA event than did students not eligible for FRL[31] (a large effect of d = 0.959 standard deviations). No other significant differences were found for either composite.

An open-ended questionnaire item asked students about their overall satisfaction with their JSS experience. The responses were generally positive. Of the 67 students who responded to this question with an interpretable answer, 45 (67%) commented on only positive aspects of the program. These responses were sometimes as simple as, "Thumbs up!!" Other times, more detail about what they enjoyed about the program was provided, such as in the following examples:

[29] The Cronbach's alpha reliability for these 11 items was 0.972.

[30] The Cronbach's alpha reliability for these 8 items was 0.902.

[31] Two-tailed independent samples t-test, $t(68) = 2.88$, $p = 0.005$.

I enjoyed and gained very much from participating in the JSS competition. I learned a lot about solar energy and its global application. (JSS Student)

I was satisfied with JSS in most ways and I plan on using everything I learn in JSS to help me find a career. (JSS Student)

JSS was a fun and educational experience. I enjoyed engineering an effective car, modeling it, and creating it. I would recommend this program. (JSS Student)

I liked the JSS experience because it helped me with leadership, construction, and documentation. (JSS Student)

Of the remaining 21 responses, 18 (27%) responses included positive comments, but had some caveats. The majority of the caveats had to do with the event itself in some way, but responses varied widely. Three students expressed disappointment at not winning. Examples of other caveats included suggesting that the track be improved, the spending limit for building the car raised, and stricter rules for building the car.

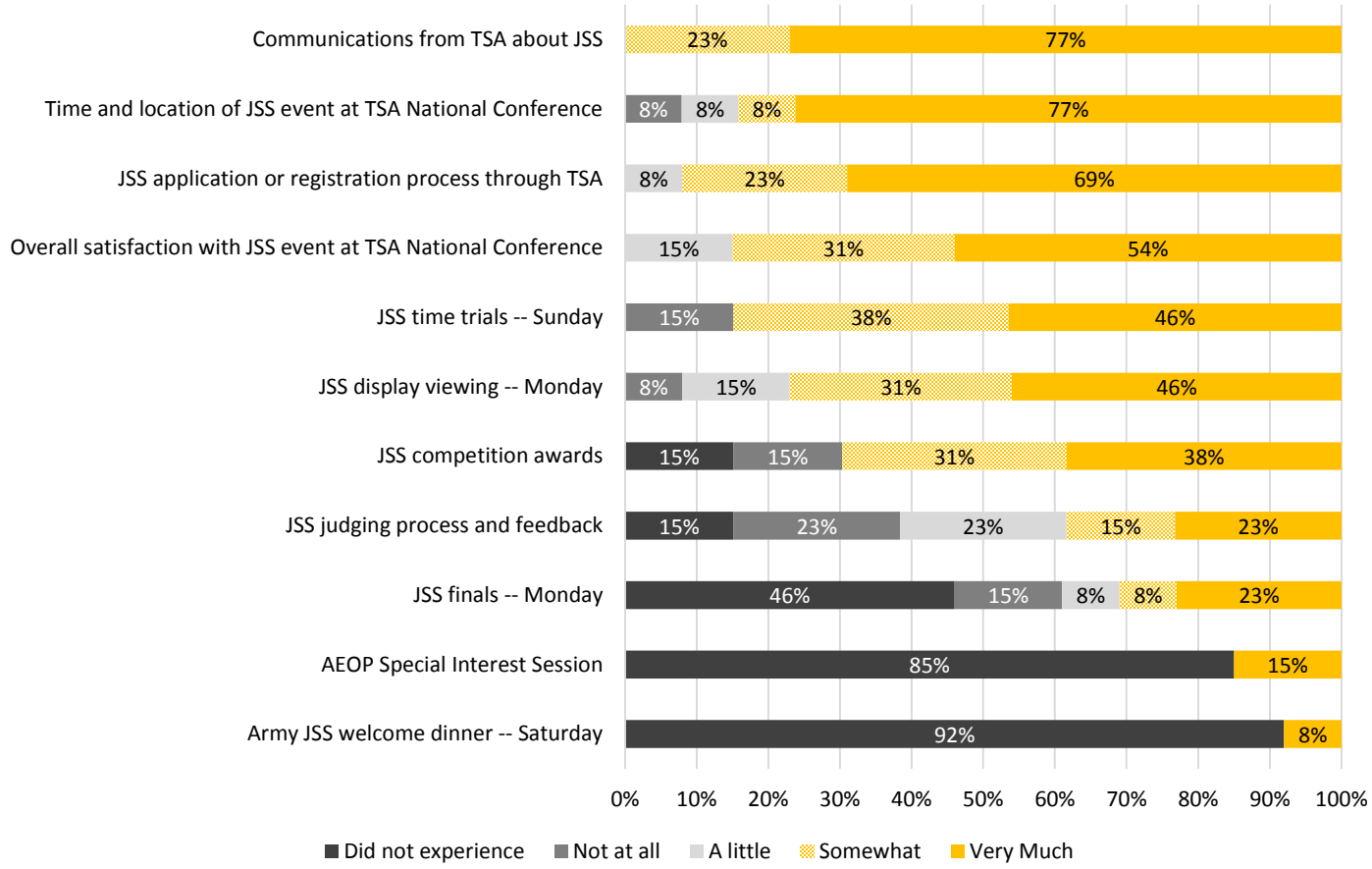
A related open-ended item asked students to note three ways in which JSS could be improved; 56 students responded to this item. Two common themes emerged: improved rules/regulations and improved guidance. Half the responding students made a suggestion relating to the program's official rules/regulations, though the suggestions varied widely. For example, 7 students (13%) mentioned having multiple chances to run their cars and 5 students (9%) suggested there be fewer rules on how to assemble the cars. Other suggestions included having better and less expensive equipment (5%) and adding a design or creativity award (5%). Twenty-six students (46%) made suggestions relating to increased levels of help or guidance; again, the suggestions varied. For example, 10 students (18%) asked for better suggestions or better guidelines to help build the car, 5 students (9%) suggested website improvements, and 4 students (7%) wished it had been easier to find key pieces of information such as the official rules/regulations and race schedules.

Similar to students, most mentors also reported being somewhat or very much satisfied with the program components they experienced (see Chart 12). For example, all mentors who attended the National TSA Conference were at least somewhat satisfied with communications from TSA about JSS, 92% with the application/registration process, and 85% with the time and location of the JSS event.[32]

[32] Only two mentors indicated attending an Army JSS event; data about their satisfaction with Army event-specific program features can be found in Appendix C.

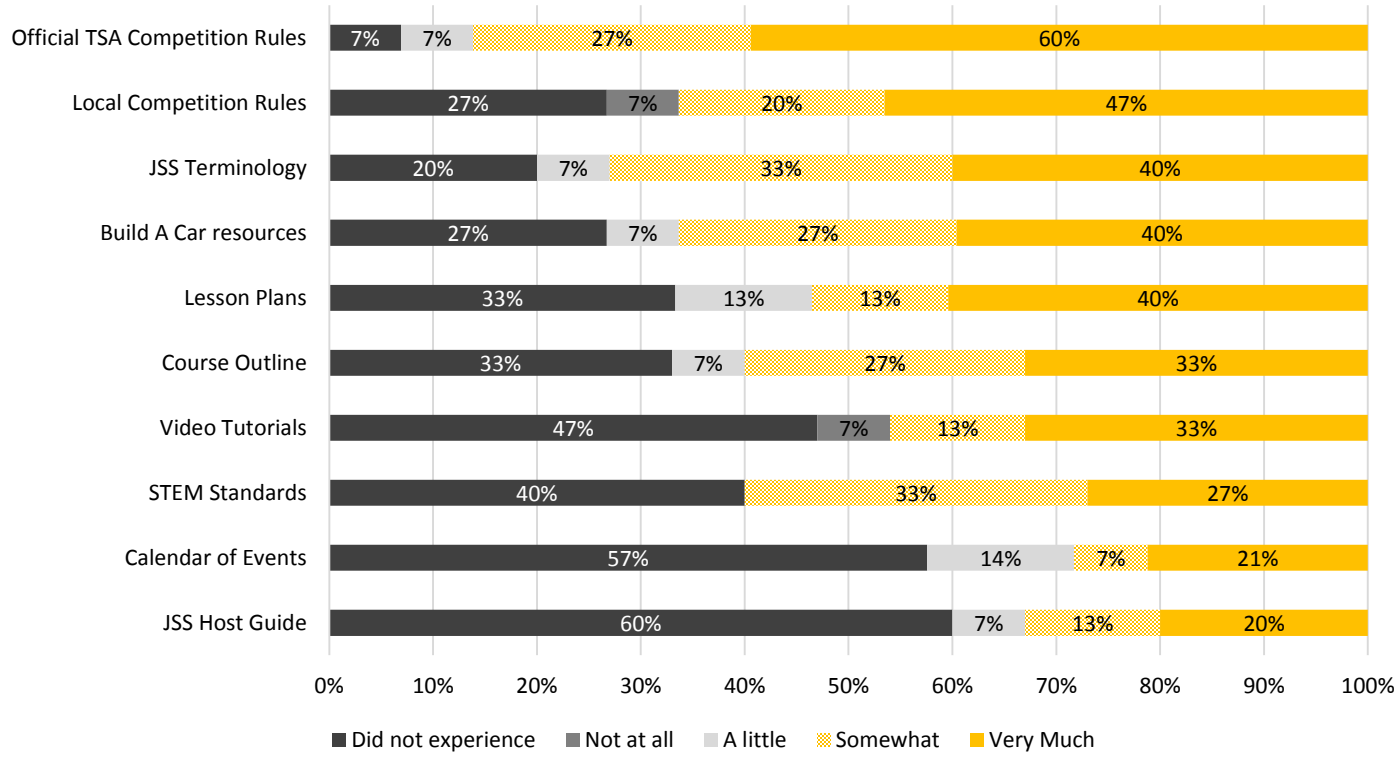
"JSS was a fun and educational experience. I enjoyed engineering an effective car, modeling it, and creating it. I would recommend this program."
-- JSS Student

Chart 12: Mentor Satisfaction with National TSA Conference Features (n = 13)



As can be seen in Chart 13, of the online supports, mentors were most likely to find the official TSA competition rules useful, with 87% rating them as "somewhat" or "very much" useful. JSS terminology (73%), local competition rules (67%), and build a car resources (67%) were also rated as at least somewhat useful by a large majority of responding mentors. The majority did not experience the JSS host guide or calendar of events.

Chart 13: Mentor Satisfaction with JSS Online Supports (n = 14-15)



An open-ended item asked mentors to identify the three most important strengths of JSS; 14 mentors responded to this question. Mentors named eight different strengths: opportunities for team-building (86%), exposing students to STEM (71%), engaging students in problem-solving (43%), that the program is hands-on (21%), the competitive nature of the program (14%), that it is fun for students (14%), it provides a chance for students to work on communication (14%), and that the program is open to any student with the desire to build a car (7%). Several of these strengths were echoed in the rapid interviews. As two mentors said:

> *I'm very involved in STEM education, and this seems to really engage the students. Also it's their first hands-on exposure in this instance to solar energy, and using electric motors, and making something that works. It's very tangible and they get to experience the design process.* (JSS Mentor)

> *I think [the program] helps the children learn teamwork and helps them to use their brain cells a little bit, instead of focusing on an iPad, or iPod, or cell phone. I think it brings out their creativity and origination as well, because they are creating their own masterpiece and when it works they can see what they can do. I think it's confidence*

building for them…it helps them to build their skills for the future. When it doesn't work, they learn, it helps them understand why…They've learned a lot, they've really enjoyed doing it. It doesn't get any better. (JSS Mentor)

> *"I think [the program] helps the children learn teamwork and helps them to use their brain cells a little bit, instead of focusing on an iPad, or iPod, or cell phone. I think it brings out their creativity and origination as well, because they are creating their own masterpiece and when it works they can see what they can do."* -- JSS Mentor

Mentors were also asked to note three ways in which JSS should be improved for future participants. The 11 mentors who responded gave several different answers. Like the students, mentors suggested improvements to the rules/regulations (27%), e.g., making the rules clearer on what kind of supplies count/don't count towards the budget cap. Also similar to the students, 27% asked for more guidance in, for example, creating the notebooks, improving the solar car, and finding resources. Mentors also asked for improvements to the repair pit, equipment setup, or race conditions (27%).

Like students, mentors were asked which resources were most useful for their participation in JSS. Of the 12 mentors who answered this question, 3 (25%) reported not using any resources. Of the nine mentors who did report using a resource, the most common answer, given by 5 of the 9 (56%) related to the official TSA competition rules.

Twelve mentors responded to the open-ended item about how resources could be improved, though responses varied widely. Respondents listed things such as, "Better description of time trial arrangements/competition and racing surface," "Construction method videos as well as a resources page for advisors to use," and "Better training for volunteers and advisers on the race rules and construction." One mentor wrote a long answer detailing the questions s/he was unsure about in terms of the display requirements and criteria for winning. In this mentor's words:

1. For both TSA and JSS, it would be beneficial to know - or know where to find rules - for the actual display. We thought that we had followed the TSA guidelines from the management guide for display. However, when our students arrived, there was a range from just a car and journal set on a table to full blown tri-fold display boards with solar cell research. What is the expectation for a 'finals' display? Please make display requirements clearer. 2. What are the exact criteria for winning this competitive event? Can students win the race event but not place because their display was limited? Is it purely race results or race results/display? How are the displays factored into the results? (JSS Mentor)

Lastly, mentors were asked to share their overall satisfaction with their JSS experience. The responses were largely positive. Of the 13 individuals who responded to this question, 69% described having a purely positive experience, with half indicating they would participate again next year. As three mentors wrote:

> *Quite enjoyed working with the girls and look forward to them doing more.*
>
> *My students were greatly interested in JSS. This is an event that we will be doing next year.*
>
> *I think this is a great activity. I used it with 2 students only but plan to use it with a whole class this next year if I can get the funding to purchase the supplies.*

Those who had both positive and negative things to say in their response to this item went into more detail. For example, one mentor indicated an interest in participating again in the future, but also brought up concerns with the organization of the event and suggested a networking session for students. In this mentor's words:

> *JSS was probably the best experience our TSA chapter had at the conference. It was exciting and [the] outcome was known immediately. Our students will definitely participate again next year. However, we were not aware of an event Saturday night (was there one - we just 'heard' there was one after the fact) nor were we able to attend the interest session, so I think we lost out on a lot of information that may have been helpful and made the experience more meaningful. It would be great if you could get all the teams together for networking or socializing prior to the event. They would not only meet each other and the JSS/AEOP people, but they could also learn about other AEOP events while there.* (JSS Mentor)

In summary, findings from the Actionable Program Evaluation indicate that JSS is having increasing success in providing a program that actively engages students in authentic STEM experiences. The multi-faceted approach to marketing JSS is helping the program to recruit students from all sub-groups. Once in JSS, students are learning about STEM jobs/careers. They are learning about DoD STEM jobs/careers to a lesser extent, which in some cases may be due to a lack of connection to Army STEM at TSA hosted sites or that students are not experiencing the resources intended to raise their awareness of DoD STEM careers. The challenge lies in making the connection between JSS and the DoD clear for students from TSA-hosted sites.

The JSS program actively engages students in learning about STEM and in STEM practices. As part of this engagement, large proportions of mentors employed strategies to help make the learning activities relevant to students, support the diverse needs of students as learners, support students' development of collaboration and interpersonal skills, and support student engagement in authentic STEM activities. Overall, of the program features they experienced, students and mentors reported their level of satisfaction as somewhat or very much satisfied.

Outcomes Evaluation

The evaluation of JSS included measurement of several outcomes relating 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 towards research, and their knowledge of and interest in participating in additional AEOP opportunities.[33] STEM competencies are necessary for a STEM-literate citizenry. STEM competencies include foundational knowledge, skills, and abilities in STEM, as well as the confidence to apply them appropriately. STEM competencies are important 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 JSS measured students' self-reported gains in STEM competencies and engagement in opportunities intended to develop what is considered to be a critical STEM skill in the 21st century—collaboration and teamwork.

STEM Knowledge and Skills

As can be seen in Chart 14, nearly all responding students reported gains in their STEM knowledge as a result of the JSS program. For example, large or extreme gains were reported by 44% of students on their knowledge of a STEM topic or field in depth, and 42% on their knowledge of research conducted in a STEM topic or field. Similar impacts were reported on knowledge of what everyday research work is like in STEM (39%), research processes, ethics, and rules for conduct in STEM (36%), and how professionals work on real problems in STEM (33%). Mentors reported similar impacts on their students' STEM knowledge (see Appendix C).

[33] The outcomes measured in the evaluation study were informed by the following documents:

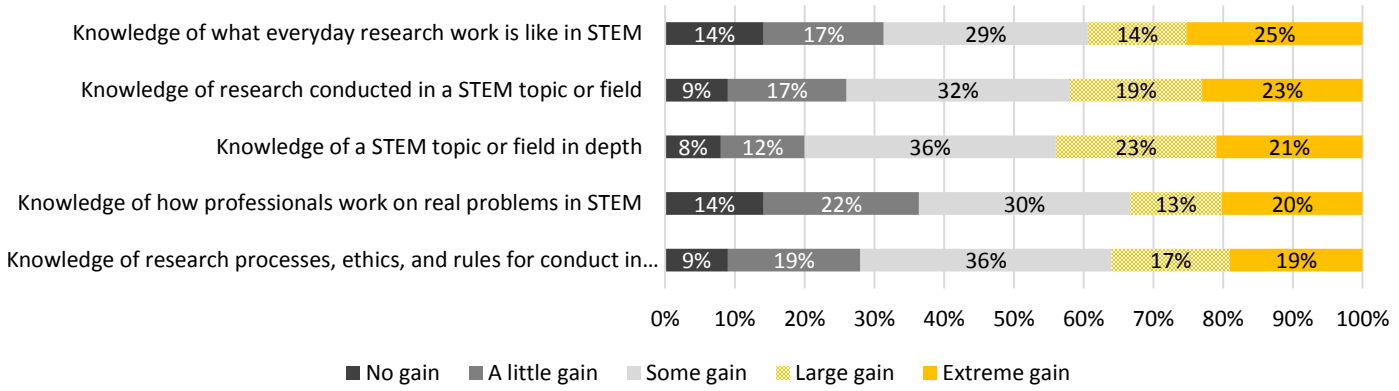
Committee on STEM Education. (2013). Federal Science, Technology, Engineering, and Mathematics (STEM) education 5-year strategic plan: A report from the Committee on STEM Education, National Science and Technology Council. Washington, DC: The White House, Office of Science and Technology Policy.

National Research Council. (2009). Learning science in informal environments: People, places, and pursuits. Committee on Learning Science in Informal Environments. Philip Bell, Bruce Lewenstein, Andrew W. Shouse, and Michael A. Feder, Editors. Board on Science Education, Center for Education. Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

President's Council of Advisors on Science and Technology (P-CAST). (February 2012). Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics. Executive Office of the President.

Report of the Academic Competitiveness Council (ACC). (2007). U.S. Department of Education. Available on the Department's Web site at: http://www.ed.gov/about/inits/ed/competitiveness/acc-mathscience/index.html.

Chart 14: Student Report of Impacts on STEM Knoweldge (n = 75-76)



These student questionnaire items were combined into a composite variable[34] to test for differential impacts across sub-groups of students. Female students reported moderately greater gains in this area than male students[35] (d = 0.524 standard deviations). Minority students reported much larger gains in this area than non-minority students[36] (d = 0.886 standard deviations). There were no significant differences between students eligible for FRL and those not eligible, or between students attending school in an underrepresented and underserved location and those attending suburban schools.

The student questionnaire also asked about perceived impacts on STEM skills, i.e., their abilities to use STEM practices. Table 24 shows the percentage of responding students reporting large or extreme gains. The greatest perceived gains were in students' ability to make a model to represent key features and functions of an object, process, or system (44%), communicate information about their investigations and explanations in different formats (42%), and apply knowledge, logic, and creativity to propose solutions that can be tested with investigations (41%). Less than a third of responding students reported large gains on their ability to display numeric data from an investigation in charts or graphs to identify patterns and relationships (29%).

[34] The Cronbach's alpha reliability for these 5 items was 0.947.

[35] Two-tailed independent samples t-test, $t(74) = 2.04$, $p = 0.044$.

[36] Two-tailed independent samples t-test, $t(74) = 2.58$, $p = 0.012$.

Table 24. Students Reporting Large or Extreme Gains in their STEM Competencies (n = 74-76)	
Item	**Questionnaire Respondents**
Making a model to represent the key features and functions of an object, process, or system	44%
Communicating information about your investigations in different formats (orally, written, graphically, mathematically, etc.)	42%
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	41%
Supporting a scientific explanation or engineering solution with relevant scientific, mathematical, and/or engineering knowledge	41%
Asking a question that can be answered with one or more investigations	38%
Supporting a scientific explanation or engineering solution with data from investigations	38%
Considering different ways to analyze or interpret data when answering a question	36%
Using mathematics or computers to analyze numeric data	36%
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	35%
Carrying out procedures for an investigation and recording data accurately	34%
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	29%

Composite scores were calculated for this set of items[37] to examine whether the JSS program had differential impacts on sub-groups of students. Female students reported greater gains in this area than did male students[38] (a moderately large effect of d = 0.738 standard deviations). Minority students reported greater gains in this area than did non-minority students[39] (a large effect of d = 0.892 standard deviations). There were no significant differences between students eligible for FRL and those not eligible, or between students attending school in an underrepresented and underserved location and those attending suburban schools.

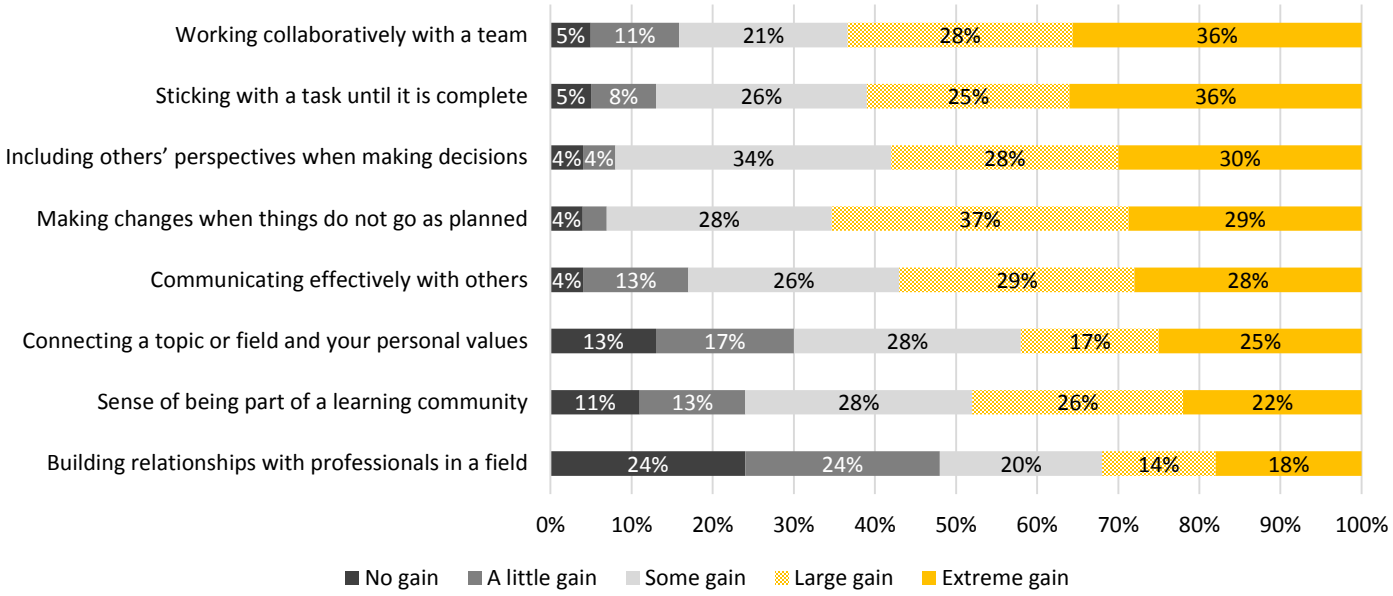
The student questionnaire also asked students about the impact of JSS on their "21st Century Skills," which are necessary across a wide variety of fields. As can be seen in Chart 15, more than half of responding students reported large or extreme gains on several of these skills, including making changes when things do not go as planned (66%), working collaboratively with a team (64%), sticking with a task until it is complete (61%), including others' perspectives when making decisions (58%), and communicating effectively with others (57%). Mentor reports of student gains in this area are generally similar to those of the students.

[37] The Cronbach's alpha reliability for these 11 items was 0.964.

[38] Two-tailed independent samples t-test, $t(74) = 2.88$, $p = 0.005$.

[39] Two-tailed independent samples t-test, $t(74) = 2.59$, $p = 0.011$.

Chart 15: Student Report of Impacts on 21st Century Skills (n = 76)



These items were combined into a composite variable[40] to test for differential impacts across sub-groups of students. Minority students reported greater gains in this area than did non-minority students[41] (a large effect of $d = 0.964$ standard deviations). Students eligible for FRL reported greater gains in this area than those not eligible for FRL[42] (a moderately large effect of $d = 0.736$ standard deviations). There were no significant differences between females and males, or between students attending school in an underrepresented and underserved location and those attending suburban schools.

STEM Identity and Confidence

Deepening students' STEM knowledge and skills is important for increasing the likelihood that they will pursue STEM further in their education and/or careers. However, they are unlikely to do so if they do not see themselves as capable of succeeding in STEM.[43] Consequently, the student questionnaire included a series of items intended to measure the impact of JSS on students' STEM identity. These data are shown in Chart 16 and suggest that the program has had a positive

[40] The Cronbach's alpha reliability for these 8 items was 0.932.

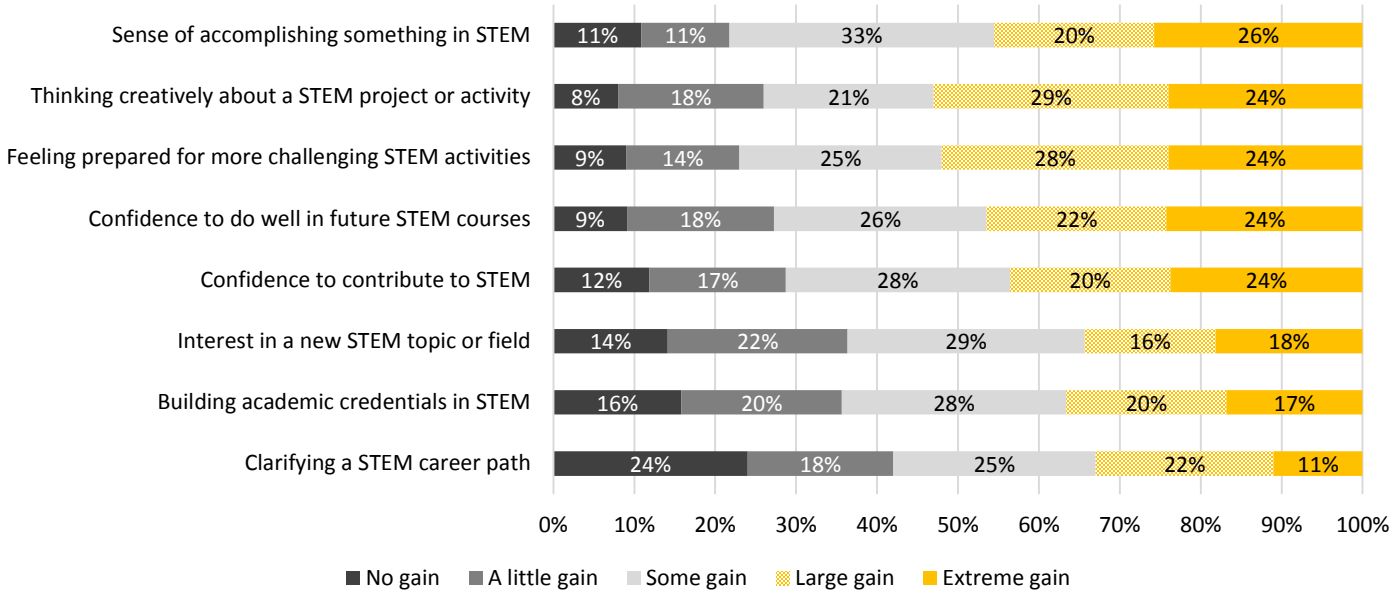
[41] Two-tailed independent samples t-test, $t(74) = 2.80$, $p = 0.006$.

[42] Two-tailed independent samples t-test, $t(68) = 2.21$, $p = 0.030$.

[43] Chang, M. J., Sharkness, J., Hurtado, S. and Newman, C. B. (2014), What matters in college for retaining aspiring scientists and engineers from underrepresented racial groups. J. Res. Sci. Teach., 51: 555–580.

impact on students in this area. For example, 53% of responding students reported a large or extreme gain in their ability to think creatively about a STEM project or activity. Similarly, roughly 1 in 2 students reported large or greater gains in their preparedness for more challenging STEM activities (52%), confidence to do well in future STEM courses (46%), and sense of accomplishing something in STEM (46%). Only about a third of students reported a large or greater increase in their interest in a new STEM topic or field (34%). Students reported similar gains regardless of gender, race/ethnicity, FRL status, or school location.

Chart 16: Student Report of Impacts on STEM Identity (n = 76)



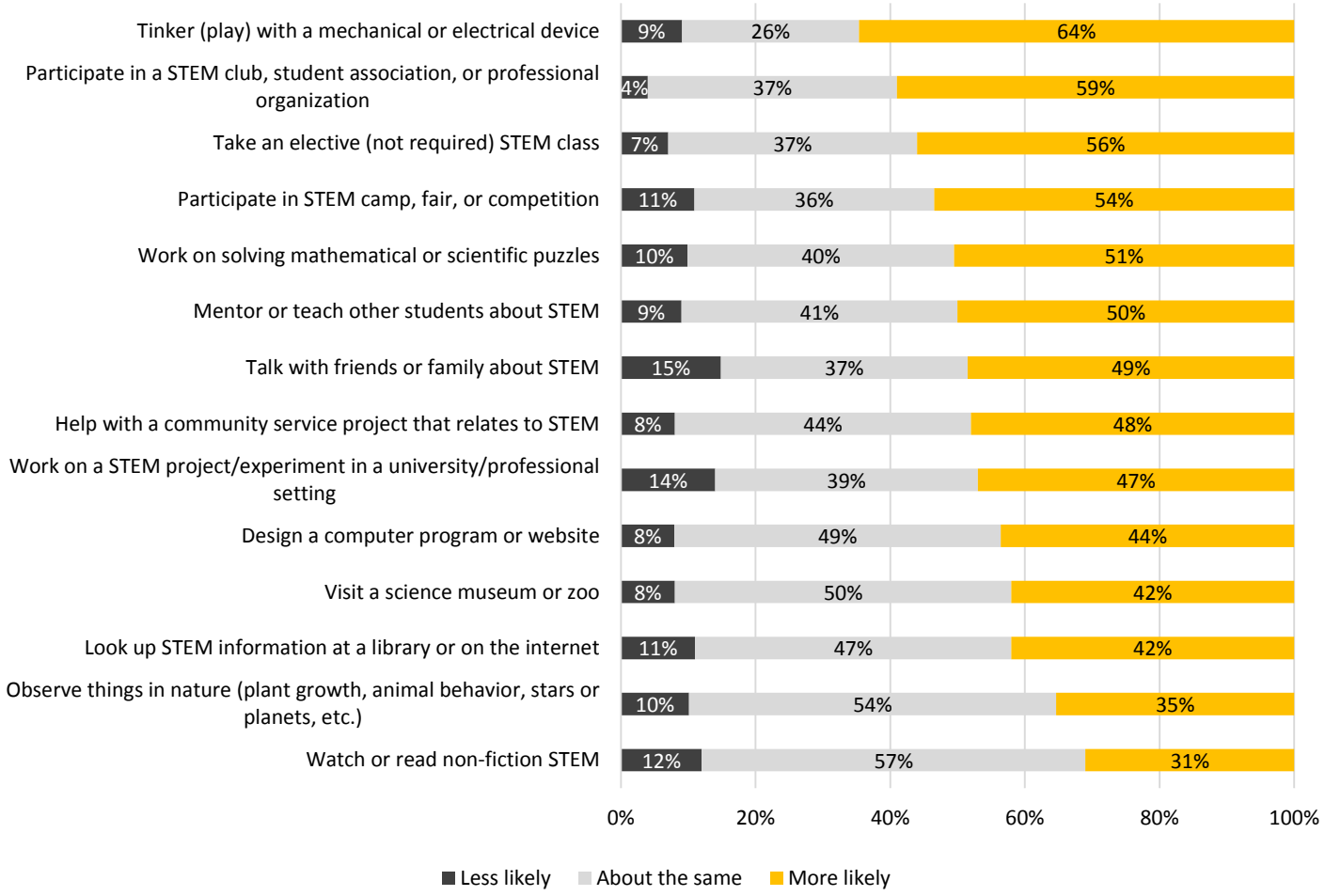
Interest and Future Engagement in STEM

A key goal of the AEOP program is to develop a STEM-literate citizenry. To do so, students need to be engaged in and out of school with high-quality STEM activities. In order to examine the impact of JSS on students' interest in future engagement in STEM, the questionnaire asked them to reflect on whether the likelihood of their engaging in STEM activities outside of school changed as a result of their experience, as well as their interest level in participating in future AEOP programs. As can be seen in Chart 17, students indicated they were more likely to engage in many of these activities as a result of JSS. For example, 64% reported being more likely to tinker with a mechanical or electrical device; 59% to participate in a STEM club, student association, or professional organization; 56% to take an elective STEM class; and 54% to participate in a STEM camp, fair, or competition. A composite score was created from these items,[44] and scores were

[44] The behavioral STEM intentions composite has a Cronbach's alpha reliability of 0.961.

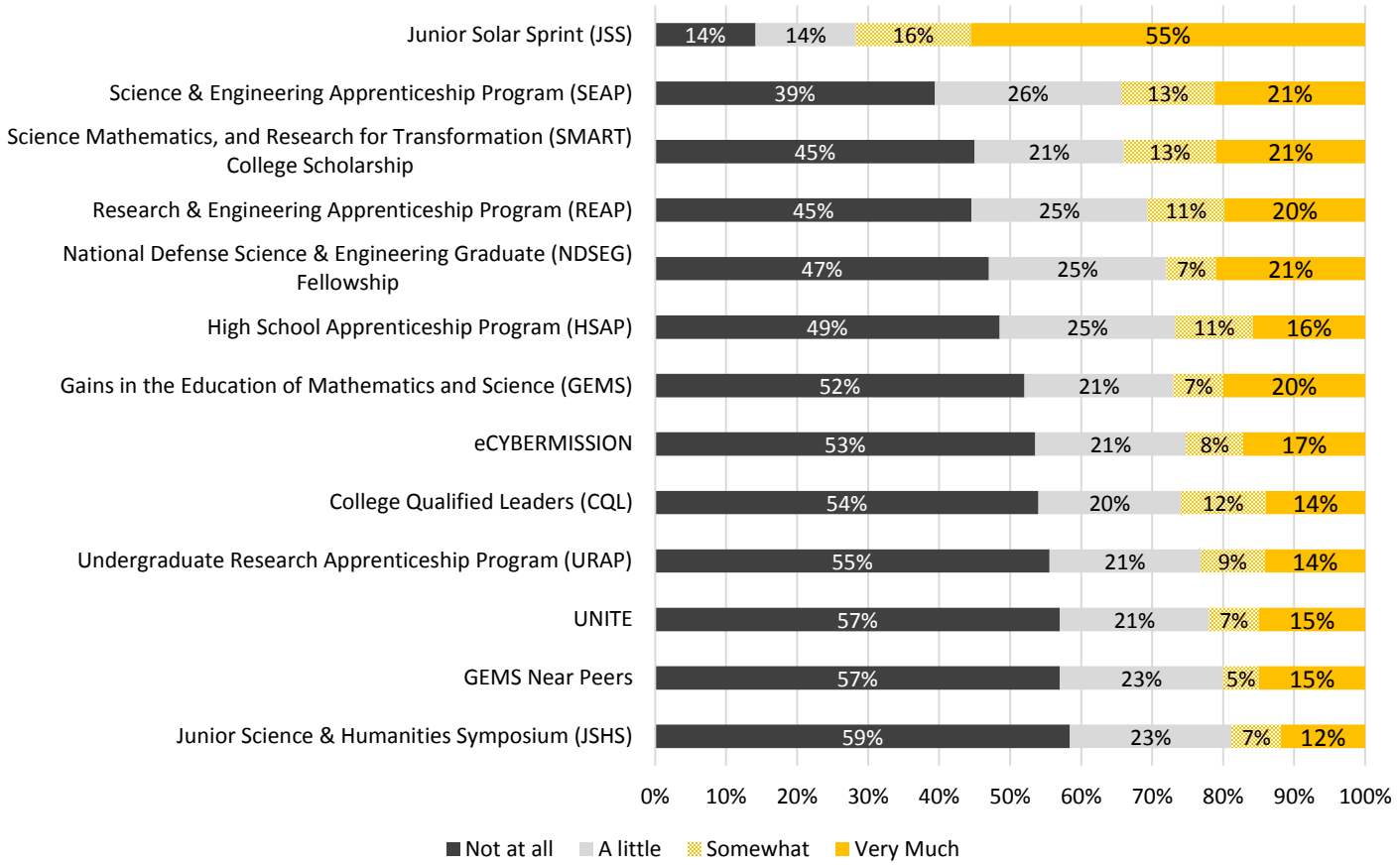
compared across sub-groups of students. There were no statistically significant differences by gender, race/ethnicity, FRL status, or school location.

Chart 17: Change in Likelihood Students Will Engage in STEM Activities Outside of School (n = 75-76)



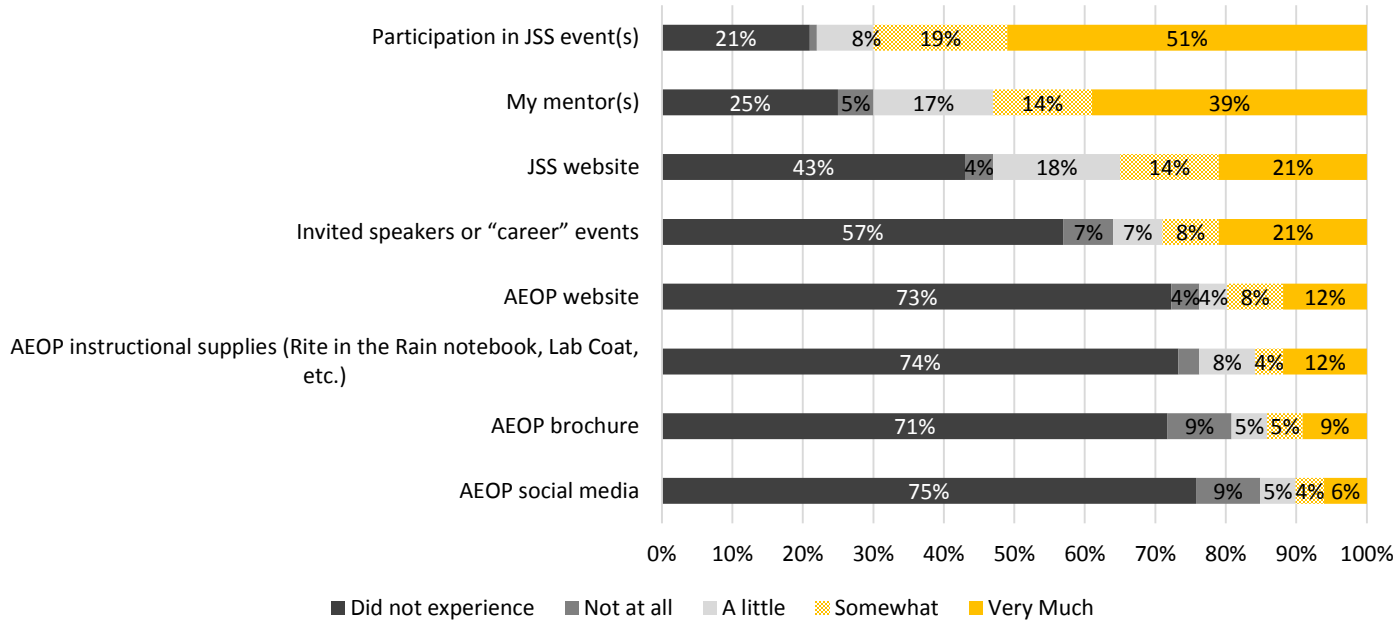
When asked how interested they are in participating in future AEOP programs, a large majority (71%) indicated being somewhat or very much interested in participating in JSS again (see Chart 18). About a third expressed at least some interest in participating in SEAP (34%), SMART (34%), and REAP (31%), and about a quarter in NDSEG (28%), HSAP (27%), GEMS (27%), CQL (26%), eCYBERMISSION (25%), URAP (23%), and UNITE (22%).

Chart 18: Student Interest in Future AEOP Programs (n = 75-76)



Students were asked which resources impacted their awareness of the various AEOPs. As can be seen in Chart 19, simply participating in JSS was most likely to be rated as impacting their awareness "somewhat" or "very much" (70%). Their mentor (53%) was also rated by a majority of students as having at least some impact on their awareness of other AEOP programs. The AEOP website, instructional supplies, brochure, and social media were rated as having the least impact on student awareness, with about three-fourths of students indicating not experiencing them at all.

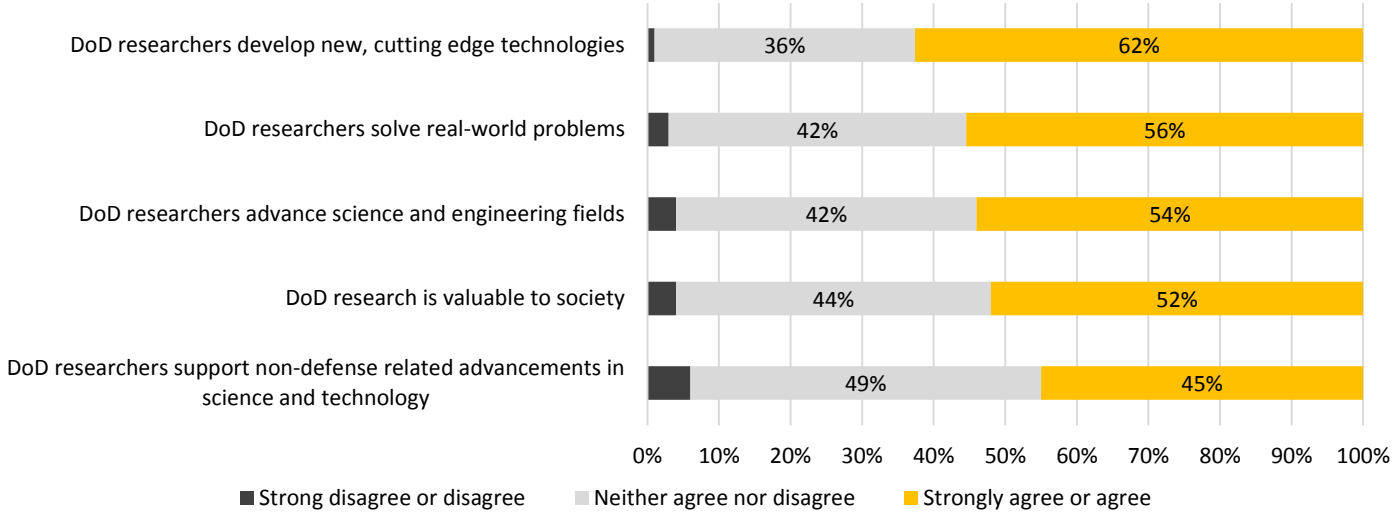
Chart 19: Impact of Resources on Student Awareness of AEOPs (n = 75-77)



Attitudes toward Research

Students' attitudes about the importance of DoD research is an important prerequisite to their potential involvement in such research in the future. In order to gauge students' attitudes in this area, the questionnaire asked students about their opinions of what DoD researchers do and the value of DoD research more broadly. The data indicate that most responding students have favorable opinions. As can be seen in Chart 20, 62% agreed or strongly agreed that DoD researchers develop cutting-edge technologies, 56% that DoD researchers solve real-world problems, 54% that DoD researchers advance science and engineering fields, and 52% that DoD research is valuable to society.

Chart 20: Student Opinions about DoD Researchers and Research (n = 77)



Education and Career Aspirations

The evaluation also examined the program's impact on students' education and career aspirations. In terms of education, the questionnaire asked students how far they wanted to go in school before and after participating in JSS. As can be seen in Table 25, when asked to think back on how far they wanted to go in school before participating in JSS, 11% indicated graduating from high school, 43% finishing college, and 42% getting more education after college. In contrast, after JSS only 4% reported wanting to finish their education after high school, 36% wanted to finish college, and 57% wanted to get more education after college. This shift towards more education was statistically significant[45] and very large in size (an effect size[46] ϕ= 0.936).

[45] Chi-square test of independence, $\chi^2(2) = 64.89$, $p < 0.001$.

[46] The effect size for a chi-square test of independence is calculated as $\varphi = \sqrt{\frac{\chi^2}{n}}$. With 2 degrees of freedom, ϕ of 0.07 is considered small, 0.21 medium, and 0.35 large.

Table 25. Student Education Aspirations (n = 74)		
	Before JSS	After JSS
Graduate from high school	11%	4%
Go to a trade or vocational school	0%	0%
Go to college for a little while	4%	3%
Finish college (get a Bachelor's degree)	43%	36%
Get more education after college	42%	57%

In terms of career aspirations, students were asked what kind of work they expect to be doing at age 30, both reflecting on what their aspirations were before participating in JSS and after JSS. Substantial portions of responding students expressed interest in STEM-related careers both before and after participating in JSS (see Table 26). For example, 18% indicated aspiring to a career in computer science before JSS, and 17% expressed interest in computer science after JSS. To examine whether the JSS program increased student interest in STEM-related careers, each career option was coded as being STEM related or non-STEM related. Although some students switched their aspirations from a non-STEM field to a STEM field, a similar proportion switched from STEM to non-STEM. Thus, there was not a statistically significant change in the proportion of students aspiring to a STEM-related career.

Table 26. Student Career Aspirations (n = 77)		
	Before JSS	After JSS
Computer science	18%	17%
Engineering	8%	13%
Medicine (e.g., doctor, dentist, veterinarian, etc.)	8%	6%
Technology	4%	6%
Military, police, or security	4%	5%
Science (no specific subject)	5%	4%
Physical science (e.g., physics, chemistry, astronomy, materials science)	3%	4%
Law	4%	3%
Biological science	3%	3%
Teaching, STEM	3%	3%
Teaching, non-STEM	4%	1%
Skilled trade (carpenter, electrician, plumber, etc.)	3%	1%
Mathematics or statistics	3%	1%
Art (e.g., writing, dancing, painting, etc.)	1%	1%
Business	1%	1%
Earth, atmospheric or oceanic science	1%	0%
Undecided	9%	12%
Other[†]	19%	18%

[†] Before, other includes "Aerospace design," "Architectural engineer," "Baseball" (n = 2), "Director," "Everything," "Foreign Diplomacy," "Game warden in Maine," "Marine Mammal Training," "Multimedia Artist and animator," "Music," "NFL," "Sports medicine," "State trooper," and

"Video game design." After, other includes "Aerospace design," "Architectural engineer," "Baseball" (n = 2), "Director," "Everything," "Game warden in Maine," "Marine Mammal Training," "Mechanical, electrical engineering," "Multimedia Artist and animator," "Music," "NFL," "Sports medicine," and "Video game design."

Students were also asked the extent to which they expect to use their STEM knowledge, skills, and/or abilities in their work when they are age 30. As can be seen in Table 27, almost all students expect to use STEM somewhat in their career. Nearly half expect to use STEM 76-100% of the time in their work, 23% expect to use STEM 51-75% of the time, and 19% expect to use STEM 26-50% of the time.

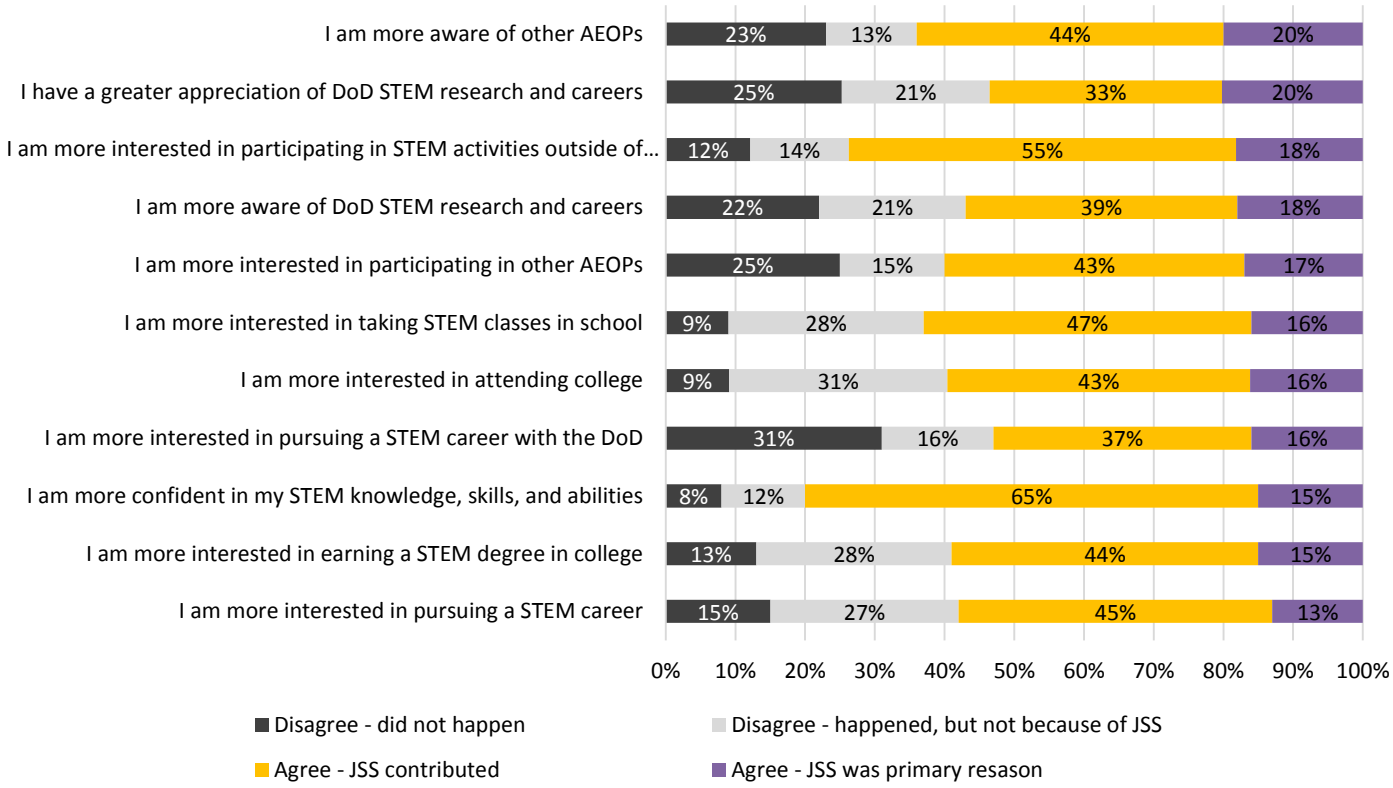
Table 27. Students Expecting to use STEM in Their Work at Age 30 (n = 73)	
	Questionnaire Respondents
Not at all	4%
Less than 25% of the time	4%
26% to 50% of the time	19%
51% to 75% of the time	23%
76% to 100% of the time	49%

Overall Impact

Lastly, students were asked about impacts of participating in JSS more broadly. From these data, it is clear that students thought the program had a substantial impact on them (see Chart 21). For example, a large majority of responding students indicated being more aware of other AEOPs, with 44% reporting that JSS contributed to this impact and another 20% reporting that JSS was the primary reason for this impact. Similarly, students reported greater appreciation of DoD STEM research and careers (33% reporting that JSS contributed, 20% reporting that JSS was primary reason), interest in participating in STEM activities outside of school (55% and 18%), and awareness of DoD STEM research and careers (39% and 18%). A composite was created from these items,[47] and scores were compared across sub-groups of students. There were no statistically significant differences by gender, race/ethnicity, FRL status, or school location. Mentors were also asked about impacts on students in these areas; in general, their reports of impacts were substantially higher than those of the students.

[47] The Cronbach's alpha reliability for these 11 items was 0.953.

Chart 21: Student Opinions of JSS Impacts (n = 72-76)



An open-ended item on the questionnaire asked students to list the three most important ways they benefited from the program; 70 students provided at least one answer to this question. More than half of the responding students (56%) wrote about STEM, either learning about STEM, becoming more interested in STEM, or learning STEM skills (e.g., "designing with CADD"). Half of the responding students listed social benefits of the program, usually citing an improvement in their teamwork skills. Several referred to STEM program and career awareness (17%), such as hearing about other AEOP opportunities and learning more about the DoD. Other benefits, each described by only a small number of students, included getting a chance to build something, having fun, and problem solving.

Student comments from the rapid interviews expand on some of these impacts. As three said:

> *It's a unique educational activity that allows you to put into practice all the methods you learn in school. You think, "When am I ever going to use this?" and you actually learn how you use it and participate in an enjoyable way.* (JSS Student)

> *"I think it was a good learning experience. I learned a lot about going back and fixing stuff, instead of just going on—just learning to take extra time."* -- JSS Student

I think it was a good learning experience. I learned a lot about going back and fixing stuff, instead of just going on—just learning to take extra time. (JSS Student)

It was very fun. We used a lot of teamwork and knowledge. For example, we had to know about friction, so we had to help each other out to figure out the design and…you get to work with your friends, and not like school where you have to study all the time. (JSS Student)

Summary of Findings

The FY14 evaluation of JSS 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 28.

Table 28. 2014 JSS Evaluation Findings	
Participant Profiles	
JSS has more work to do in terms of serving students of historically underrepresented and underserved populations.	• JSS has room to improve when it comes to attracting female participants—a population that is historically underrepresented and underserved in STEM fields. Student questionnaire respondents included more males (71%) than females (29%).
	• JSS had limited success in providing outreach to students from historically underrepresented and underserved races/ethnicities and low-income groups. Only a small percentage of questionnaire respondents identified as Black or African American (10%) or Hispanic or Latino (3%). Only 14% of students responding to the questionnaire reported qualifying for free or reduced-price lunch (FRL).
	• JSS served students across a range of school contexts. The vast majority of student questionnaire respondents attended public schools (97%). A third attended schools in urban or rural settings, which tend to have larger populations of students from underrepresented and underserved groups.
JSS engages a diverse group of adult participants as STEM mentors.	• In total, 341 adults, mostly teachers, were involved in JSS. Additional STEM professionals from a range of business sectors participated in career day activities at the TSA-hosted JSS sites.

Actionable Program Evaluation	
JSS uses multiple avenues to market the program.	• JSS employed multi-pronged efforts to market the program to and recruit students. These efforts included providing printed promotional materials to Army-hosted sites, the distribution of solar car kits to middle school TSA advisors and Army-hosted sites, and social media.
	• Students most frequently learned about JSS from the TSA website (72%); teachers/professors (54%); friends (28%); a school newsletter/email/website (15%); and past participants (13%).
JSS students are motivated by multiple factors.	• Students were most frequently motivated to participate in JSS by the desire to have fun (64%), because of their interest in STEM (62%), and because of teacher or professional encouragement (50%).
JSS engages students in meaningful STEM learning, through team-based and hands-on activities.	• Most students (55-59%) report communicating with other students about STEM and learning about new STEM topics on most days or every day of their JSS experience.
	• Most students had opportunities to engage in a variety of STEM practices during their JSS experience. For example, 81% reported working as part of a team, 67% building or simulating something, and 64% participating in hands-on activities on most days or every day.
	• Large proportions of mentors report using strategies to help make learning activities to students relevant, support the needs of diverse learners, develop students' collaboration and interpersonal skills, and engage students in "authentic" STEM activities.
JSS promotes DoD STEM research and careers at TSA-based sites but can improve marketing of other AEOP opportunities.	• Many mentors had a history of participating in other AEOPs besides JSS. In addition, although most students reported an increase in awareness of other AEOPs, a substantial proportion reported never hearing about any of the other programs. Mentors reported explicitly discussing only two other AEOP programs with students: eCYBERMISSION and GEMS.
	• TSA-based JSS sites offered a variety of activities for promoting STEM, including participation in STEM leadership activities and STEM breakouts at conferences. All of the three Army-based JSS sites engaged Army engineers and/or Army research facilities in their events. Two Army scientist and engineers participated in the national JSS event.
The JSS experience is greatly valued by students and mentors.	• All responding students indicated being satisfied with their JSS experience, highlighting the opportunity to learn about STEM and the chance to have fun.
	• The vast majority of responding mentors indicated having a positive experience. Further, many commented on the benefits the program provides students, including deepening their knowledge about STEM and their confidence.
Outcomes Evaluation	
JSS had positive impacts on students' STEM knowledge and competencies.	• A majority of students reported at least some gains in their knowledge of what everyday research work is like in STEM, research conducted in a STEM topic or field, a STEM topic or field in depth, how professionals work on real problems in

	STEM, and the research processes, ethics, and rules for conduct in STEM. Females reported greater gains in these areas than males.
	• Twenty-nine to 44% of responding students reported large or extreme gains in their abilities to do STEM, including such things as making a model that represents the key features or functions of an object, process, or system, communicating information about their investigations in different formats, applying knowledge, logic, and creativity to propose solutions that can be tested with investigations, and supporting a scientific explanation or engineering solution with relevant scientific, mathematical, and/or engineering knowledge. Female and minority students reported greater gains in these areas than males and non-minority students, respectively.
JSS had positive impacts on students' 21st Century Skills.	• A majority of students reported large or extreme gains in their 21st Century Skills, including their ability to work collaboratively with a team, sticking with a task until it is complete, and including others' perspectives when making a decision. Minority students and FRL-eligible students reported greater gains in these areas than non-minority/non-eligible students.
JSS positively impacted students' confidence and identity in STEM, as well as their interest in future STEM engagement.	• The majority of students reported a large or extreme gain in their confidence to do well in their ability to think creatively about a STEM project or activity (53%) and preparedness for more challenging STEM activities (52%). Slightly less than half reported a large or extreme gain in their sense of accomplishing something in STEM (46%), confidence to do well in future STEM courses (46%), and confidence to contribute to STEM (44%).
	• Students also reported on the likelihood that they would engage in additional STEM activities outside of school. A majority of students indicated that as a result of JSS they were more likely to tinker with mechanical or electrical devices, participate in a STEM club, association, or professional organization, take an elective STEM class, participate in a STEM camp, fair, or competition, and work on math/science puzzles.
JSS succeeded in raising students' education aspirations, though did not change their career aspirations.	• After participating in JSS, students indicated being more likely to go further in their schooling than they would have before JSS, with the greatest change being in the proportion of students who expected to continue their education beyond a Bachelor's degree (42% before JSS, 57% after).
	• Students were asked to indicate what kind of work they expected to be doing at age 30, and the data were coded as STEM-related or non-STEM-related. Although many students indicated interest in a STEM-related career, there was not a statistically significant difference from before JSS to after.
JSS students are largely unaware of AEOP initiatives, but students show substantial interest in future AEOP opportunities.	• Student were largely unaware of other AEOP initiatives, but 64% of students indicated that JSS made them more aware of other AEOPs, and 60% credited JSS with increasing their interest in participating in other programs.

JSS raised student awareness and appreciation of DoD STEM research and careers, as well as their interest in pursuing a STEM career with the DoD.	• A majority of students reported that they had a greater awareness (57%) and appreciation (53%) of DoD STEM research and careers. In addition, 53% indicated that JSS raised their interest in pursuing a STEM career with the DoD.

Recommendations

1. AEOP programs have the goal of broadening the talent pool in STEM fields, yet, overall, JSS continues to be challenged by attracting students from groups historically underrepresented and underserved in these fields. As was recommended in the 2013 evaluation report, the program may want to consider doing more to recruit students from schools serving historically underrepresented and underserved groups, and work towards increasing the likelihood that the program has a long-term impact on the number of students who pursue STEM, especially given the findings that females and minority students tended to report larger impacts of participation than males and non-minority students. As many students come to the program via state-level TSA competitions, it will be important to consider additional ways to reach out to a broader range of schools and students through both the TSA-hosted (as TSA structure allows) and Army-hosted events.

2. In order for students to progress from JSS into other AEOP programs, it will be necessary to provide opportunities for students see the connection between JSS and other AEOP programs as well as opportunities in Army/DoD STEM fields. In 2014, only a third of mentors recommended AEOPs to students that align with students' educational goals. In addition, mentors indicated explicitly discussing only two other AEOPs with students: eCYBERMISSION and GEMS. Although a recommendation was made in the 2013 report to increase students' exposure to other AEOP opportunities, no improvement was seen between 2013 and 2014. Further, although many students expressed interest in participating in other AEOP programs, a substantial proportion indicated having no interest. Given the proportion of students who reported learning about other AEOPs from the JSS program and their mentor, and that most mentors reported never hearing about most of the AEOPs, the program may want to work with each site to ensure that all students have access to structured opportunities that both describe the other AEOPs and provide information to students on how they can apply to them. In addition, given the limited use of the AEOP website, print materials, and social media, the program should consider how these materials could be adjusted to provide students with more information and facilitate their enrollment in other AEOPs.

3. Additional efforts should be undertaken to improve participation in evaluation activities, as the low response rates for both the student and mentor questionnaires raise questions about the representativeness of the results, especially across Army-hosted regional events and TSA-hosted regional events. Further, most of the respondents (73 of 78 students and 14 of 16 mentors) to the FY14 survey participated in the JSS national event at the National

TSA conference. Improved communication with the individual program sites about expectations for the evaluation may help. In addition, the evaluation instruments may need to be streamlined as perceived response burden can affect participation. In particular, consideration should be given to whether the parallel nature of the student and mentor questionnaires is necessary, with items being asked only of the most appropriate data source.

4. A number of students suggested the JSS program could be improved by clarifying rules and adding more guidance. Mentors also expressed a need for more resources to help students. To help ensure a high-quality experience across sites, the program should continue to clarify the existing rules and making them easier to interpret. In addition, participants would welcome additional resources, such as pictures/videos of cars from previous years' competitions to get a sense of the wide range of possibilities for a car's design. An easy-to-locate schedule for each event and stricter adherence to the schedule would also be appreciated.

Appendices

Appendix A

FY14 JSS Evaluation Plan

Purpose:

As per the approved FY14 AEOP APP, the external evaluation of JSS conducted by VT includes two post-program questionnaires:

1. AEOP Youth Questionnaire to be completed by student participants of the National TSA Conference JSS event and the three local Army-sponsored JSS events; and
2. AEOP Mentor Questionnaire to be completed by competition advisors, chaperones, or event organizers who supported students as they prepared for or participated in National TSA Conference JSS event and the three local Army-sponsored JSS events.

Questionnaires are the primary method of data collection for AEOP evaluation and collect information about participants' experiences with and perceptions of program resources, structures, and activities; potential benefits to participants; and strengths and areas of improvement for programs.

The questionnaires have been revised for FY14 to align with:

- Army's strategic plan and AEOP Priorities 1 (STEM Literate Citizenry), 2 (STEM Savvy Educators) *and* 3 (Sustainable Infrastructure);
- Federal guidance for evaluation of Federal STEM investments (e.g., inclusive of implementation and outcomes evaluation, and outcomes of STEM-specific competencies, transferrable competencies, attitudes about/identifying with STEM, future engagement in STEM-related activities, and educational/career pathways);
- Best practices and published assessment tools in STEM education, STEM informal/outreach, and the evaluation/ research communities;
- AEOP's vision to improve the quality of the data collected, focusing on changes in intended student outcomes and contributions of AEOPs like CQL effecting those changes.

The use of common questionnaires and sets of items that are appropriate across programs will allow for comparisons across AEOP programs and, if administered in successive years, longitudinal studies of students as they advance through pipelines within the AEOP. Because the questionnaires incorporate batteries of items from existing tools that have been validated in published research, external comparisons may also be possible.

All AEOPs are expected to administer the Youth and Mentor questionnaires provided for their program. Both the Youth and Mentor questionnaires have two versions, an "advanced" version (JSHS and apprenticeship programs) or a "basic" version (all other programs). The same basic set of items are used in both, with slightly modified items and/or additional items used in the advanced version. Additionally, the surveys are customized to gather information specific structures, resources, and activities of programs.

Site Visits/Onsite Focus Groups

Purpose:
As per the approved FY14 AEOP APP, the external evaluation of JSS conducted by VT includes site visits/onsite focus groups at the National TSA Conference JSS event; additionally, evaluators will attend one National Capitol Region Army-sponsored event (e.g., June 7 event at APG.)

Site visits provide the VT evaluation team with first-hand opportunities to speak with students and their mentors. We are able to observe the AEOPs in action. The information gleaned from these visits assists us in illustrating and more deeply understanding the findings of other data collected (from questionnaires). In total, VT's findings are used to highlight program successes and inform program changes so that the AEOPs can be even better in the future.

Evaluation Activities during JSS Site Visits:

- One or two 45 minute focus group with 6-8 youth participants;
- One 45-minute focus group with 6-8 mentors;
- 30-60 minutes to observe your program (specifically, to see students engaged in program activities, preferably with their mentors); and
- 10-15 minute transitions between each evaluation activity for moving groups in and out and providing evaluators with time to organize paperwork and take nature breaks.
- Evaluators may also conduct rapid (3-5 minute) interviews with a random sampling of participants.

Data Analyses
Quantitative and qualitative data were compiled and analyzed after all data collection concluded. Evaluators summarized quantitative data with descriptive statistics such as numbers of respondents, frequencies and proportions of responses, average response when responses categories are assigned to a 6-point scale (e.g., 1 = "Strongly Disagree" to 6 = "Strongly Agree"), and standard deviations. Emergent coding was used for the qualitative data to identify the most common themes in responses.

Evaluators conducted inferential statistics to study any differences among participant groups (e.g., by gender or race/ethnicity) that could indicate inequities in the JSS program. Statistical significance indicates whether a result is unlikely to be due to chance alone. Statistical significance was determined with t-tests, chi-square tests, and various non-parametric tests as appropriate, with significance defined at $p < 0.05$. Because statistical significance is sensitive to the number of respondents, it is more difficult to detect significant changes with small numbers of respondents. Practical significance, also known as effect size, indicates the magnitude of an effect, and is typically reported when differences are statistically significant. The formula for effect sizes depends on the type of statistical test used, and is specified, along with generally accepted rules of thumb for interpretation, in the body of the report.

Appendix B

FY14 JSS Student Questionnaire and Data Summaries

2014 Junior Solar Sprint (JSS): JSS youth Survey

Virginia Tech conducts program evaluation on behalf of the [IPA] and U.S. Army to determine how well the Army Educational Outreach Programs (AEOP) is achieving its goals of promoting student interest and engagement in science, technology, engineering, and mathematics (STEM). As part of this study Virginia Tech is surveying students (like you) who have participated in an AEOP program. The survey will collect information about you, your experiences in school, and your experiences in the AEOP program you just completed or will soon complete.

About this survey:

- While this survey is not anonymous, your responses are CONFIDENTIAL. When analyzing data and reporting results, your name will not be linked to any item responses or any comments you make.
- Responding to this survey is VOLUNTARY. You are not required to participate, although we hope you do because your responses will provide valuable information for meaningful and continuous improvement.
- If you provide your email address, the AEOP may contact you in the future to ask about your academic and career success.

If you have any additional questions or concerns, please contact one of the following people:

Tanner Bateman, Virginia Tech
Senior Project Associate, AEOPCA
(540) 231-4540, tbateman@vt.edu

Rebecca Kruse, Virginia Tech
Evaluation Director, AEOPCA
(703) 336-7922, rkruse75@vt.edu

If you are 17 and under, your parent/guardian provided permission for you to participate in the evaluation study when they authorized your participation in the AEOP program you just completed or will soon complete.

Q1. Do you agree to participate in this survey? (required)

❍ Yes, I agree to participate in this survey
❍ No, I do not wish to participate in this survey **If selected, respondent will be directed to the end of the survey**

Q2. Please provide your personal information below:

First Name: _____
Last Name: _____

Q3. What is your email address? (optional)

Email: _____

Q4. So that we can determine how diverse students respond to participation in AEOP programs please tell us about yourself and your school. What grade will you start in the fall? (select one)

- ❍ 4th
- ❍ 5th
- ❍ 6th
- ❍ 7th
- ❍ 8th
- ❍ 9th
- ❍ 10th
- ❍ 11th
- ❍ 12th
- ❍ College freshman
- ❍ College sophomore
- ❍ College junior
- ❍ College senior
- ❍ Graduate program
- ❍ Other (specify): _____
- ❍ Choose not to report

Q5. What is your gender?

- ❍ Male
- ❍ Female
- ❍ Choose not to report

Q6. What is your race or ethnicity?

- ❍ Hispanic or Latino
- ❍ Asian
- ❍ Black or African American
- ❍ Native American or Alaska Native
- ❍ Native Hawaiian or Other Pacific Islander
- ❍ White
- ❍ Other race or ethnicity (specify): _____
- ❍ Choose not to report

Q7. Do you qualify for free or reduced lunches at school? **Only presented to those who responded with grades 4 – college freshman on Q4**

- ❍ Yes
- ❍ No
- ❍ Choose not to report

Q8. Which best describes the location of your school? **Only presented to those who responded with grades 4 – college freshman on Q4**

- ❍ Frontier or tribal school
- ❍ Rural (country)
- ❍ Suburban

❍ Urban (city)

Q9. What kind of school do you attend? **Only presented to those who responded with grades 4 – college freshman on Q4**

❍ Public school
❍ Private school
❍ Home school
❍ Online school
❍ Department of Defense school (DoDDS or DoDEA)

Q10. Which JSS event(s) did you attend? (Check all that apply)

❑ AMRDEC at Redstone Arsenal (Huntsville, AL) - May 17th, 2014
❑ ARDEC at Picatinny Arsenal (New Jersey) - May 19th, 2014
❑ ARDEC at Aberdeen Proving Ground (Aberdeen, MD) - June 7th, 2014
❑ TSA National Conference (Washington, DC) - June 27 through July 1st, 2014
❑ Other, (specify): _____

Q11. How did you learn about JSS? (Check all that apply)

❑ Technology Student Association website
❑ Army Educational Outreach Program (AEOP) website
❑ Facebook, Twitter, Pinterest, or other social media
❑ School or university newsletter, email, or website
❑ News story or other media coverage
❑ Past participant of JSS
❑ Friend
❑ Immediate family member (mother, father, siblings)
❑ Extended family member (grandparents, aunts, uncles, cousins)
❑ Friend of the family
❑ Teacher or professor
❑ Guidance counselor
❑ Mentor from JSS
❑ Someone who works at an Army laboratory
❑ Someone who works with the Department of Defense
❑ Other, (specify): _____

Q12. How motivating were the following factors in your decision to participate in JSS?

	Not at all	A little	Somewhat	Very much
Teacher or professor encouragement	❍	❍	❍	❍
An academic requirement or school grade	❍	❍	❍	❍
Desire to learn something new or interesting	❍	❍	❍	❍
The program mentor(s)	❍	❍	❍	❍

Building college application or Résumé	❍	❍	❍	❍
Networking opportunities	❍	❍	❍	❍
Interest in science, technology, engineering, or mathematics (STEM)	❍	❍	❍	❍
Interest in STEM careers with the Army	❍	❍	❍	❍
Having fun	❍	❍	❍	❍
Earning stipend or award while doing STEM	❍	❍	❍	❍
Opportunity to do something with friends	❍	❍	❍	❍
Opportunity to use advanced laboratory technology	❍	❍	❍	❍
Desire to expand laboratory or research skills	❍	❍	❍	❍
Learning in ways that are not possible in school	❍	❍	❍	❍
Serving the community or country	❍	❍	❍	❍
Parent encouragement	❍	❍	❍	❍
Exploring a unique work environment	❍	❍	❍	❍
Other, (specify)	❍	❍	❍	❍

Q13. How often do you do each of the following <u>in STEM classes at school</u> this year?

	Not at all	At least once	A few times	Most days	Every day
Learn about new science, technology, engineering, or mathematics (STEM) topics	❍	❍	❍	❍	❍
Apply STEM knowledge to real life situations	❍	❍	❍	❍	❍
Learn about cutting-edge STEM research	❍	❍	❍	❍	❍
Learn about different STEM careers	❍	❍	❍	❍	❍
Interact with STEM professionals	❍	❍	❍	❍	❍

Q14. How often did you do each of the following <u>in JSS</u> this year?

	Not at all	At least once	A few times	Most days	Every day
Learn about new science, technology, engineering, or mathematics (STEM) topics	❍	❍	❍	❍	❍
Apply STEM knowledge to real life situations	❍	❍	❍	❍	❍
Learn about cutting-edge STEM research	❍	❍	❍	❍	❍
Learn about different STEM careers	❍	❍	❍	❍	❍
Interact with STEM professionals	❍	❍	❍	❍	❍

Q15. How often do you do each of the following in STEM classes at school this year?

	Not at all	At least once	A few times	Most days	Every day
Practice using laboratory or field techniques, procedures, and tools	❍	❍	❍	❍	❍
Participate in hands-on STEM activities	❍	❍	❍	❍	❍
Work as part of a team	❍	❍	❍	❍	❍
Communicate with other students about STEM	❍	❍	❍	❍	❍

Q16. How often did you do each of the following in JSS this year?

	Not at all	At least once	A few times	Most days	Every day
Practice using laboratory or field techniques, procedures, and tools	❍	❍	❍	❍	❍
Participate in hands-on STEM activities	❍	❍	❍	❍	❍
Work as part of a team	❍	❍	❍	❍	❍
Communicate with other students about STEM	❍	❍	❍	❍	❍

Q17. How often do you do each of the following in STEM classes at school this year?

	Not at all	At least once	A few times	Most days	Every day
Pose questions or problems to investigate	❍	❍	❍	❍	❍
Design an investigation	❍	❍	❍	❍	❍
Carry out an investigation	❍	❍	❍	❍	❍
Analyze and interpret data or information	❍	❍	❍	❍	❍
Draw conclusions from an investigation	❍	❍	❍	❍	❍
Come up with creative explanations or solutions	❍	❍	❍	❍	❍
Build (or simulate) something	❍	❍	❍	❍	❍

Q18. How often did you do each of the following in JSS this year?

	Not at all	At least once	A few times	Most days	Every day
Pose questions or problems to investigate	❍	❍	❍	❍	❍
Design an investigation	❍	❍	❍	❍	❍
Carry out an investigation	❍	❍	❍	❍	❍
Analyze and interpret data or information	❍	❍	❍	❍	❍

Draw conclusions from an investigation	❍	❍	❍	❍	❍
Come up with creative explanations or solutions	❍	❍	❍	❍	❍
Build (or simulate) something	❍	❍	❍	❍	❍

Q19. The list below describes instructional and mentoring strategies that are effective ways to support STEM learners. From the list below, please indicate which strategies that your mentor(s) used when working directly with you in JSS.

	No - my mentor(s) did not use this strategy with me	Yes - my mentor(s) used this strategy with me
Helped me become aware of the roles STEM play in my everyday life	❍	❍
Helped me understand how STEM can help me improve my community	❍	❍
Used teaching/mentoring activities that addressed my learning style	❍	❍
Provided me with extra support when I needed it	❍	❍
Encouraged me to exchange ideas with others whose backgrounds or viewpoints are different from mine	❍	❍
Allowed me to work on a collaborative project as a member of a team	❍	❍
Helped me practice a variety of STEM skills with supervision	❍	❍
Gave me constructive feedback to improve my STEM knowledge, skills, or abilities	❍	❍
Gave me guidance about educational pathways that would prepare me for a STEM career	❍	❍
Recommended Army Educational Outreach Programs that match my interests	❍	❍
Discussed STEM career opportunities with DoD or other government agencies	❍	❍

Q20. Rate how the following items impacted your awareness of Army Educational Outreach Programs (AEOPs) during JSS:

	Did not experience	Not at all	A little	Somewhat	Very much
Junior Solar Sprint (JSS) website	❍	❍	❍	❍	❍
Army Educational Outreach Program (AEOP) website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat, etc.)	❍	❍	❍	❍	❍
My mentor(s)	❍	❍	❍	❍	❍

Invited speakers or "career" events	❍	❍	❍	❍	❍
Participation in JSS event(s)	❍	❍	❍	❍	❍

Q21. Rate how the following items impacted your awareness of Department of Defense (DoD) STEM careers during JSS:

	Did not experience	Not at all	A little	Somewhat	Very much
Junior Solar Sprint (JSS) website	❍	❍	❍	❍	❍
Army Educational Outreach Program (AEOP) website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat, etc.)	❍	❍	❍	❍	❍
My mentor(s)	❍	❍	❍	❍	❍
Invited speakers or "career" events	❍	❍	❍	❍	❍
Participation in JSS event(s)	❍	❍	❍	❍	❍

Q22. How SATISFIED were you with each of the following for Junior Solar Sprint (JSS) at the National TSA Conference?

	Did not experience	Not at all	A little	Somewhat	Very much
Communications from Technology Student Association	❍	❍	❍	❍	❍
JSS application or registration process through TSA	❍	❍	❍	❍	❍
Time and location of JSS event at TSA National Conference	❍	❍	❍	❍	❍
Army Educational Outreach Program (AEOP) Special Interest Session	❍	❍	❍	❍	❍
Army JSS welcome dinner — Saturday	❍	❍	❍	❍	❍
JSS time trials — Sunday	❍	❍	❍	❍	❍
JSS finals — Monday	❍	❍	❍	❍	❍
JSS display viewing — Monday	❍	❍	❍	❍	❍
JSS judging process and feedback	❍	❍	❍	❍	❍
JSS competition awards	❍	❍	❍	❍	❍
Overall satisfaction with TSA National Conference JSS event	❍	❍	❍	❍	❍

Q23. How SATISFIED were you with each of the following Junior Solar Sprint (JSS) at the Army-hosted event you attended? If you did not attend one of the three Army-hosted JSS events, leave this section BLANK.

	Did not experience	Not at all	A little	Somewhat	Very much
Communications from Army organizer about JSS	❍	❍	❍	❍	❍
JSS application or registration process through Army organizer	❍	❍	❍	❍	❍
Time and location of Army JSS event	❍	❍	❍	❍	❍
Army speaker or "career" event	❍	❍	❍	❍	❍
JSS car racing	❍	❍	❍	❍	❍
JSS judging process and feedback	❍	❍	❍	❍	❍
JSS competition awards	❍	❍	❍	❍	❍
Overall satisfaction with Army JSS event	❍	❍	❍	❍	❍

Q24. How USEFUL were each of the following JSS resources provided at jrsolarsprint.org?

	Did Not Experience	Not at all	A little	Somewhat	Very much
Official TSA Competition Rules	❍	❍	❍	❍	❍
Local Competition Rules	❍	❍	❍	❍	❍
Build A Car Resources	❍	❍	❍	❍	❍
JSS Terminology	❍	❍	❍	❍	❍
Video Tutorials	❍	❍	❍	❍	❍
Calendar of Events	❍	❍	❍	❍	❍

Q25. Which JSS resources were MOST USEFUL for your participation in JSS? Why?

Q26. What resources could be IMPROVED OR ADDED to better support your participation in JSS? How would these changes better support your participation?

Q27. Which category best describes the focus of your JSS experience?

- ❍ Science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics

Q28. AS A RESULT OF YOUR JSS EXPERIENCE, how much did you GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Knowledge of a STEM topic or field in depth	❍	❍	❍	❍	❍
Knowledge of research conducted in a STEM topic or field	❍	❍	❍	❍	❍
Knowledge of research processes, ethics, and rules for conduct in STEM	❍	❍	❍	❍	❍
Knowledge of how professionals work on real problems in STEM	❍	❍	❍	❍	❍
Knowledge of what everyday research work is like in STEM	❍	❍	❍	❍	❍

Q29. AS A RESULT OF YOUR JSS EXPERIENCE, how much did you GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Asking a question that can be answered with one or more investigations	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	❍	❍	❍	❍	❍
Making a model to represent the key features and functions of an object, process, or system	❍	❍	❍	❍	❍
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	❍	❍	❍	❍	❍
Carrying out procedures for an investigation and recording data accurately	❍	❍	❍	❍	❍
Considering different ways to analyze or interpret data when answering a question	❍	❍	❍	❍	❍
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics or computers to analyze numeric data	❍	❍	❍	❍	❍
Supporting a scientific explanation or engineering solution with data from investigations	❍	❍	❍	❍	❍
Supporting a scientific explanation or engineering solution with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍

Communicating information about your investigations in different formats (orally, written, graphically, mathematically, etc.)	❍	❍	❍	❍	❍

Q30. AS A RESULT OF YOUR JSS EXPERIENCE, how much did you GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Sticking with a task until it is complete	❍	❍	❍	❍	❍
Making changes when things do not go as planned	❍	❍	❍	❍	❍
Working collaboratively with a team	❍	❍	❍	❍	❍
Communicating effectively with others	❍	❍	❍	❍	❍
Including others' perspectives when making decisions	❍	❍	❍	❍	❍
Sense of being part of a learning community	❍	❍	❍	❍	❍
Building relationships with professionals in a field	❍	❍	❍	❍	❍
Connecting a topic or field and your personal values	❍	❍	❍	❍	❍

Q31. AS A RESULT OF YOUR JSS EXPERIENCE, how much did you GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Interest in a new STEM topic or field	❍	❍	❍	❍	❍
Clarifying a STEM career path	❍	❍	❍	❍	❍
Sense of accomplishing something in STEM	❍	❍	❍	❍	❍
Building academic credentials in STEM	❍	❍	❍	❍	❍
Feeling prepared for more challenging STEM activities	❍	❍	❍	❍	❍
Confidence to do well in future STEM courses	❍	❍	❍	❍	❍
Confidence to contribute to STEM	❍	❍	❍	❍	❍
Thinking creatively about a STEM project or activity	❍	❍	❍	❍	❍

Q32. AS A RESULT OF YOUR JSS EXPERIENCE, how much MORE or LESS likely are you to engage in the following activities in science, technology, engineering, or mathematics (STEM) outside of school requirements or activities?

	Much less likely	Less likely	About the same before and after	More likely	Much more likely
Visit a science museum or zoo	❍	❍	❍	❍	❍
Watch or read non-fiction STEM	❍	❍	❍	❍	❍
Look up STEM information at a library or on the internet	❍	❍	❍	❍	❍

Tinker (play) with a mechanical or electrical device	❍	❍	❍	❍	❍
Work on solving mathematical or scientific puzzles	❍	❍	❍	❍	❍
Design a computer program or website	❍	❍	❍	❍	❍
Observe things in nature (plant growth, animal behavior, stars or planets, etc.)	❍	❍	❍	❍	❍
Talk with friends or family about STEM	❍	❍	❍	❍	❍
Mentor or teach other students about STEM	❍	❍	❍	❍	❍
Help with a community service project that relates to STEM	❍	❍	❍	❍	❍
Participate in a STEM club, student association, or professional organization	❍	❍	❍	❍	❍
Participate in STEM camp, fair, or competition	❍	❍	❍	❍	❍
Take an elective (not required) STEM class	❍	❍	❍	❍	❍
Work on a STEM project or experiment in a university or professional setting	❍	❍	❍	❍	❍
Receive an award or special recognition for STEM accomplishments	❍	❍	❍	❍	❍

Q33. How far did you want to go in school BEFORE participating in JSS?

❍ Graduate from high school
❍ Go to a trade or vocational school
❍ Go to college for a little while
❍ Finish college (get a Bachelor's degree)
❍ Get more education after college

Q34. How far do you want to go in school AFTER participating in JSS?

❍ Graduate from high school
❍ Go to a trade or vocational school
❍ Go to college for a little while
❍ Finish college (get a Bachelor's degree)
❍ Get more education after college

Q35. BEFORE JSS, what kind of work did you expect to be doing when you are 30 years old? (select the ONE answer that best describes your career goals BEFORE JSS)

❍ Undecided
❍ Science (no specific subject)
❍ Physical science (physics, chemistry, astronomy, materials science)
❍ Biological science
❍ Earth, atmospheric or oceanic science
❍ Agricultural science
❍ Environmental science
❍ Computer science
❍ Technology
❍ Engineering

- ❍ Mathematics or statistics
- ❍ Teaching, STEM
- ❍ Teaching, non-STEM
- ❍ Medicine (doctor, dentist, veterinarian, etc.)
- ❍ Health (nursing, pharmacy, technician, etc.)
- ❍ Social science (psychologist, sociologist)
- ❍ Business
- ❍ Law
- ❍ English/language arts
- ❍ Farming
- ❍ Military, police, or security
- ❍ Art (writing, dancing, painting, etc.)
- ❍ Skilled trade (carpenter, electrician, plumber, etc.)
- ❍ Other, (specify): _____

Q36. AFTER JSS, what kind of work do you expect to be doing when you are 30 years old? (select the ONE answer that best describes your career AFTER JSS)

- ❍ Undecided
- ❍ Science (no specific subject)
- ❍ Physical science (physics, chemistry, astronomy, materials science)
- ❍ Biological science
- ❍ Earth, atmospheric or oceanic science
- ❍ Agricultural science
- ❍ Environmental science
- ❍ Computer science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics or statistics
- ❍ Teaching, STEM
- ❍ Teaching, non-STEM
- ❍ Medicine (doctor, dentist, veterinarian, etc.)
- ❍ Health (nursing, pharmacy, technician, etc.)
- ❍ Social science (psychologist, sociologist)
- ❍ Business
- ❍ Law
- ❍ English/language arts
- ❍ Farming
- ❍ Military, police, or security
- ❍ Art (writing, dancing, painting, etc.)
- ❍ Skilled trade (carpenter, electrician, plumber, etc.)
- ❍ Other, (specify): _____

Q37. When you are 30, to what extent do you expect to use your STEM knowledge, skills, and/or abilities in your work?

- ❍ not at all
- ❍ less than 25% of the time
- ❍ 26% to 50% of the time

- 51% to 75% of the time
- 76% to 100% of the time

Q38. How many times have you participated in any of the following Army Educational Outreach Programs (AEOPs)? If you have heard of an AEOP but never participated select "Never". If you have not heard of an AEOP select "Never heard of it".

	Never	Once	Twice	Three or more times	Never heard of it
Camp Invention	❍	❍	❍	❍	❍
eCYBERMISSION	❍	❍	❍	❍	❍
Junior Solar Sprint (JSS)	❍	❍	❍	❍	❍
West Point Bridge Design Contest (WPBDC)	❍	❍	❍	❍	❍
Junior Science & Humanities Symposium (JSHS)	❍	❍	❍	❍	❍
Gains in the Education of Mathematics and Science (GEMS)	❍	❍	❍	❍	❍
GEMS Near Peers	❍	❍	❍	❍	❍
UNITE	❍	❍	❍	❍	❍
Science & Engineering Apprenticeship Program (SEAP)	❍	❍	❍	❍	❍
Research & Engineering Apprenticeship Program (REAP)	❍	❍	❍	❍	❍
High School Apprenticeship Program (HSAP)	❍	❍	❍	❍	❍
College Qualified Leaders (CQL)	❍	❍	❍	❍	❍
Undergraduate Research Apprenticeship Program (URAP)	❍	❍	❍	❍	❍
Science Mathematics, and Research for Transformation (SMART) College Scholarship	❍	❍	❍	❍	❍
National Defense Science & Engineering Graduate (NDSEG) Fellowship	❍	❍	❍	❍	❍

Q39. How interested are you in participating in the following programs in the future?

	Not at all	A little	Somewhat	Very much
Camp Invention	❍	❍	❍	❍
eCYBERMISSION	❍	❍	❍	❍
Junior Solar Sprint (JSS)	❍	❍	❍	❍
West Point Bridge Design Contest (WPBDC)	❍	❍	❍	❍
Junior Science & Humanities Symposium (JSHS)	❍	❍	❍	❍
Gains in the Education of Mathematics and Science (GEMS)	❍	❍	❍	❍
GEMS Near Peers	❍	❍	❍	❍
UNITE	❍	❍	❍	❍
Science & Engineering Apprenticeship Program (SEAP)	❍	❍	❍	❍
Research & Engineering Apprenticeship Program (REAP)	❍	❍	❍	❍
High School Apprenticeship Program (HSAP)	❍	❍	❍	❍
College Qualified Leaders (CQL)	❍	❍	❍	❍
Undergraduate Research Apprenticeship Program (URAP)	❍	❍	❍	❍
Science Mathematics, and Research for Transformation (SMART) College Scholarship	❍	❍	❍	❍
National Defense Science & Engineering Graduate (NDSEG) Fellowship	❍	❍	❍	❍

Q40. How many jobs/careers in science, technology, engineering, or math (STEM) did you learn about during JSS?

❍ None
❍ 1
❍ 2
❍ 3
❍ 4
❍ 5 or more

Q41. How many Department of Defense (DoD) STEM jobs/careers did you learn about during JSS?

❍ None
❍ 1
❍ 2
❍ 3
❍ 4
❍ 5 or more

Q42. Rate how much you agree or disagree with each of the following statements about Department of Defense (DoD) researchers and research:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
DoD researchers advance science and engineering fields	❍	❍	❍	❍	❍
DoD researchers develop new, cutting edge technologies	❍	❍	❍	❍	❍
DoD researchers support non-defense related advancements in science and technology	❍	❍	❍	❍	❍
DoD researchers solve real-world problems	❍	❍	❍	❍	❍
DoD research is valuable to society	❍	❍	❍	❍	❍

Q43. Which of the following statements describe you AFTER PARTICIPATING IN THE JSS PROGRAM?

	Disagree - This did not happen	Disagree - This happened but not because of JSS	Agree - JSS contributed	Agree - JSS was primary reason
I am more confident in my STEM knowledge, skills, and abilities	❍	❍	❍	❍
I am more interested in participating in STEM activities outside of school requirements	❍	❍	❍	❍
I am more aware of other AEOPs	❍	❍	❍	❍
I am more interested in participating in other AEOPs	❍	❍	❍	❍
I am more interested in taking STEM classes in school	❍	❍	❍	❍
I am more interested in attending college	❍	❍	❍	❍
I am more interested in earning a STEM degree in college	❍	❍	❍	❍
I am more interested in pursuing a STEM career	❍	❍	❍	❍
I am more aware of DoD STEM research and careers	❍	❍	❍	❍
I have a greater appreciation of DoD STEM research and careers	❍	❍	❍	❍
I am more interested in pursuing a STEM career with the DoD	❍	❍	❍	❍

Q44. What are the three most important ways that you have benefited from JSS?

Benefit #1:

Benefit #2:

Benefit #3:

45. What are the three ways that JSS should be improved for future participants?

Improvement #1:

Improvement #2:

Improvement #3:

Q46. Tell us about your overall satisfaction with your JSS experience.

JSS Youth Data Summary

So that we can determine how diverse students respond to participation in AEOP programs, please tell us about yourself and your school. What grade will you start in the fall? (select one) (Avg. = 5.24, SD =)		
	Freq.	**%**
4th	0	0%
5th	0	0%
6th	1	1%
7th	13	17%
8th	38	49%
9th	26	33%
10th	0	0%
11th	0	0%
12th	0	0%
Other, (specify):	0	0%
Choose not to report	0	0%
Total	**78**	**100%**

What is your gender?		
	Freq.	**%**
Male	55	71%
Female	23	29%
Choose not to report	0	0%
Total	**78**	**100%**

What is your race or ethnicity?		
	Freq.	**%**
Hispanic or Latino	2	3%
Asian	8	10%
Black or African American	8	10%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	54	69%
Other race or ethnicity, (specify):	5	6%

Choose not to report	1	1%
Total	**78**	**100%**

Do you qualify for free or reduced lunches at school?		
	Freq.	**%**
Yes	11	14%
No	61	78%
Choose not to report	6	8%
Total	**78**	**100%**

Which best describes the location of your school?		
	Freq.	**%**
Frontier or tribal school	0	0%
Rural (country)	9	12%
Suburban	51	66%
Urban (city)	17	22%
Total	**77**	**100%**

What kind of school do you attend?		
	Freq.	**%**
Public school	75	97%
Private school	2	3%
Home school	0	0%
Online school	0	0%
Department of Defense school (DoDDS or DoDEA)	0	0%
Total	**77**	**100%**

Which JSS event(s) did you attend? (Check all that apply)		
	Freq.	**%**
AMRDEC at Redstone Arsenal (Huntsville, AL) - May 17th, 2014	1	1%
ARDEC at Picatinny Arsenal (New Jersey) - May 19th, 2014	2	3%

ARDEC at Aberdeen Proving Ground (Aberdeen, MD) - June 7th, 2014	3	4%
TSA National Conference (Washington, DC) - June 27 through July 1st, 2014	73	92%
Other, (specify):	0	0%
Total	**79**	**100%**

How did you learn about JSS? (Check all that apply)

	Freq.	%		Freq.	%
Technology Student Association website	56	72%	**Extended family member (grandparents, aunts, uncles, cousins)**	0	0%
Army Educational Outreach Program (AEOP) website	1	1%	**Friend of the family**	2	3%
Facebook, Twitter, Pinterest, or other social media	2	3%	**Teacher or professor**	42	54%
School or university newsletter, email, or website	12	15%	**Guidance counselor**	2	3%
News story or other media coverage	0	0%	**Mentor from JSS**	4	5%
Past participant of JSS	10	13%	**Someone who works at an Army laboratory**	0	0%
Friend	22	28%	**Someone who works with the Department of Defense**	0	0%
Immediate family member (mother, father, siblings)	4	5%	**Other, (specify):**	3	4%
			Total	**160**	**100%**

Note. "Other" includes Adviser, Chapter Adviser, and TSA Group.

How motivating were the following factors in your decision to participate in JSS?

	1	2	3	4	n	Avg.	SD
Teacher or professor encouragement	7 (9%)	10 (13%)	22 (28%)	39 (50%)	78	3.19	0.98
An academic requirement or school grade	52 (68%)	9 (12%)	10 (13%)	6 (8%)	77	1.61	0.99
Desire to learn something new or interesting	8 (10%)	9 (12%)	26 (34%)	34 (44%)	77	3.12	0.99
The program mentor(s)	28 (36%)	21 (27%)	14 (18%)	14 (18%)	77	2.18	1.12
Building college application or Résumé	35 (45%)	14 (18%)	13 (17%)	16 (21%)	78	2.13	1.20
Networking opportunities	40 (51%)	16 (21%)	12 (15%)	10 (13%)	78	1.90	1.09
Interest in science, technology, engineering, or mathematics (STEM)	2 (3%)	8 (10%)	18 (23%)	49 (64%)	77	3.48	0.79
Interest in STEM careers with the Army	34 (44%)	21 (27%)	16 (21%)	7 (9%)	78	1.95	1.01

Having fun	2 (3%)	8 (10%)	18 (23%)	50 (64%)	78	3.49	0.79
Earning stipend or award while doing STEM	58 (74%)	10 (13%)	6 (8%)	4 (5%)	78	1.44	0.85
Opportunity to do something with friends	6 (8%)	23 (29%)	22 (28%)	27 (35%)	78	2.90	0.97
Opportunity to use advanced laboratory technology	26 (34%)	14 (18%)	19 (25%)	17 (22%)	76	2.36	1.17
Desire to expand laboratory or research skills	18 (23%)	20 (26%)	25 (32%)	14 (18%)	77	2.45	1.05
Learning in ways that are not possible in school	14 (18%)	21 (27%)	20 (26%)	23 (29%)	78	2.67	1.09
Serving the community or country	29 (37%)	26 (33%)	15 (19%)	8 (10%)	78	2.03	0.99
Parent encouragement	26 (33%)	16 (21%)	16 (21%)	20 (26%)	78	2.38	1.20
Exploring a unique work environment	20 (26%)	19 (24%)	21 (27%)	18 (23%)	78	2.47	1.11
Other, (specify)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	39	3.19	0.98

Note. Response scale: **1** = "Not at all," **2** = "A little," **3** = "Somewhat," **4** = "Very much". "Other" responses include "TSA event" and "Love for engineering."

How often do you do each of the following in STEM classes at school this year?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Learn about new science, technology, engineering, or mathematics (STEM) topics	1 (1%)	6 (8%)	19 (25%)	28 (37%)	22 (29%)	76	3.84	0.98
Apply STEM knowledge to real life situations	7 (9%)	11 (15%)	24 (32%)	15 (20%)	18 (24%)	75	3.35	1.26
Learn about cutting-edge STEM research	13 (17%)	9 (12%)	32 (43%)	14 (19%)	7 (9%)	75	2.91	1.18
Learn about different STEM careers	6 (8%)	18 (24%)	27 (36%)	12 (16%)	13 (17%)	76	3.11	1.18
Interact with STEM professionals	28 (37%)	20 (26%)	15 (20%)	5 (7%)	8 (11%)	76	2.28	1.31

Note. Response scale: **1** = "Not at all," **2** = "At least once," **3** = "A few times," **4** = "Most days," **5** = "Every day".

How often do you do each of the following in JSS this year?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Learn about new science, technology, engineering, or mathematics (STEM) topics	7 (9%)	9 (12%)	15 (20%)	32 (42%)	13 (17%)	76	3.46	1.18
Apply STEM knowledge to real life situations	4 (5%)	15 (20%)	20 (26%)	20 (26%)	17 (22%)	76	3.41	1.19
Learn about cutting-edge STEM research	19 (25%)	12 (16%)	20 (27%)	16 (21%)	8 (11%)	75	2.76	1.33
Learn about different STEM careers	17 (22%)	20 (26%)	17 (22%)	14 (18%)	8 (11%)	76	2.68	1.30
Interact with STEM professionals	39 (51%)	13 (17%)	9 (12%)	10 (13%)	5 (7%)	76	2.07	1.33

Note. Response scale: **1** = "Not at all," **2** = "At least once," **3** = "A few times," **4** = "Most days," **5** = "Every day".

How often do you do each of the following in STEM classes at school this year?								
	1	2	3	4	5	n	Avg.	SD
Practice using laboratory or field techniques, procedures, and tools	9 (12%)	8 (11%)	24 (32%)	20 (26%)	15 (20%)	76	3.32	1.25
Participate in hands-on STEM activities	7 (9%)	10 (13%)	16 (21%)	22 (29%)	21 (28%)	76	3.53	1.28
Work as part of a team	7 (9%)	2 (3%)	13 (17%)	27 (36%)	27 (36%)	76	3.86	1.21
Communicate with other students about STEM	8 (11%)	11 (14%)	21 (28%)	16 (21%)	20 (26%)	76	3.38	1.31

Note. Response scale: **1** = "Not at all," **2** = "At least once," **3** = "A few times," **4** = "Most days," **5** = "Every day".

How often do you do each of the following in JSS this year?								
	1	2	3	4	5	n	Avg.	SD
Practice using laboratory or field techniques, procedures, and tools	6 (8%)	9 (12%)	17 (22%)	25 (33%)	19 (25%)	76	3.55	1.22
Participate in hands-on STEM activities	6 (8%)	8 (11%)	14 (18%)	21 (28%)	27 (36%)	76	3.72	1.27
Work as part of a team	2 (3%)	4 (5%)	8 (11%)	17 (22%)	45 (59%)	76	4.3	1.03
Communicate with other students about STEM	5 (7%)	7 (9%)	22 (29%)	13 (17%)	29 (38%)	76	3.71	1.25

Note. Response scale: **1** = "Not at all," **2** = "At least once," **3** = "A few times," **4** = "Most days," **5** = "Every day".

How often do you do each of the following in STEM classes at school this year?								
	1	2	3	4	5	n	Avg.	SD
Pose questions or problems to investigate	7 (9%)	9 (12%)	26 (34%)	15 (20%)	19 (25%)	76	3.39	1.24
Design an investigation	11 (14%)	23 (30%)	17 (22%)	15 (20%)	10 (13%)	76	2.87	1.27
Carry out an investigation	9 (12%)	22 (29%)	19 (25%)	14 (18%)	12 (16%)	76	2.97	1.26
Analyze and interpret data or information	3 (4%)	11 (14%)	19 (25%)	25 (33%)	18 (24%)	76	3.58	1.12
Draw conclusions from an investigation	6 (8%)	11 (14%)	22 (29%)	22 (29%)	15 (20%)	76	3.38	1.19
Come up with creative explanations or solutions	4 (5%)	8 (11%)	19 (25%)	27 (36%)	18 (24%)	76	3.62	1.12
Build (or simulate) something	6 (8%)	9 (12%)	19 (25%)	21 (28%)	20 (27%)	75	3.53	1.23

Note. Response scale: **1** = "Not at all," **2** = "At least once," **3** = "A few times," **4** = "Most days," **5** = "Every day".

How often do you do each of the following in JSS this year?								
	1	2	3	4	5	n	Avg.	SD
Pose questions or problems to investigate	6 (8%)	15 (20%)	22 (30%)	15 (20%)	16 (22%)	74	3.27	1.24

Design an investigation	17 (23%)	13 (18%)	16 (22%)	11 (15%)	17 (23%)	74	2.97	1.48
Carry out an investigation	12 (16%)	13 (18%)	18 (25%)	15 (21%)	15 (21%)	73	3.11	1.37
Analyze and interpret data or information	6 (8%)	16 (22%)	15 (21%)	22 (30%)	14 (19%)	73	3.3	1.24
Draw conclusions from an investigation	10 (14%)	18 (25%)	11 (15%)	14 (19%)	20 (27%)	73	3.22	1.44
Come up with creative explanations or solutions	5 (7%)	13 (18%)	15 (21%)	21 (29%)	19 (26%)	73	3.49	1.25
Build (or simulate) something	5 (7%)	8 (11%)	11 (15%)	21 (29%)	28 (38%)	73	3.81	1.25

Note. Response scale: **1** = "Not at all," **2** = "At least once," **3** = "A few times," **4** = "Most days," **5** = "Every day".

The list below describes instructional and mentoring strategies that are effective ways to support STEM learners. From the list below, please indicate which strategies your mentor(s) used when working directly with you in JSS:

	Yes - my mentor(s) used this strategy with me		No - my mentor(s) did not use this strategy with me	
	Freq.	**%**	**Freq.**	**%**
Helped me become aware of the roles STEM play in my everyday life	53	70%	23	30%
Helped me understand how STEM can help me improve my community	58	76%	18	24%
Used teaching/mentoring activities that addressed my learning style	57	75%	19	25%
Provided me with extra support when I needed it	66	87%	10	13%
Encouraged me to exchange ideas with others whose backgrounds or viewpoints are different from mine	50	66%	26	34%
Allowed me to work on a collaborative project as a member of a team	65	87%	10	13%
Helped me practice a variety of STEM skills with supervision	54	71%	22	29%
Gave me constructive feedback to improve my STEM knowledge, skills, or abilities	64	84%	12	16%
Gave me guidance about educational pathways that would prepare me for a STEM career	51	68%	24	32%
Recommended Army Educational Outreach Programs that match my interests	29	38%	47	62%
Discussed STEM career opportunities with DoD or other government agencies	29	38%	47	62%
Total		**100%**		**100%**

Rate how the following items impacted your awareness of Army Educational Outreach Programs (AEOPs) during JSS:

	0	1	2	3	4	n	Avg.	SD
Junior Solar Sprint (JSS) website	33 (43%)	3 (4%)	14 (18%)	11 (14%)	16 (21%)	77	2.91	0.98

Army Educational Outreach Program (AEOP) website	56 (73%)	3 (4%)	3 (4%)	6 (8%)	9 (12%)	77	3	1.10
AEOP social media	58 (75%)	7 (9%)	4 (5%)	3 (4%)	5 (6%)	77	2.32	1.25
AEOP brochure	55 (71%)	7 (9%)	4 (5%)	4 (5%)	7 (9%)	77	2.5	1.26
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat, etc.)	56 (74%)	2 (3%)	6 (8%)	3 (4%)	9 (12%)	76	2.95	1.10
My mentor(s)	19 (25%)	4 (5%)	13 (17%)	11 (14%)	30 (39%)	77	3.16	1.01
Invited speakers or "career" events	43 (57%)	5 (7%)	5 (7%)	6 (8%)	16 (21%)	75	3.03	1.15
Participation in JSS event(s)	16 (21%)	1 (1%)	6 (8%)	15 (19%)	39 (51%)	77	3.51	0.74
Junior Solar Sprint (JSS) website	33 (43%)	3 (4%)	14 (18%)	11 (14%)	16 (21%)	77	2.91	0.98

Note. Response scale: **0** = "Did Not Experience," **1** = "Not at all," **2** = "A little," **3** = "Somewhat," **4** = "Very much".

Rate how the following items impacted your awareness of Department of Defense (DoD) STEM careers during JSS:								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
Junior Solar Sprint (JSS) website	35 (45%)	14 (18%)	9 (12%)	11 (14%)	8 (10%)	77	2.31	1.14
Army Educational Outreach Program (AEOP) website	56 (73%)	4 (5%)	4 (5%)	10 (13%)	3 (4%)	77	2.57	0.98
AEOP social media	59 (77%)	6 (8%)	1 (1%)	7 (9%)	4 (5%)	77	2.5	1.20
AEOP brochure	55 (71%)	5 (6%)	3 (4%)	10 (13%)	4 (5%)	77	2.59	1.05
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat, etc.)	55 (72%)	6 (8%)	4 (5%)	6 (8%)	5 (7%)	76	2.48	1.17
My mentor(s)	34 (45%)	8 (11%)	9 (12%)	8 (11%)	17 (22%)	76	2.81	1.17
Invited speakers or "career" events	49 (64%)	3 (4%)	9 (12%)	7 (9%)	9 (12%)	77	2.79	1.03
Participation in JSS event(s)	29 (38%)	6 (8%)	10 (13%)	12 (16%)	20 (26%)	77	2.96	1.07
Junior Solar Sprint (JSS) website	35 (45%)	14 (18%)	9 (12%)	11 (14%)	8 (10%)	77	2.31	1.14

Note. Response scale: **0** = "Did Not Experience," **1** = "Not at all," **2** = "A little," **3** = "Somewhat," **4** = "Very much".

How SATISFIED were you with each of the following at the National TSA Conference?								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
Communications from Technology Student Association (TSA) about JSS	6 (8%)	1 (1%)	12 (16%)	27 (36%)	28 (38%)	74	3.21	0.78
JSS application or registration process through TSA	5 (7%)	6 (8%)	15 (21%)	20 (27%)	27 (37%)	73	3	0.99
Time and location of JSS event at TSA National Conference	0 (0%)	5 (7%)	11 (15%)	25 (35%)	31 (43%)	72	3.14	0.92
Army Educational Outreach Program (AEOP) Special Interest Session	33 (45%)	6 (8%)	8 (11%)	8 (11%)	18 (25%)	73	2.95	1.13

Army JSS welcome dinner -- Saturday	51 (69%)	2 (3%)	3 (4%)	2 (3%)	16 (22%)	74	3.39	1.03
JSS time trials -- Sunday	10 (14%)	7 (10%)	13 (18%)	18 (25%)	23 (32%)	71	2.93	1.03
JSS finals -- Monday	32 (47%)	4 (6%)	4 (6%)	4 (6%)	24 (35%)	68	3.33	1.07
JSS display viewing -- Monday	17 (26%)	4 (6%)	6 (9%)	12 (18%)	27 (41%)	66	3.27	0.97
JSS judging process and feedback	24 (36%)	7 (10%)	11 (16%)	8 (12%)	17 (25%)	67	2.81	1.14
JSS competition awards	29 (43%)	3 (4%)	6 (9%)	7 (10%)	22 (33%)	67	3.26	1.00
Overall satisfaction with TSA National Conference JSS event	6 (8%)	0 (0%)	9 (13%)	19 (26%)	38 (53%)	72	3.44	0.73

Note. Response scale: **0** = "Did Not Experience," **1** = "Not at all," **2** = "A little," **3** = "Somewhat," **4** = "Very much".

How SATISFIED were you with each of the following at the Army JSS event?

	0	1	2	3	4	n	Avg.	SD
Communications from Army organizer about JSS	24 (50%)	2 (4%)	5 (10%)	5 (10%)	12 (25%)	48	3.13	1.03
JSS application or registration process through Army organizer	19 (40%)	5 (11%)	4 (9%)	7 (15%)	12 (26%)	47	2.93	1.15
Time and location of Army JSS event	17 (36%)	2 (4%)	4 (9%)	10 (21%)	14 (30%)	47	3.2	0.92
Army speaker or "career" event	25 (56%)	2 (4%)	3 (7%)	4 (9%)	11 (24%)	45	3.2	1.06
JSS car racing	14 (30%)	1 (2%)	4 (9%)	8 (17%)	20 (43%)	47	3.42	0.83
JSS judging process and feedback	21 (46%)	4 (9%)	5 (11%)	5 (11%)	11 (24%)	46	2.92	1.15
JSS competition awards	23 (51%)	1 (2%)	4 (9%)	5 (11%)	12 (27%)	45	3.27	0.94
Overall satisfaction with Army JSS event	15 (32%)	1 (2%)	7 (15%)	6 (13%)	18 (38%)	47	3.28	0.92

Note. Response scale: **0** = "Did Not Experience," **1** = "Not at all," **2** = "A little," **3** = "Somewhat," **4** = "Very much".

How USEFUL were each of the following JSS supports provided at jrsolarsprint.org?

	0	1	2	3	4	n	Avg.	SD
Official TSA Competition Rules	13 (17%)	2 (3%)	3 (4%)	11 (15%)	46 (61%)	75	3.63	0.73
Local Competition Rules	23 (31%)	1 (1%)	10 (13%)	14 (19%)	27 (36%)	75	3.29	0.85
Build A Car resources	22 (29%)	2 (3%)	13 (17%)	13 (17%)	25 (33%)	75	3.15	0.93
JSS Terminology	24 (32%)	6 (8%)	9 (12%)	16 (21%)	20 (27%)	75	2.98	1.03
Video Tutorials	37 (51%)	5 (7%)	4 (5%)	8 (11%)	19 (26%)	73	3.14	1.10
Calendar of Events	29 (39%)	5 (7%)	13 (17%)	7 (9%)	21 (28%)	75	2.96	1.09

Note. Response scale: **0** = "Did Not Experience," **1** = "Not at all," **2** = "A little," **3** = "Somewhat," **4** = "Very much".

Which category best describes the focus of your JSS experience?

	Freq.	%
Science	6	9%
Technology	14	21%
Engineering	43	64%
Mathematics	4	6%
Total	**67**	**100%**

AS A RESULT OF YOUR JSS EXPERIENCE, how much did you GAIN in the following areas?

	1	2	3	4	5	n	Avg.	SD
Knowledge of a STEM topic or field in depth	6 (8%)	9 (12%)	27 (36%)	17 (23%)	16 (21%)	75	3.37	1.18
Knowledge of research conducted in a STEM topic or field	7 (9%)	13 (17%)	24 (32%)	14 (19%)	17 (23%)	75	3.28	1.26
Knowledge of research processes, ethics, and rules for conduct in STEM	7 (9%)	14 (19%)	27 (36%)	13 (17%)	14 (19%)	75	3.17	1.21
Knowledge of how professionals work on real problems in STEM	11 (14%)	17 (22%)	23 (30%)	10 (13%)	15 (20%)	76	3.01	1.32
Knowledge of what everyday research work is like in STEM	11 (14%)	13 (17%)	22 (29%)	11 (14%)	19 (25%)	76	3.18	1.37

Note. Response scale: **1** = "No gain," **2** = "A little gain," **3** = "Some gain," **4** = "Large gain," **5** = "Extreme gain".

AS A RESULT OF YOUR JSS EXPERIENCE, how much did you GAIN in the following areas?

	1	2	3	4	5	n	Avg.	SD
Asking a question that can be answered with one or more investigations	8 (11%)	14 (19%)	24 (32%)	13 (17%)	16 (21%)	75	3.2	1.27
Applying knowledge, logic, and creativity to propose scientific explanations or engineering solutions that can be tested with investigations	4 (5%)	10 (13%)	31 (41%)	15 (20%)	16 (21%)	76	3.38	1.12
Making a model to represent the key features and functions of an object, process, or system	7 (9%)	12 (16%)	23 (30%)	17 (22%)	17 (22%)	76	3.33	1.25
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	9 (12%)	12 (16%)	28 (37%)	11 (14%)	16 (21%)	76	3.17	1.27
Carrying out procedures for an investigation and recording data accurately	6 (8%)	19 (25%)	25 (33%)	11 (14%)	15 (20%)	76	3.13	1.23
Considering different ways to analyze or interpret data	7 (9%)	15 (20%)	26 (34%)	14 (18%)	14 (18%)	76	3.17	1.22

Displaying numeric data in charts or graphs to identify patterns and relationships	16 (21%)	17 (22%)	21 (28%)	10 (13%)	12 (16%)	76	2.8	1.35
Using mathematics or computers to analyze numeric data	17 (22%)	13 (17%)	19 (25%)	9 (12%)	18 (24%)	76	2.97	1.47
Supporting a scientific explanation or engineering solution with data from investigations	10 (14%)	15 (20%)	21 (28%)	10 (14%)	18 (24%)	74	3.15	1.36
Supporting a scientific explanation or engineering solution with relevant scientific, mathematical, and/or engineering knowledge	9 (12%)	16 (21%)	20 (26%)	13 (17%)	18 (24%)	76	3.2	1.34
Communicating information about your investigations in different formats (orally, written, graphically, mathematically, etc.)	11 (14%)	15 (20%)	18 (24%)	13 (17%)	19 (25%)	76	3.18	1.39

Note. Response scale: **1** = "No gain," **2** = "A little gain," **3** = "Some gain," **4** = "Large gain," **5** = "Extreme gain".

AS A RESULT OF YOUR JSS EXPERIENCE, how much did you GAIN in the following areas?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Sticking with a task until it is complete	4 (5%)	6 (8%)	20 (26%)	19 (25%)	27 (36%)	76	3.78	1.17
Making changes when things do not go as planned	3 (4%)	2 (3%)	21 (28%)	28 (37%)	22 (29%)	76	3.84	1.01
Working collaboratively with a team	4 (5%)	8 (11%)	16 (21%)	21 (28%)	27 (36%)	76	3.78	1.20
Communicating effectively with others	3 (4%)	10 (13%)	20 (26%)	22 (29%)	21 (28%)	76	3.63	1.14
Including others' perspectives when making decisions	3 (4%)	3 (4%)	26 (34%)	21 (28%)	23 (30%)	76	3.76	1.06
Sense of being part of a learning community	8 (11%)	10 (13%)	21 (28%)	20 (26%)	17 (22%)	76	3.37	1.26
Building relationships with professionals in a field	18 (24%)	18 (24%)	15 (20%)	11 (14%)	14 (18%)	76	2.8	1.43
Connecting a topic or field and your personal values	10 (13%)	13 (17%)	21 (28%)	13 (17%)	19 (25%)	76	3.24	1.36

Note. Response scale: **1** = "No gain," **2** = "A little gain," **3** = "Some gain," **4** = "Large gain," **5** = "Extreme gain".

AS A RESULT OF YOUR JSS EXPERIENCE, how much did you GAIN in the following areas?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Interest in a new STEM topic or field	11 (14%)	17 (22%)	22 (29%)	12 (16%)	14 (18%)	76	3.01	1.31
Clarifying a STEM career path	18 (24%)	14 (18%)	19 (25%)	17 (22%)	8 (11%)	76	2.78	1.32
Sense of accomplishing something in STEM	8 (11%)	8 (11%)	25 (33%)	15 (20%)	20 (26%)	76	3.41	1.28
Building academic credentials in STEM	12 (16%)	15 (20%)	21 (28%)	15 (20%)	13 (17%)	76	3.03	1.32
Feeling prepared for more challenging STEM activities	7 (9%)	11 (14%)	19 (25%)	21 (28%)	18 (24%)	76	3.42	1.26

Confidence to do well in future STEM courses	7 (9%)	14 (18%)	20 (26%)	17 (22%)	18 (24%)	76	3.33	1.28
Confidence to contribute to STEM	9 (12%)	13 (17%)	21 (28%)	15 (20%)	18 (24%)	76	3.26	1.32
Thinking creatively about a STEM project or activity	6 (8%)	14 (18%)	16 (21%)	22 (29%)	18 (24%)	76	3.42	1.26

Note. Response scale: **1** = "No gain," **2** = "A little gain," **3** = "Some gain," **4** = "Large gain," **5** = "Extreme gain".

AS A RESULT OF YOUR JSS EXPERIENCE, how much MORE or LESS likely are you to engage in the following activities in science, technology, engineering, or mathematics (STEM) outside of school requirements or activities?

	1	2	3	4	5	n	Avg.	SD
Visit a science museum or zoo	3 (4%)	3 (4%)	38 (50%)	18 (24%)	14 (18%)	76	3.49	0.97
Watch or read non-fiction STEM	5 (7%)	4 (5%)	43 (57%)	14 (19%)	9 (12%)	75	3.24	0.97
Look up STEM information at a library or on the internet	5 (7%)	3 (4%)	36 (47%)	18 (24%)	14 (18%)	76	3.43	1.05
Tinker (play) with a mechanical or electrical device	4 (5%)	3 (4%)	20 (26%)	23 (30%)	26 (34%)	76	3.84	1.11
Work on solving mathematical or scientific puzzles	2 (3%)	5 (7%)	30 (40%)	24 (32%)	14 (19%)	75	3.57	0.96
Design a computer program or website	3 (4%)	3 (4%)	37 (49%)	12 (16%)	21 (28%)	76	3.59	1.06
Observe things in nature (plant growth, animal behavior, stars or planets, etc.)	4 (5%)	4 (5%)	41 (54%)	11 (14%)	16 (21%)	76	3.41	1.05
Talk with friends or family about STEM	3 (4%)	8 (11%)	28 (37%)	18 (24%)	19 (25%)	76	3.55	1.10
Mentor or teach other students about STEM	3 (4%)	4 (5%)	31 (41%)	18 (24%)	20 (26%)	76	3.63	1.06
Help with a community service project that relates to STEM	2 (3%)	4 (5%)	33 (44%)	20 (27%)	16 (21%)	75	3.59	0.97
Participate in a STEM club, student association, or professional organization	2 (3%)	1 (1%)	28 (37%)	23 (30%)	22 (29%)	76	3.82	0.96
Participate in STEM camp, fair, or competition	3 (4%)	5 (7%)	27 (36%)	24 (32%)	17 (22%)	76	3.62	1.03
Take an elective (not required) STEM class	2 (3%)	3 (4%)	28 (37%)	17 (22%)	26 (34%)	76	3.82	1.04
Work on a STEM project or experiment in a university or professional setting	2 (3%)	8 (11%)	30 (39%)	16 (21%)	20 (26%)	76	3.58	1.07
Receive an award or special recognition for STEM accomplishments	3 (4%)	1 (1%)	26 (34%)	21 (28%)	25 (33%)	76	3.84	1.03

Note. Response scale: **1** = "Much less likely," **2** = "Less likely," **3** = "About the same before and after," **4** = "More likely," **5** = "Much more likely".

How far did you want to go in school BEFORE participating in JSS?

	Freq.	%
Graduate from high school	8	11%
Go to a trade or vocational school	0	0%

Go to college for a little while	3	4%
Finish college (get a Bachelor's degree)	32	43%
Get more education after college	31	42%
Total	**74**	**100%**

How far did you want to go in school AFTER participating in JSS?		
	Freq.	**%**
Graduate from high school	3	4%
Go to a trade or vocational school	0	0%
Go to college for a little while	2	3%
Finish college (get a Bachelor's degree)	29	38%
Get more education after college	42	55%
Total	**76**	**100%**

BEFORE JSS, what kind of work did you expect to be doing when you are 30 years old (select the ONE answer that best describes your career goals BEFORE JSS)

	Freq.	%			Freq.	%
Undecided	7	9%		Teaching, non-STEM	3	4%
Science (no specific subject)	4	5%		Medicine (doctor, dentist, veterinarian, etc.)	6	8%
Physical science (physics, chemistry, astronomy, materials science, etc.)	2	3%		Health (nursing, pharmacy, technician, etc.)	0	0%
Biological science	2	3%		Social science (psychologist, sociologist)	0	0%
Earth, atmospheric or oceanic science	1	1%		Business	1	1%
Agricultural science	0	0%		Law	3	4%
Environmental science	0	0%		English/language arts	0	0%
Computer science	14	18%		Farming	0	0%
Technology	3	4%		Military, police, or security	3	4%
Engineering	6	8%		Art (writing, dancing, painting, etc.)	1	1%
Mathematics or statistics	2	3%		Skilled trade (carpenter, electrician, plumber, etc.)	2	3%
Teaching, STEM	2	3%		Other, (specify):	15	19%
				Total	**77**	**100%**

AFTER JSS, what kind of work do you expect to be doing when you are 30 years old? (select the ONE answer that best describes your career goals AFTER JSS)						
	Freq.	%			Freq.	%
Undecided	9	12%		Teaching, non-STEM	1	1%
Science (no specific subject)	3	4%		Medicine (doctor, dentist, veterinarian, etc.)	5	6%
Physical science (physics, chemistry, astronomy, materials science, etc.)	3	4%		Health (nursing, pharmacy, technician, etc.)	0	0%
Biological science	2	3%		Social science (psychologist, sociologist)	0	0%
Earth, atmospheric or oceanic science	0	0%		Business	1	1%
Agricultural science	0	0%		Law	2	3%
Environmental science	0	0%		English/language arts	0	0%
Computer science	13	17%		Farming	0	0%
Technology	5	6%		Military, police, or security	4	5%
Engineering	10	13%		Art (writing, dancing, painting, etc.)	1	1%
Mathematics or statistics	1	1%		Skilled trade (carpenter, electrician, plumber, etc.)	1	1%
Teaching, STEM	2	3%		Other, (specify):	14	18%
				Total	77	100%

When you are 30, to what extent do you expect to use your STEM knowledge, skills, and/or abilities in your work?		
	Freq.	%
not at all	3	4%
less than 25% of the time	3	4%
26% to 50% of the time	14	19%
51% to 75% of the time	17	23%
76% to 100% of the time	36	49%
Total	73	100%

How many times have you participated in any of the following Army Educational Outreach Programs? If you have not heard of an AEOP, select "Never heard of it." If you have heard of an AEOP but never participated, select "Never."								
	0	1	2	3	4	n	Avg.	SD
Camp Invention	28 (36%)	43 (56%)	3 (4%)	2 (3%)	1 (1%)	77	1.2	0.61
eCYBERMISSION	31 (40%)	42 (55%)	3 (4%)	0 (0%)	1 (1%)	77	1.13	0.50
Junior Solar Sprint (JSS)	7 (9%)	10 (13%)	38 (49%)	8 (10%)	14 (18%)	77	2.37	0.97

West Point Bridge Design Contest (WPBDC)	28 (36%)	39 (51%)	7 (9%)	1 (1%)	2 (3%)	77	1.31	0.71
Junior Science & Humanities Symposium (JSHS)	36 (47%)	39 (51%)	1 (1%)	1 (1%)	0 (0%)	77	1.07	0.35
Gains in the Education of Mathematics and Science (GEMS)	33 (43%)	40 (52%)	3 (4%)	0 (0%)	1 (1%)	77	1.14	0.51
GEMS Near Peers	33 (43%)	41 (53%)	2 (3%)	1 (1%)	0 (0%)	77	1.09	0.36
UNITE	35 (45%)	40 (52%)	1 (1%)	1 (1%)	0 (0%)	77	1.07	0.34
Science & Engineering Apprenticeship Program (SEAP)	33 (43%)	42 (55%)	1 (1%)	1 (1%)	0 (0%)	77	1.07	0.33
Research & Engineering Apprenticeship Program (REAP)	35 (45%)	38 (49%)	3 (4%)	0 (0%)	1 (1%)	77	1.14	0.52
High School Apprenticeship Program (HSAP)	34 (44%)	41 (53%)	1 (1%)	1 (1%)	0 (0%)	77	1.07	0.34
College Qualified Leaders (CQL)	35 (45%)	39 (51%)	2 (3%)	0 (0%)	1 (1%)	77	1.12	0.50
Undergraduate Research Apprenticeship Program (URAP)	35 (46%)	39 (51%)	1 (1%)	1 (1%)	0 (0%)	76	1.07	0.35
Science Mathematics, and Research for Transformation (SMART) College Scholarship	31 (40%)	44 (57%)	1 (1%)	1 (1%)	0 (0%)	77	1.07	0.33
National Defense Science & Engineering Graduate (NDSEG) Fellowship	34 (44%)	40 (52%)	1 (1%)	1 (1%)	1 (1%)	77	1.14	0.56

Note. Response scale: **0** = "Never heard of it," **1** = "Never," **2** = "Once," **3**= "Twice," **4** = "Three or more times".

How interested are you in participating in the following programs in the future?

	1	2	3	4	n	Avg.	SD
Camp Invention	34 (45%)	18 (24%)	8 (11%)	16 (21%)	76	2.08	1.19
eCYBERMISSION	40 (53%)	16 (21%)	6 (8%)	13 (17%)	75	1.89	1.15
Junior Solar Sprint (JSS)	11 (14%)	11 (14%)	12 (16%)	42 (55%)	76	3.12	1.13
West Point Bridge Design Contest (WPBDC)	34 (45%)	17 (22%)	10 (13%)	15 (20%)	76	2.08	1.17
Junior Science & Humanities Symposium (JSHS)	44 (59%)	17 (23%)	5 (7%)	9 (12%)	75	1.72	1.03
Gains in the Education of Mathematics and Science (GEMS)	39 (52%)	16 (21%)	5 (7%)	15 (20%)	75	1.95	1.18
GEMS Near Peers	43 (57%)	17 (23%)	4 (5%)	11 (15%)	75	1.77	1.09
UNITE	43 (57%)	16 (21%)	5 (7%)	11 (15%)	75	1.79	1.09
Science & Engineering Apprenticeship Program (SEAP)	30 (39%)	20 (26%)	10 (13%)	16 (21%)	76	2.16	1.17
Research & Engineering Apprenticeship Program (REAP)	34 (45%)	19 (25%)	8 (11%)	15 (20%)	76	2.05	1.16
High School Apprenticeship Program (HSAP)	37 (49%)	19 (25%)	8 (11%)	12 (16%)	76	1.93	1.11
College Qualified Leaders (CQL)	41 (54%)	15 (20%)	9 (12%)	11 (14%)	76	1.87	1.11
Undergraduate Research Apprenticeship Program (URAP)	42 (55%)	16 (21%)	7 (9%)	11 (14%)	76	1.83	1.10

Science Mathematics, and Research for Transformation (SMART) College Scholarship	34 (45%)	16 (21%)	10 (13%)	16 (21%)	76	2.11	1.20
National Defense Science & Engineering Graduate (NDSEG) Fellowship	36 (47%)	19 (25%)	5 (7%)	16 (21%)	76	2.01	1.18

Note. Response scale: **1** = "Not at all," **2** = "A little," **3** = "Somewhat," **4** = "Very much".

How many jobs/careers in science, technology, engineering, or math (STEM) did you learn about during JSS?

	Freq.	%
None	22	29%
1	9	12%
2	14	18%
3	9	12%
4	2	3%
5 or more	21	27%
Total	**77**	**100%**

How many Department of Defense (DoD) STEM jobs/careers did you learn about during JSS?

	Freq.	%
None	52	68%
1	8	10%
2	7	9%
3	2	3%
4	0	0%
5 or more	8	10%
Total	**77**	**100%**

Rate how much you agree or disagree with each of the following statements about Department of Defense (DoD) researchers and research:

	1	2	3	4	5	n	Avg.	SD
DoD researchers advance science and engineering fields	1 (1%)	2 (3%)	32 (42%)	21 (27%)	21 (27%)	77	3.77	0.93
DoD researchers develop new, cutting edge technologies	1 (1%)	0 (0%)	28 (36%)	24 (31%)	24 (31%)	77	3.91	0.89
DoD researchers support non-defense related advancements in science and technology	2 (3%)	2 (3%)	38 (49%)	18 (23%)	17 (22%)	77	3.6	0.95

DoD researchers solve real-world problems	2 (3%)	0 (0%)	32 (42%)	22 (29%)	21 (27%)	77	3.78	0.94
DoD research is valuable to society	2 (3%)	1 (1%)	34 (44%)	19 (25%)	21 (27%)	77	3.73	0.97

Note. Response scale: **1** = "Strongly Disagree," **2** = "Disagree," **3** = "Neither Agree nor Disagree," **4** = "Agree," **5** = "Strongly Agree".

Which of the following statements describe you after participating in JSS?

	1	2	3	4	n	Avg.	SD
I am more confident in my STEM knowledge, skills, and abilities	6 (8%)	9 (12%)	49 (65%)	11 (15%)	75	2.87	0.76
I am more interested in participating in STEM activities outside of school requirements	9 (12%)	11 (14%)	42 (55%)	14 (18%)	76	2.8	0.88
I am more aware of other AEOPs	17 (23%)	10 (13%)	33 (44%)	15 (20%)	75	2.61	1.05
I am more interested in participating in other AEOPs	19 (25%)	11 (15%)	32 (43%)	13 (17%)	75	2.52	1.06
I am more interested in taking STEM classes in school	7 (9%)	21 (28%)	36 (47%)	12 (16%)	76	2.7	0.85
I am more interested in attending college	7 (9%)	23 (31%)	32 (43%)	12 (16%)	74	2.66	0.86
I am more interested in earning a STEM degree in college	10 (13%)	21 (28%)	33 (44%)	11 (15%)	75	2.6	0.90
I am more interested in pursuing a STEM career	11 (15%)	20 (27%)	34 (45%)	10 (13%)	75	2.57	0.90
I am more aware of DoD STEM research and careers	16 (22%)	15 (21%)	28 (39%)	13 (18%)	72	2.53	1.03
I have a greater appreciation of DoD STEM research and careers	19 (25%)	16 (21%)	25 (33%)	15 (20%)	75	2.48	1.08
I am more interested in pursuing a STEM career with the DoD	23 (31%)	12 (16%)	28 (37%)	12 (16%)	75	2.39	1.09

Note. Response scale: **1** = "Disagree – This did not happen," **2** = "Disagree – This happened but not because of JSS," **3** = "Agree – JSS contributed," **4** = "Agree – JSS was primary reason".

Appendix C

FY14 JSS Mentor Questionnaire and Data Summaries

2014 Junior Solar Sprint (JSS): JSS mentor Survey

Virginia Tech is conducting an evaluation study on behalf of the Academy of Applied Science and the U.S. Army to determine how well JSHS is achieving its goals of promoting student interest and engagement in science, technology, engineering, and mathematics (STEM). As part of this study Virginia Tech is surveying adults who participate in JSHS in the capacity of STEM mentors (e.g., instructors, research mentors, or competition advisors). The questionnaire will collect information about you, your experiences in school, and your experiences in JSHS. The results of this survey will be used to help us improve JSHS and to report to the organizations that support JSHS.

About this survey:

- This research protocol has been approved for use with human subjects by the Virginia Tech IRB office.
- Although this questionnaire is not anonymous, it is CONFIDENTIAL. Prior to analysis and reporting responses will be de-identified and no one will be able to connect your responses to you or your apprentice's name.
- Only AEOP evaluation personnel will have access to completed questionnaires and personal information will be stored securely.
- Responding to this survey is VOLUNTARY. You are not required to participate, although we hope you do because your responses will provide valuable information for meaningful and continuous improvement.
- If you provide your email address, the AEOP may contact you in the future to ask about you or your students.

If you have any additional questions or concerns, please contact one of the following people:

Tanner Bateman, Virginia Tech
Senior Project Associate, AEOPCA
(540) 231-4540, tbateman@vt.edu

Rebecca Kruse, Virginia Tech
Evaluation Director, AEOPCA
(540) 315-5807, rkruse75@vt.edu

Q1 Do you agree to participate in this survey? (required)

- ❍ Yes, I agree to participate in this survey
- ❍ No, I do not wish to participate in this survey **If selected, respondent will be directed to the end of the survey**

Q2 Please provide your personal information below: (required)

First Name _____
Last Name _____

Q3 Please provide your email address: (optional)

Email _____

Q4 What is your gender?

- ❍ Male
- ❍ Female
- ❍ Choose not to report

Q5 What is your race or ethnicity?

- ❍ Hispanic or Latino
- ❍ Asian
- ❍ Black or African American
- ❍ Native American or Alaska Native
- ❍ Native Hawaiian or Other Pacific Islander
- ❍ White
- ❍ Other race or ethnicity, (specify): _____
- ❍ Choose not to report

Q6 Which of the following BEST describes your current occupation (select ONE)

- ❍ Teacher
- ❍ Other school staff
- ❍ University educator
- ❍ Scientist, Engineer, or Mathematician in training (undergraduate or graduate student, etc.)
- ❍ Scientist, Engineer, or Mathematics professional
- ❍ Other, (specify): _____

Q7 Which of the following BEST describes your organization? (select ONE)

- ❍ No organization
- ❍ School or district (K-12)
- ❍ State educational agency
- ❍ Institution of higher education (vocational school, junior college, college, or university)
- ❍ Industry
- ❍ Department of Defense or other government agency
- ❍ Non-profit
- ❍ Other, (specify): _____

Answer If Which of the following BEST describes your current occupation (select ONE) Teacher Is Selected Or Which of the following BEST describes your current occupation (select ONE) Other school staff Is Selected

Q8 What grade level(s) do you teach? (Select all that apply)

- ❑ Upper elementary school
- ❑ Middle school
- ❑ High school

Answer If Which of the following BEST describes your current occupation (select ONE) Teacher Is Selected Or Which of the following BEST describes your current occupation (select ONE) Other school staff Is Selected

Q9 Which best describes the location of your school?

- ❍ Frontier or tribal school
- ❍ Rural (country)
- ❍ Suburban
- ❍ Urban (city)

Answer If Which of the following BEST describes your current occupation (select ONE) Teacher Is Selected Or Which of the following BEST describes your current occupation (select ONE) Other school staff Is Selected

Q10 At what kind of school do you work?

- ❍ Public school
- ❍ Private school
- ❍ Home school
- ❍ Online school
- ❍ Department of Defense school (DoDDS, DoDEA)

Answer If Which of the following BEST describes your current occupation (select ONE) Teacher Is Selected Or Which of the following BEST describes your current occupation (select ONE) Other school staff Is Selected

Q11 Do you work at a "Title-I" school?

- ❍ Yes
- ❍ No
- ❍ I am not sure

Answer If Which of the following BEST describes your current occupation (select ONE) Teacher Is Selected Or Which of the following BEST describes your current occupation (select ONE) Other school staff Is Selected

Q12 Which of the following subjects do you teach? (Select all that apply)

- ❑ Physical science (physics, chemistry, astronomy, materials science)
- ❑ Biological science
- ❑ Earth, atmospheric, or oceanic science
- ❑ Agricultural science
- ❑ Environmental science
- ❑ Computer science
- ❑ Technology
- ❑ Engineering
- ❑ Mathematics or statistics
- ❑ Medical, health, or behavioral science
- ❑ Social science (psychology, sociology, anthropology, etc.)
- ❑ Other, (specify) _____

Answer If Which of the following BEST describes your current occupation (select ONE) Scientist, Engineer, or Mathematician in training (undergraduate or graduate student, etc.) Is Selected Or Which of the following BEST describes your current occupation (select ONE) Scientist, Engineer, or Mathematics professional Is Selected

Q13 Which of the following best describes your primary area of research?

- ❍ Physical science (physics, chemistry, astronomy, materials science)
- ❍ Biological science
- ❍ Earth, atmospheric, or oceanic science
- ❍ Agricultural science
- ❍ Environmental science
- ❍ Computer science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics or statistics
- ❍ Medical, health, or behavioral science
- ❍ Social science (psychology, sociology, anthropology, etc.)
- ❍ Other, (specify) _____

Q14 Where was the JSS program located?

- ❍ AMRDEC at Redstone Arsenal (Huntsville, AL) - May 17th, 2014
- ❍ ARDEC at Picatinny Arsenal (New Jersey) - May 19th, 2014
- ❍ ARDEC at Aberdeen Proving Ground (Aberdeen, MD) - June 7th, 2014
- ❍ TSA National Conference (Washington, DC) - June 27 through July 1st, 2014
- ❍ Other, (specify): _____

Q15 Which of the following BEST describes your role during JSS?

- ❍ Competition advisor
- ❍ Chaperone
- ❍ Event coordinator or staff
- ❍ Other, (specify) _____

Q16 How many JSS students did you work with this year?

Q17 How did you learn about JSS? (Check all that apply)

- ❑ Technology Student Association website
- ❑ Army Educational Outreach Program (AEOP) website
- ❑ Facebook, Twitter, Pinterest, or other social media
- ❑ State or national educator conference
- ❑ STEM conference
- ❑ School, university, or professional organization newsletter, email or website
- ❑ A news story or other media coverage

- ❑ Past JSS participant
- ❑ A student
- ❑ A colleague
- ❑ A supervisor or superior
- ❑ JSS event or site host/director
- ❑ Workplace communications
- ❑ Someone who works at an Army laboratory
- ❑ Someone who works with the Department of Defense
- ❑ Other, (specify): _____

Q18 How many times have YOU PARTICIPATED in any of the following Army Educational Outreach Programs (AEOPs) in any capacity? If you have heard of an AEOP but never participated select "Never." If you have not heard of an AEOP select "Never heard of it."

	Never	Once	Twice	Three or more times	Never heard of it
Camp Invention	❍	❍	❍	❍	❍
eCYBERMISSION	❍	❍	❍	❍	❍
Junior Solar Sprint (JSS)	❍	❍	❍	❍	❍
West Point Bridge Design Contest (WPBDC)	❍	❍	❍	❍	❍
Junior Science & Humanities Symposium (JSHS)	❍	❍	❍	❍	❍
Gains in the Education of Mathematics and Science (GEMS)	❍	❍	❍	❍	❍
GEMS Near Peers	❍	❍	❍	❍	❍
UNITE	❍	❍	❍	❍	❍
Science & Engineering Apprenticeship Program (SEAP)	❍	❍	❍	❍	❍
Research & Engineering Apprenticeship Program (REAP)	❍	❍	❍	❍	❍
High School Apprenticeship Program (HSAP)	❍	❍	❍	❍	❍
College Qualified Leaders (CQL)	❍	❍	❍	❍	❍
Undergraduate Research Apprenticeship Program (URAP)	❍	❍	❍	❍	❍
Science Mathematics, and Research for Transformation (SMART) College Scholarship	❍	❍	❍	❍	❍
National Defense Science & Engineering Graduate (NDSEG) Fellowship	❍	❍	❍	❍	❍

Q19 How SATISFIED were you with each of the following at the National TSA Conference?

	Did not experience	Not at all	A little	Somewhat	Very much

Communications from Technology Student Association (TSA) about JSS	❍	❍	❍	❍	❍
JSS application or registration process through TSA	❍	❍	❍	❍	❍
Time and location of JSS event at TSA National Conference	❍	❍	❍	❍	❍
Army Educational Outreach Program (AEOP) Special Interest Session	❍	❍	❍	❍	❍
Army JSS welcome dinner -- Saturday	❍	❍	❍	❍	❍
JSS time trials -- Sunday	❍	❍	❍	❍	❍
JSS finals -- Monday	❍	❍	❍	❍	❍
JSS display viewing -- Monday	❍	❍	❍	❍	❍
JSS judging process and feedback	❍	❍	❍	❍	❍
JSS competition awards	❍	❍	❍	❍	❍
Overall satisfaction with JSS event at TSA National Conference	❍	❍	❍	❍	❍

Q20 How SATISFIED were you with each of the following at the Army JSS event?

	Did not experience	Not at all	A little	Somewhat	Very much
Communications from Army organizers about JSS	❍	❍	❍	❍	❍
JSS application or registration process through Army organizer	❍	❍	❍	❍	❍
Time and location of Army JSS event	❍	❍	❍	❍	❍
Army speaker or "career" event	❍	❍	❍	❍	❍
JSS car racing	❍	❍	❍	❍	❍
JSS judging process and feedback	❍	❍	❍	❍	❍
JSS competition awards	❍	❍	❍	❍	❍
Overall satisfaction with Army JSS event	❍	❍	❍	❍	❍

Q21 How USEFUL were the following JSS resources provided at jrsolarsprint.org?

	Did not experience	Not at all	A little	Somewhat	Very much
Official TSA Competition Rules	❍	❍	❍	❍	❍
Local Competition Rules	❍	❍	❍	❍	❍
Build A Car resources	❍	❍	❍	❍	❍
Course Outline	❍	❍	❍	❍	❍
STEM Standards	❍	❍	❍	❍	❍

Lesson Plans	❍	❍	❍	❍	❍
JSS Terminology	❍	❍	❍	❍	❍
Video Tutorials	❍	❍	❍	❍	❍
JSS Host Guide	❍	❍	❍	❍	❍
Calendar of Events	❍	❍	❍	❍	❍

Q22 Which JSS resources were MOST USEFUL for your participation in JSS? Why?

Q23 What resources could be IMPROVED OR ADDED to better support your participation in JSS? How would these changes better support your participation?

Q24 The list below describes instructional and mentoring strategies that are effective ways to establish the relevance of learning activities for students. From the list below, please indicate which strategies you used when working with your student(s) in JSS.

	Yes - I used this strategy	No - I did not use this strategy
Finding out about students' backgrounds and interests at the beginning of the program	❍	❍
Giving students real-life problems to investigate or solve	❍	❍
Asking students to relate outside events or activities to topics covered in the program	❍	❍
Selecting readings or activities that relate to students' backgrounds	❍	❍
Encouraging students to suggest new readings, activities, or projects	❍	❍
Making explicit provisions for students who wish to carry out independent studies	❍	❍
Helping students become aware of the roles STEM plays in their everyday lives	❍	❍
Helping students understand how STEM can help them improve their communities	❍	❍
Other, (specify):	❍	❍

Q25 The list below describes instructional and mentoring strategies that are effective ways to support the diverse needs of students as learners. From the list below, please indicate which strategies you used when working with your student(s) in JSS.

	Yes - I used this strategy	No - I did not use this strategy

Finding out about students' learning styles at the beginning of the program	❍	❍
Interacting with all students in the same way regardless of their gender or race and ethnicity	❍	❍
Using gender neutral language	❍	❍
Using diverse teaching/mentoring activities to address a broad spectrum of students	❍	❍
Integrating ideas from the literature on pedagogical activities for women and underrepresented students	❍	❍
Providing extra readings, activities, or other support for students who lack essential background knowledge or skills	❍	❍
Directing students to other individuals or programs if I can only provide limited support	❍	❍
Other, (specify):	❍	❍

Q26 The list below describes instructional and mentoring strategies that are effective ways to support students development of collaboration and interpersonal skills. From the list below, please indicate which strategies you used when working with your student(s) in JSS.

	Yes - I used this strategy	No - I did not use this strategy
Having students tell others about their backgrounds and interests	❍	❍
Having students explain difficult ideas to others	❍	❍
Having students exchange ideas with others whose backgrounds or viewpoints are different from their own	❍	❍
Having students participate in giving and receiving feedback	❍	❍
Having students work on collaborative activities or projects as a member of a team	❍	❍
Having students listen to the ideas of others with an open mind	❍	❍
Having students pay attention to the feelings of all team members	❍	❍
Having students develop ways to resolve conflict and reach agreement among the team	❍	❍
Other, (specify):	❍	❍

Q27 The list below describes instructional and mentoring strategies that are effective ways to support students' engagement in "authentic" STEM activities. From the list below, please indicate which strategies you used when working with your student(s) in JSS.

	Yes - I used this strategy	No - I did not use this strategy

Teaching (or assigning readings) about specific STEM subject matter	❍	❍
Having students access and critically review technical texts or media to support their work	❍	❍
Demonstrating the use of laboratory or field techniques, procedures, and tools students are expected to use	❍	❍
Helping students practice STEM skills with supervision	❍	❍
Giving constructive feedback to improve students' STEM competencies	❍	❍
Allowing students to work independently as appropriate for their self-management abilities and STEM competencies	❍	❍
Encouraging students to seek support from other team members	❍	❍
Encouraging opportunities in which students could learn from others (team projects, team meetings, journal clubs)	❍	❍
Other, (specify):	❍	❍

Q28 The list below describes instructional and mentoring strategies that are effective ways to support students' STEM educational and career pathways. The list also includes items that reflect AEOP and Army priorities. From the list below, please indicate which strategies you used when working with your student(s) in JSS.

	Yes - I used this strategy	No - I did not use this strategy
Asking about students' educational and career interests	❍	❍
Recommending extracurricular programs that align with students' educational goals	❍	❍
Recommending Army Educational Outreach Programs that align with students' educational goals	❍	❍
Providing guidance about educational pathways that would prepare students for a STEM career	❍	❍
Sharing personal experiences, attitudes, and values pertaining to STEM	❍	❍
Discussing STEM career opportunities with the DoD or other government agencies	❍	❍
Discussing STEM career opportunities outside of the DoD or other government agencies (private industry, academia)	❍	❍
Discussing non-technical aspects of a STEM career (economic, political, ethical, and/or social issues)	❍	❍
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	❍	❍
Recommending student and professional organizations in STEM	❍	❍
Helping students build effective STEM networks	❍	❍
Critically reviewing students' résumé, application, or interview preparations	❍	❍
Other, (specify):	❍	❍

Q29 How USEFUL were each of the following in your efforts to expose student(s) to Army Educational Outreach Programs (AEOPs) during JSS?

	Did not experience	Not at all	A little	Somewhat	Very much
Junior Solar Sprint website	❍	❍	❍	❍	❍
Army Educational Outreach Program (AEOP) website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍	❍
TSA or Army event coordinator	❍	❍	❍	❍	❍
Invited speakers or "career" events	❍	❍	❍	❍	❍
Participation in JSS	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab coats, etc.)	❍	❍	❍	❍	❍

Q30 Which of the following AEOPs did YOU EXPLICITLY DISCUSS with your student(s) during JSS? (Check ALL that apply)

	Yes - I discussed this program with my student(s)	No - I did not discuss this program with my student(s)
Camp Invention	❍	❍
eCYBERMISSION	❍	❍
Junior Solar Sprint (JSS)	❍	❍
West Point Bridge Design Contest (WPBDC)	❍	❍
Junior Science & Humanities Symposium (JSHS)	❍	❍
Gains in the Education of Mathematics and Science (GEMS)	❍	❍
GEMS Near Peers	❍	❍
UNITE	❍	❍
Science & Engineering Apprenticeship Program (SEAP)	❍	❍
Research & Engineering Apprenticeship Program (REAP)	❍	❍
High School Apprenticeship Program (HSAP)	❍	❍
College Qualified Leaders (CQL)	❍	❍
Undergraduate Research Apprenticeship Program (URAP)	❍	❍
Science Mathematics, and Research for Transformation (SMART) College Scholarship	❍	❍
National Defense Science & Engineering Graduate (NDSEG) Fellowship	❍	❍

I discussed AEOP with my student(s) but did not discuss any specific program	❍	❍

Q31 How USEFUL were each of the following in your efforts to expose your student(s) to Department of Defense (DoD) STEM careers during JSS?

	Did not experience	Not at all	A little	Somewhat	Very much
Junior Solar Sprint website	❍	❍	❍	❍	❍
Army Educational Outreach Program (AEOP) website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍	❍
TSA or Army event coordinator	❍	❍	❍	❍	❍
Invited speakers or "career" events	❍	❍	❍	❍	❍
Participation in JSS	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab coats, etc.)	❍	❍	❍	❍	❍

Q32 Rate how much you agree or disagree with each of the following statements about Department of Defense (DoD) researchers and research:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
DoD researchers advance science and engineering fields	❍	❍	❍	❍	❍
DoD researchers develop new, cutting edge technologies	❍	❍	❍	❍	❍
DoD researchers support non-defense related advancements in science and technology	❍	❍	❍	❍	❍
DoD researchers solve real-world problems	❍	❍	❍	❍	❍
DoD research is valuable to society	❍	❍	❍	❍	❍

Q33 How often did YOUR STUDENT(S) have opportunities do each of the following in JSS?

	Not at all	At least once	A few times	Most days	Every day
Learn new science, technology, engineering, or mathematics (STEM) topics	❍	❍	❍	❍	❍
Apply STEM knowledge to real life situations	❍	❍	❍	❍	❍
Learn about cutting-edge STEM research	❍	❍	❍	❍	❍
Learn about different STEM careers	❍	❍	❍	❍	❍

Interact with STEM professionals	❍	❍	❍	❍	❍
Practice using laboratory or field techniques, procedures, and tools	❍	❍	❍	❍	❍
Participate in hands-on STEM activities	❍	❍	❍	❍	❍
Work as part of a team	❍	❍	❍	❍	❍
Communicate with other students about STEM	❍	❍	❍	❍	❍
Draw conclusions from an investigation	❍	❍	❍	❍	❍
Build (or simulate) something	❍	❍	❍	❍	❍
Pose questions or problems to investigate	❍	❍	❍	❍	❍
Design an investigation	❍	❍	❍	❍	❍
Carry out an investigation	❍	❍	❍	❍	❍
Analyze and interpret data or information	❍	❍	❍	❍	❍
Come up with creative explanations or solutions	❍	❍	❍	❍	❍

Q34 Which category best describes the focus of your student(s)' JSS experience?

- ❍ Science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics

Q35 AS A RESULT OF THE JSS EXPERIENCE, how much did your student(s) GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Knowledge of a STEM topic or field in depth	❍	❍	❍	❍	❍
Knowledge of research conducted in a STEM topic or field	❍	❍	❍	❍	❍
Knowledge of research processes, ethics, and rules for conduct in STEM	❍	❍	❍	❍	❍
Knowledge of how professionals work on real problems in STEM	❍	❍	❍	❍	❍
Knowledge of what everyday research work is like in STEM	❍	❍	❍	❍	❍

Q36 AS A RESULT OF THE JSS EXPERIENCE, how much did your student(s) GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Asking a question that can be answered with one or more investigations	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose scientific explanations or engineering solutions that can be tested with investigations	❍	❍	❍	❍	❍

Making a model to represent the key features and functions of an object, process, or system	❍	❍	❍	❍	❍
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	❍	❍	❍	❍	❍
Carrying out procedures for an investigation and recording data accurately	❍	❍	❍	❍	❍
Considering different ways to analyze or interpret data when answering a question	❍	❍	❍	❍	❍
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics or computers to analyze numeric data	❍	❍	❍	❍	❍
Supporting a scientific explanation or engineering solution with data from investigations	❍	❍	❍	❍	❍
Supporting a scientific explanation or engineering or engineering solution with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Communicating information about your investigations and explanations in different formats (orally, written, graphically, mathematically)	❍	❍	❍	❍	❍

Q37 AS A RESULT OF THE JSS EXPERIENCE, how much did your student(s) GAIN (on average) in the following areas?

	No gain	A little gain	Some gain	Large gain	Extreme gain
Sticking with a task until it is complete	❍	❍	❍	❍	❍
Making changes when things do not go as planned	❍	❍	❍	❍	❍
Working collaboratively with a team	❍	❍	❍	❍	❍
Communicating effectively with others	❍	❍	❍	❍	❍
Including others' perspectives when making decisions	❍	❍	❍	❍	❍
Sense of being part of a learning community	❍	❍	❍	❍	❍
Building relationships with professionals in a field	❍	❍	❍	❍	❍
Connecting a topic or field and their personal values	❍	❍	❍	❍	❍

Q38 Which of the following statements describe YOUR STUDENT(S) after participating in the JSS program?

	Disagree - This did not happen	Disagree - This happened but not because of JSS	Agree - JSS contributed	Agree - JSS was primary reason
More confident in STEM knowledge, skills, and abilities	❍	❍	❍	❍
More interested in participating in STEM activities outside of school requirements	❍	❍	❍	❍
More aware of other AEOPs	❍	❍	❍	❍
More interested in participating in other AEOPs	❍	❍	❍	❍

More interested in taking STEM classes in school	❍	❍	❍	❍
More interested in attending college	❍	❍	❍	❍
More interested in earning a STEM degree in college	❍	❍	❍	❍
More interested in pursuing a STEM career	❍	❍	❍	❍
More aware of Department of Defense (DoD) STEM research and careers	❍	❍	❍	❍
Greater appreciation of DoD STEM research and careers	❍	❍	❍	❍
More interested in pursuing a STEM career with the DoD	❍	❍	❍	❍

Q39 What are the three most important strengths of JSS?

Strength #1

Strength #2

Strength #3

Q40 What are the three ways JSS should be improved for future participants?

Improvement #1

Improvement #2

Improvement #3

Q41 Tell us about your overall satisfaction with your JSS experience.

JSS Mentor Data Summary

What is your gender?		
	Freq.	**%**
Male	9	56%
Female	7	44%
Choose not to report	0	0%
Total	**16**	**100%**

What is your race or ethnicity?		
	Freq.	**%**
Hispanic or Latino	1	6%
Asian	0	0%
Black or African American	2	13%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	11	69%
Other race or ethnicity, (specify):	1	6%
Choose not to report	1	6%
Total	**16**	**100%**

Which of the following BEST describes your current occupation? (select ONE)		
	Freq.	**%**
Teacher	14	88%
Other school staff	0	0%
University educator	0	0%
Scientist, Engineer, or Mathematician in training (undergraduate or graduate student, etc.)	0	0%
Scientist, Engineer, or Mathematics professional	0	0%

Other, (specify):	2	13%
Total	**16**	**100%**

Which of the following BEST describes your organization? (select ONE)		
	Freq.	**%**
No organization	1	6%
School or district (K-12)	14	88%
State educational agency	0	0%
Institution of higher education (vocational school, junior college, college, or university)	0	0%
Industry	0	0%
Department of Defense or other government agency	0	0%
Non-profit	0	0%
Other, (specify):	1	6%
Total	**16**	**100%**

Note. "Other" responses includes 'Community STEM Club'

What grade level(s) do you teach? (Select ALL that apply)		
	Freq.	**%**
Upper elementary	1	7%
Middle school	14	100%
High school	0	0%
Total	**15**	**100%**

Which best describes the location of your school?		
	Freq.	**%**
Frontier or tribal	0	0%
Rural (country)	2	14%
Suburban	8	57%
Urban (city)	4	29%
Total	**14**	**100%**

At what kind of school did you teach while participating in JSS?		
	Freq.	%
Public school	14	100%
Private school	0	0%
Home school	0	0%
Online school	0	0%
Department of Defense school (DoDDS or DoDEA)	0	0%
Total	14	100%

Do you work at a "Title-I" school?		
	Freq.	%
Yes	9	64%
No	5	36%
I am not sure	0	0%
Total	14	100%

Which of the following subjects do you teach? (Check all that apply)						
	Freq.	%			Freq.	%
Physical science (physics, chemistry, astronomy, materials science, etc.)	3	21%		Technology	12	86%
Biological science	3	21%		Engineering	7	50%
Earth, atmospheric, or oceanic science	2	14%		Mathematics or statistics	2	14%
Agricultural science	1	7%		Medical, health, or behavioral science	1	7%
Environmental science	2	14%		Social science (psychology, sociology, anthropology, etc.)	0	0%
Computer science	2	14%		Other, (specify):	5	36%
				Total	14	100%

Note. "Other" responses include: Technology Education, STEM - Intro to engineering, Robotics, English, Project Lead The Way

Which JSS event(s) did you attend? (Check all that apply) (n = 16)						
	Freq.	%			Freq.	%

AMRDEC at Redstone Arsenal (Huntsville, AL) - May 17th, 2014	1	6%		ARDEC at Aberdeen Proving Ground (Aberdeen, MD) - June 7th, 2014	1	6%
ARDEC at Picatinny Arsenal (New Jersey) - May 19th, 2014	0	0%		TSA National Conference (Washington, DC) - June 27 through July 1st, 2014	14	88%
				Other, (specify):	1	6%

Note. "Other" includes: Orlando, Florida.

Which of the following BEST describes your role during JSS?		
	Freq.	%
Competition advisor	13	81%
Chaperone	2	13%
Event coordinator or staff	0	0%
Other (specify)	1	6%
Total	16	100%

Other = "STEM club volunteer."

How many JSS students did you work with this year?		
# of Students	Freq.	%
1	0	0%
2	3	19%
3	1	6%
4	3	19%
5	4	25%
6	1	6%
7	0	0%
8	2	13%
9	0	0%
10 or more	2	13%
Total	16	100%

How did you learn about JSS? (Check all that apply) (n = 16)						
	Freq.	%			Freq.	%
Technology Student Association website	11	69%		A student	1	6%
Army Educational Outreach Program (AEOP) website	2	13%		A colleague	2	13%

Facebook, Twitter, Pinterest, or other social media	0	0%		A supervisor or superior	0	0%
State or national educator conference	0	0%		JSS event or site host/director	3	19%
STEM conference	2	13%		Workplace communications	0	0%
School, university, or professional organization newsletter, email, or website	0	0%		Someone who works at an Army laboratory	0	0%
A news story or other media coverage	0	0%		Someone who works with the Department of Defense	1	6%
Past JSS participant	1	6%		Other, (specify):	2	13%

Note: "Other" responses include: 'I have been doing JSS for over 15 years,' and 'We host 8 JSS events for Hillsborough County and also compete in the annual Energy Whiz Olympics at the Florida Solar Energy Center.'

How many times have YOU PARTICIPATED in any of the following Army Educational Outreach Programs in any capacity? If you have not heard of an AEOP, select "Never heard of it." If you have heard of an AEOP but never participated, select "Never."

	0	1	2	3	4	n	Avg.	SD
Camp Invention	9 (56%)	5 (31%)	1 (6%)	0 (0%)	1 (6%)	16	.69	1.08
eCYBERMISSION	7 (44%)	7 (44%)	1 (6%)	0 (0%)	1 (6%)	16	.81	1.05
Junior Solar Sprint (JSS)	0 (0%)	0 (0%)	10 (63%)	3 (19%)	3 (19%)	16	2.56	.81
West Point Bridge Design Contest (WPBDC)	3 (19%)	9 (56%)	2 (13%)	0 (0%)	2 (13%)	16	1.31	1.20
Junior Science & Humanities Symposium (JSHS)	10 (63%)	6 (38%)	0 (0%)	0 (0%)	0 (0%)	16	.38	.50
Gains in the Education of Mathematics and Science (GEMS)	8 (50%)	5 (31%)	2 (13%)	0 (0%)	1 (6%)	16	.81	1.11
GEMS Near Peers	8 (50%)	8 (50%)	0 (0%)	0 (0%)	0 (0%)	16	.50	.52
UNITE	6 (38%)	10 (63%)	0 (0%)	0 (0%)	0 (0%)	16	.63	.50
Science & Engineering Apprenticeship Program (SEAP)	9 (56%)	7 (44%)	0 (0%)	0 (0%)	0 (0%)	16	.44	.51
Research & Engineering Apprenticeship Program (REAP)	11 (69%)	5 (31%)	0 (0%)	0 (0%)	0 (0%)	16	.31	.48
High School Apprenticeship Program (HSAP)	11 (69%)	5 (31%)	0 (0%)	0 (0%)	0 (0%)	16	.31	.48
College Qualified Leaders (CQL)	10 (63%)	6 (38%)	0 (0%)	0 (0%)	0 (0%)	16	.38	.50
Undergraduate Research Apprenticeship Program (URAP)	11 (69%)	5 (31%)	0 (0%)	0 (0%)	0 (0%)	16	.31	.48
Science Mathematics, and Research for Transformation (SMART) College Scholarship	11 (69%)	5 (31%)	0 (0%)	0 (0%)	0 (0%)	16	.31	.48
National Defense Science & Engineering Graduate (NDSEG) Fellowship	11 (69%)	5 (31%)	0 (0%)	0 (0%)	0 (0%)	16	.31	.48

Note. Response scale: 0 = "Never heard of it," 1 = "Never," 2 = "Once," 3= "Twice," 4 = "Three or more times".

How SATISFIED were you with each of the following at the National TSA Conference?								
	0	1	2	3	4	n	Avg.	SD
Communications from Technology Student Association (TSA) about JSS	0 (0%)	0 (0%)	0 (0%)	3 (23%)	10 (77%)	13	3.77	0.44
JSS application or registration process through TSA	0 (0%)	0 (0%)	1 (8%)	3 (23%)	9 (69%)	13	3.62	0.65
Time and location of JSS event at TSA National Conference	0 (0%)	1 (8%)	1 (8%)	1 (8%)	10 (77%)	13	3.54	0.97
Army Educational Outreach Program (AEOP) Special Interest Session	11 (85%)	0 (0%)	0 (0%)	0 (0%)	2 (15%)	13	4.00	0.00
Army JSS welcome dinner -- Saturday	12 (92%)	0 (0%)	0 (0%)	0 (0%)	1 (8%)	13	4.00	0.00
JSS time trials -- Sunday	0 (0%)	2 (15%)	0 (0%)	5 (38%)	6 (46%)	13	3.15	1.17
JSS finals -- Monday	6 (46%)	2 (15%)	1 (8%)	1 (8%)	3 (23%)	13	2.71	1.38
JSS display viewing -- Monday	0 (0%)	1 (8%)	2 (15%)	4 (31%)	6 (46%)	13	3.15	0.99
JSS judging process and feedback	2 (15%)	3 (23%)	3 (23%)	2 (15%)	3 (23%)	13	2.45	1.21
JSS competition awards	2 (15%)	2 (15%)	0 (0%)	4 (31%)	5 (38%)	13	3.09	1.14
Overall satisfaction with JSS event at TSA National Conference	0 (0%)	0 (0%)	2 (15%)	4 (31%)	7 (54%)	13	3.38	0.77

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

How SATISFIED were you with each of the following at the Army JSS event?								
	0	1	2	3	4	n	Avg.	SD
Communications from Army organizers about JSS	0 (0%)	0 (0%)	0 (0%)	1 (50%)	1 (50%)	2	3.50	0.71
JSS application or registration process through Army organizer	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	2	4.00	0.00
Time and location of Army JSS event	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	2	4.00	0.00
Army speaker or "career" event	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2	0.00	0.00
JSS car racing	0 (0%)	0 (0%)	0 (0%)	1 (50%)	1 (50%)	2	3.50	0.71
JSS judging process and feedback	0 (0%)	0 (0%)	1 (50%)	1 (50%)	0 (0%)	2	4.00	0.71
JSS competition awards	0 (0%)	0 (0%)	0 (50%)	0 (0%)	2 (100%)	2	2.50	0.00
Overall satisfaction with Army JSS event	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	2	4.00	0.00

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

How USEFUL were the following JSS resources provided at jrsolarsprint.org?								
	0	1	2	3	4	n	Avg.	SD

Official TSA Competition Rules	1 (7%)	0 (0%)	1 (7%)	4 (27%)	9 (60%)	15	3.57	0.65
Local Competition Rules	4 (27%)	1 (7%)	0 (0%)	3 (20%)	7 (47%)	15	3.45	0.93
Build A Car resources	4 (27%)	0 (0%)	1 (7%)	4 (27%)	6 (40%)	15	3.45	0.69
Course Outline	5 (33%)	0 (0%)	1 (7%)	4 (27%)	5 (33%)	15	3.40	0.70
STEM Standards	6 (40%)	0 (0%)	0 (0%)	5 (33%)	4 (27%)	15	3.44	0.53
Lesson Plans	5 (33%)	0 (0%)	2 (13%)	2 (13%)	6 (40%)	15	3.40	0.84
JSS Terminology	3 (20%)	0 (0%)	1 (7%)	5 (33%)	6 (40%)	15	3.42	0.67
Video Tutorials	7 (47%)	1 (7%)	0 (0%)	2 (13%)	5 (33%)	15	3.38	1.06
JSS Host Guide	9 (60%)	0 (0%)	1 (7%)	2 (13%)	3 (20%)	15	3.33	0.82
Calendar of Events	8 (57%)	0 (0%)	2 (14%)	1 (7%)	3 (21%)	14	3.17	0.98

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

The list below describes instructional and mentoring strategies that are effective ways to establish the relevance of learning activities for students. From the list below, please indicate which strategies you used when working with your student(s) in JSS.

	Yes – I used this strategy		No – I did not use this strategy	
	Freq.	**%**	**Freq.**	**%**
Finding out about students' backgrounds and interests at the beginning of the program	11	73%	4	27%
Giving students real-life problems to investigate or solve	14	93%	1	7%
Asking students to relate outside events or activities to topics covered in the program	12	80%	3	20%
Selecting readings or activities that relate to students' backgrounds	8	53%	7	47%
Encouraging students to suggest new readings, activities, or projects	11	73%	4	27%
Making explicit provisions for students who wish to carry out independent studies	9	60%	6	40%
Helping students become aware of the roles STEM plays in their everyday lives	14	93%	1	7%
Helping students understand how STEM can help them improve their communities	14	93%	1	7%
Other, (specify):	1	50%	1	50%

Note. "Other" response includes: "team work and design."

The list below describes instructional and mentoring strategies that are effective ways to support the diverse needs of students as learners. From the list below, please indicate which strategies you used when working with your student(s) in JSS.

	Yes – I used this strategy		No – I did not use this strategy	
	Freq.	%	Freq.	%
Finding out about students' learning styles at the beginning of the program	12	80%	3	20%
Interacting with all students in the same way regardless of their gender or race and ethnicity	15	100%	0	0%
Using gender neutral language	15	100%	0	0%
Using diverse teaching/mentoring activities to address a broad spectrum of students	13	87%	2	13%
Integrating ideas from the literature on pedagogical activities for women and underrepresented students	12	80%	3	20%
Providing extra readings, activities, or other support for students who lack essential background knowledge or skills	12	80%	3	20%
Directing students to other individuals or programs if I can only provide limited support	13	87%	2	13%
Other, (specify):	0	0%	0	0%

The list below describes instructional and mentoring strategies that are effective ways to support students development of collaboration and interpersonal skills. From the list below, please indicate which strategies you used when working with your student(s) in JSS.

	Yes – I used this strategy		No – I did not use this strategy	
	Freq.	%	Freq.	%
Having students tell others about their backgrounds and interests	7	47%	8	53%
Having students explain difficult ideas to others	13	87%	2	13%
Having students exchange ideas with others whose backgrounds or viewpoints are different from their own	14	93%	1	7%
Having students participate in giving and receiving feedback	14	93%	1	7%
Having students work on collaborative activities or projects as a member of a team	14	93%	1	7%
Having students listen to the ideas of others with an open mind	13	87%	2	13%
Having students pay attention to the feelings of all team members	13	87%	2	13%
Having students develop ways to resolve conflict and reach agreement among the team	13	87%	2	13%
Other, (specify):	1	50%	1	50%

The list below describes instructional and mentoring strategies that are effective ways to support students' engagement in "authentic" STEM activities. From the list below, please indicate which strategies you used when working with your student(s) in JSS.				
	Yes – I used this strategy		No – I did not use this strategy	
	Freq.	%	Freq.	%
Teaching (or assigning readings) about specific STEM subject matter	11	73%	4	27%
Having students access and critically review technical texts or media to support their work	13	87%	2	13%
Demonstrating the use of laboratory or field techniques, procedures, and tools students are expected to use	15	100%	0	0%
Helping students practice STEM skills with supervision	12	80%	3	20%
Giving constructive feedback to improve students' STEM competencies	14	93%	1	7%
Allowing students to work independently as appropriate for their self-management abilities and STEM competencies	14	93%	1	7%
Encouraging students to seek support from other team members	15	100%	0	0%
Encouraging opportunities in which students could learn from others (team projects, team meetings, journal clubs)	15	100%	0	0%
Other, (specify):	0	0%	0	0%

The list below describes instructional and mentoring strategies that are effective ways to support students' STEM educational and career pathways. The list also includes items that reflect AEOP and Army priorities. From the list below, please indicate which strategies you used when working with your student(s) in JSS.				
	Yes – I used this strategy		No – I did not use this strategy	
	Freq.	%	Freq.	%
Asking about students' educational and career interests	13	87%	2	13%
Recommending extracurricular programs that align with students' educational goals	11	73%	4	27%
Recommending Army Educational Outreach Programs that align with students' educational goals	5	33%	10	67%
Providing guidance about educational pathways that would prepare students for a STEM career	12	80%	3	20%
Sharing personal experiences, attitudes, and values pertaining to STEM	13	87%	2	13%
Discussing STEM career opportunities with the DoD or other government agencies	7	47%	8	53%
Discussing STEM career opportunities outside of the DoD or other government agencies (private industry, academia)	11	73%	4	27%

Discussing non-technical aspects of a STEM career (economic, political, ethical, and/or social issues)	10	67%	5	33%
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	11	73%	4	27%
Recommending student and professional organizations in STEM	12	80%	3	20%
Helping students build effective STEM networks	11	73%	4	27%
Critically reviewing students' résumé, application, or interview preparations	7	47%	8	53%
Other, (specify):	0	0%	1	100%

How USEFUL were each of the following in your efforts to expose student(s) to Army Educational Outreach Programs (AEOPs) during JSS?

	0	1	2	3	4	n	Avg.	SD
Junior Solar Sprint website	2 (13%)	1 (7%)	3 (20%)	2 (13%)	7 (47%)	15	3.15	1.07
Army Educational Outreach Program (AEOP) website	7 (47%)	1 (7%)	2 (13%)	2 (13%)	3 (20%)	15	2.88	1.13
AEOP social media	12 (80%)	1 (7%)	1 (7%)	0 (0%)	1 (7%)	15	2.33	1.53
AEOP brochure	9 (64%)	1 (7%)	0 (0%)	2 (14%)	2 (14%)	14	3.00	1.22
TSA or Army event coordinator	3 (20%)	0 (0%)	2 (13%)	4 (27%)	6 (40%)	15	3.33	0.78
Invited speakers or "career" events	8 (53%)	2 (13%)	1 (7%)	1 (7%)	3 (20%)	15	2.71	1.38
Participation in JSS event(s)	0 (0%)	1 (7%)	1 (7%)	4 (29%)	8 (57%)	14	3.36	0.93
AEOP instructional supplies (Rite in the Rain notebook, Lab coats, etc.)	12 (80%)	0 (0%)	1 (7%)	1 (7%)	1 (7%)	15	3.00	1.00

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

Which of the following AEOPs did you EXPLICITLY DISCUSS with your student(s) during JSS?

	Yes - I discussed this program with my student(s)		No - I did not discuss this program with my student(s)	
	Freq.	%	Freq.	%
Camp Invention	2	13%	13	87%
eCYBERMISSION	3	20%	12	80%
Junior Solar Sprint (JSS)	15	100%	0	0%
West Point Bridge Design Contest (WPBDC)	5	33%	10	67%
Junior Science & Humanities Symposium (JSHS)	0	0%	14	100%
Gains in the Education of Mathematics and Science (GEMS)	2	14%	12	86%

GEMS Near Peers	0	0%	14	100%
UNITE	0	0%	14	100%
Science & Engineering Apprenticeship Program (SEAP)	0	0%	14	100%
Research & Engineering Apprenticeship Program (REAP)	0	0%	14	100%
High School Apprenticeship Program (HSAP)	0	0%	14	100%
College Qualified Leaders (CQL)	0	0%	14	100%
Undergraduate Research Apprenticeship Program (URAP)	0	0%	14	100%
Science Mathematics, and Research for Transformation (SMART) College Scholarship	0	0%	14	100%
National Defense Science & Engineering Graduate (NDSEG) Fellowship	0	0%	14	100%
I discussed AEOP with my student(s) but did not discuss any specific program	2	15%	11	85%
Total		**100%**		**100%**

How USEFUL were each of the following in your efforts to expose your student(s) to Department of Defense (DoD) STEM careers during JSS?

	0	1	2	3	4	n	Avg.	SD
Junior Solar Sprint website	3 (20%)	0 (0%)	1 (7%)	5 (33%)	6 (40%)	15	3.42	0.67
AEOP website	8 (53%)	1 (7%)	1 (7%)	2 (13%)	3 (20%)	15	3.00	1.15
AEOP social media	11 (73%)	2 (13%)	0 (0%)	1 (7%)	1 (7%)	15	2.25	1.50
AEOP brochure	11 (73%)	1 (7%)	0 (0%)	1 (7%)	2 (13%)	15	3.00	1.41
TSA or Army event coordinator	5 (33%)	0 (0%)	2 (13%)	6 (40%)	2 (13%)	15	3.00	0.67
Invited speakers or "career" events	14 (93%)	0 (0%)	0 (0%)	0 (0%)	1 (7%)	15	4.00	0.00
Participation in JSS event(s)	3 (20%)	0 (0%)	2 (13%)	2 (13%)	8 (53%)	15	3.50	0.80
AEOP instructional supplies (Rite in the Rain notebook, Lab coats, etc.)	12 (80%)	1 (7%)	0 (0%)	1 (7%)	1 (7%)	15	2.67	1.53

Note. Response scale: 0 = "Did Not Experience," 1 = "Not at all," 2 = "A little," 3 = "Somewhat," 4 = "Very much".

Rate how much you agree or disagree with each of the following statements about Department of Defense (DoD) researchers and research:

	1	2	3	4	5	n	Avg.	SD
DoD researchers advance science and engineering fields	0 (0%)	0 (0%)	1 (7%)	7 (47%)	7 (47%)	15	4.40	0.63
DoD researchers develop new, cutting edge technologies	0 (0%)	0 (0%)	2 (13%)	6 (40%)	7 (47%)	15	4.33	0.72
DoD researchers support non-defense related advancements in science and technology	0 (0%)	0 (0%)	3 (20%)	5 (33%)	7 (47%)	15	4.27	0.80

DoD researchers solve real-world problems	0 (0%)	0 (0%)	2 (13%)	6 (40%)	7 (47%)	15	4.33	0.72
DoD research is valuable to society	0 (0%)	0 (0%)	2 (13%)	4 (27%)	9 (60%)	15	4.47	0.74

Note. Response scale: 1 = "Strongly Disagree," 2 = "Disagree," 3 = "Neither Agree nor Disagree," 4 = "Agree," 5 = "Strongly Agree".

How often did YOUR STUDENT(S) have opportunities to do each of the following in JSS?

	1	2	3	4	5	n	Avg.	SD
Learn new science, technology, engineering, or mathematics (STEM) topics	0 (0%)	0 (0%)	3 (20%)	7 (47%)	5 (33%)	15	4.13	0.74
Apply STEM knowledge to real life situations	1 (7%)	0 (0%)	3 (20%)	8 (53%)	3 (20%)	15	3.80	1.01
Learn about cutting-edge STEM research	2 (13%)	2 (13%)	5 (33%)	4 (27%)	2 (13%)	15	3.13	1.25
Learn about different STEM careers	4 (27%)	1 (7%)	1 (7%)	6 (40%)	3 (20%)	15	3.20	1.57
Interact with STEM professionals	4 (27%)	4 (27%)	4 (27%)	3 (20%)	0 (0%)	15	2.40	1.12
Practice using laboratory or field techniques, procedures, and tools	2 (13%)	1 (7%)	2 (13%)	8 (53%)	2 (13%)	15	3.47	1.25
Participate in hands-on STEM activities	0 (0%)	0 (0%)	2 (13%)	8 (53%)	5 (33%)	15	4.20	0.68
Work as part of a team	0 (0%)	0 (0%)	1 (7%)	6 (40%)	8 (53%)	15	4.47	0.64
Communicate with other students about STEM	1 (7%)	0 (0%)	3 (20%)	6 (40%)	5 (33%)	15	3.93	1.10
Draw conclusions from an investigation	0 (0%)	1 (7%)	1 (7%)	9 (60%)	4 (27%)	15	4.07	0.80
Build (or simulate) something	0 (0%)	0 (0%)	2 (13%)	7 (47%)	6 (40%)	15	4.27	0.70
Pose questions or problems to investigate	0 (0%)	1 (7%)	3 (20%)	7 (47%)	4 (27%)	15	3.93	0.88
Design an investigation	0 (0%)	2 (13%)	4 (27%)	6 (40%)	3 (20%)	15	3.67	0.98
Carry out an investigation	0 (0%)	2 (13%)	4 (27%)	6 (40%)	3 (20%)	15	3.67	0.98
Analyze and interpret data or information	0 (0%)	0 (0%)	4 (27%)	8 (53%)	3 (20%)	15	3.93	0.70
Come up with creative explanations or solutions	0 (0%)	1 (7%)	3 (20%)	8 (53%)	3 (20%)	15	3.87	0.83

Note. Response scale: 1 = "Not at all," 2 = "At least once," 3 = "A few times," 4 = "Most days," 5 = "Every day".

Which category best describes the focus of your student's JSS project?

	Freq.	%
Science	2	13%
Technology	3	20%
Engineering	10	67%
Mathematics	0	0%
Total	**15**	**100%**

AS A RESULT OF THE JSS EXPERIENCE, how much did your student(s) GAIN in the following areas?								
	1	2	3	4	5	n	Avg.	SD
Knowledge of a STEM topic or field in depth	1 (7%)	1 (7%)	4 (27%)	7 (47%)	2 (13%)	15	3.53	1.06
Knowledge of research conducted in a STEM topic or field	1 (7%)	1 (7%)	4 (27%)	7 (47%)	2 (13%)	15	3.53	1.06
Knowledge of research processes, ethics, and rules for conduct in STEM	1 (7%)	0 (0%)	6 (40%)	6 (40%)	2 (13%)	15	3.53	0.99
Knowledge of how professionals work on real problems in STEM	2 (13%)	2 (13%)	4 (27%)	4 (27%)	3 (20%)	15	3.27	1.33
Knowledge of what everyday research work is like in STEM	1 (7%)	3 (20%)	4 (27%)	4 (27%)	3 (20%)	15	3.33	1.23

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF THE JSS EXPERIENCE, how much did your student(s) GAIN in the following areas?								
	1	2	3	4	5	n	Avg.	SD
Asking a question that can be answered with one or more investigations	0 (0%)	1 (7%)	5 (36%)	6 (43%)	2 (14%)	14	3.64	0.84
Applying knowledge, logic, and creativity to propose scientific explanations or engineering solutions that can be tested with investigations	0 (0%)	2 (13%)	4 (27%)	8 (53%)	1 (7%)	15	3.53	0.83
Making a model to represent the key features and functions of an object, process, or system	0 (0%)	1 (7%)	4 (27%)	5 (33%)	5 (33%)	15	3.93	0.96
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	0 (0%)	2 (13%)	4 (27%)	6 (40%)	3 (20%)	15	3.67	0.98
Carrying out procedures for an investigation and recording data accurately	0 (0%)	1 (7%)	6 (40%)	4 (27%)	4 (27%)	15	3.73	0.96
Considering different ways to analyze or interpret data	0 (0%)	1 (7%)	4 (29%)	6 (43%)	3 (21%)	14	3.79	0.89
Displaying numeric data in charts or graphs to identify patterns and relationships	3 (20%)	1 (7%)	3 (20%)	7 (47%)	1 (7%)	15	3.13	1.3
Using mathematics or computers to analyze numeric data	3 (20%)	2 (13%)	5 (33%)	5 (33%)	0 (0%)	15	2.8	1.15
Supporting a scientific explanation or engineering solution with data from investigations	0 (0%)	2 (13%)	5 (33%)	7 (47%)	1 (7%)	15	3.47	0.83
Supporting a scientific explanation or engineering or engineering solution with	0 (0%)	2 (13%)	4 (27%)	7 (47%)	2 (13%)	15	3.6	0.91

relevant scientific, mathematical, and/or engineering knowledge								
Communicating information about investigations in different formats (orally, written, graphically, mathematically, etc.)	0 (0%)	1 (7%)	6 (40%)	7 (47%)	1 (7%)	15	3.53	0.74

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

AS A RESULT OF THE JSS EXPERIENCE, how much did your student(s) GAIN (on average) in the following areas?								
	1	2	3	4	5	n	Avg.	SD
Sticking with a task until it is complete	0 (0%)	0 (0%)	1 (7%)	9 (60%)	5 (33%)	15	4.27	0.59
Making changes when things do not go as planned	0 (0%)	0 (0%)	0 (0%)	10 (71%)	4 (29%)	14	4.29	0.47
Working collaboratively with a team	0 (0%)	0 (0%)	2 (13%)	7 (47%)	6 (40%)	15	4.27	0.70
Communicating effectively with others	0 (0%)	0 (0%)	3 (20%)	8 (53%)	4 (27%)	15	4.07	0.70
Including others' perspectives when making decisions	0 (0%)	0 (0%)	5 (33%)	6 (40%)	4 (27%)	15	3.93	0.80
Sense of being part of a learning community	0 (0%)	0 (0%)	4 (27%)	8 (53%)	3 (20%)	15	3.93	0.70
Building relationships with professionals in a field	2 (13%)	4 (27%)	3 (20%)	3 (20%)	3 (20%)	15	3.07	1.39
Connecting a topic or field and their personal values	0 (0%)	2 (13%)	6 (40%)	4 (27%)	3 (20%)	15	3.53	0.99

Note. Response scale: 1 = "No gain," 2 = "A little gain," 3 = "Some gain," 4 = "Large gain," 5 = "Extreme gain".

Which of the following statements describe your student(s) AFTER PARTICIPATING IN JSS?							
	1	2	3	4	n	Avg.	SD
More confident in STEM knowledge, skills, and abilities	0 (0%)	0 (0%)	13 (87%)	2 (13%)	15	3.13	0.35
More interested in participating in STEM activities outside of school requirements	0 (0%)	0 (0%)	12 (80%)	3 (20%)	15	3.20	0.41
More aware of other AEOPs	4 (27%)	1 (7%)	8 (53%)	2 (13%)	15	2.53	1.06
More interested in participating in other AEOPs	5 (33%)	1 (7%)	6 (40%)	3 (20%)	15	2.47	1.19
More interested in taking STEM classes in school	0 (0%)	1 (7%)	10 (67%)	4 (27%)	15	3.2	0.56
More interested in attending college	0 (0%)	3 (20%)	10 (67%)	2 (13%)	15	2.93	0.59
More interested in earning a STEM degree in college	0 (0%)	1 (7%)	14 (93%)	0 (0%)	15	2.93	0.26
More interested in pursuing a STEM career	1 (7%)	0 (0%)	13 (87%)	1 (7%)	15	2.93	0.59
More aware of Department of Defense (DoD) STEM research and careers	4 (27%)	3 (20%)	6 (40%)	2 (13%)	15	2.40	1.06
Greater appreciation of DoD STEM research and careers	5 (33%)	2 (13%)	6 (40%)	2 (13%)	15	2.33	1.11
More interested in pursuing a STEM career with the DoD	7 (47%)	1 (7%)	5 (33%)	2 (13%)	15	2.13	1.19

Note. Response scale: **1** = “Disagree – This did not happen,” **2** = “Disagree – This happened but not because of JSS,” **3** = “Agree – JSS contributed,” **4** = “Agree – JSS was the primary reason”.

Appendix D

FY14 JSS Student Focus Group Protocol

2014 Army Educational Outreach Program

Student Focus Group

Facilitator: "Thank you for meeting with us today so that we can learn more about your experiences in [X] program. We'd like to suggest some basic ground rules to help the group's discussion proceed smoothly and respectfully for everyone:

- What is shared in the room stays in the room.
- Only one person speaks at a time.
- It is important for us to hear everyone's ideas and opinions. If you disagree, be respectful.
- It is important for us to hear all sides of an issue—both the positive and negative.
- Your participation is voluntary--you may choose not to answer any question, or stop participating at any time.
- We will be audio recording the session for notetaking purposes and will delete the email after the notes have been taken."

Key Questions

1. Why did you choose to participate in [X] this year?
    - How did you hear about [X]?

2. One AEOP objective is to increase your awareness of the AEOP's pipeline of STEM programs. Did you learn about other AEOPs in [X]?
    - Which ones did you learn about?
    - How did you learn about them?
    - Which AEOPs are you interested in pursuing?

3. One AEOP objective is to increase your awareness of STEM research and career opportunities within the Department of Defense. Did you learn about DoD STEM research and careers in [X]?
    - Which ones did you learn about?
    - How did you learn about them?
    - Which AEOPs are you interested in pursuing?

4. Overall, were you happy that you chose to participate in [X]?
    - How have you benefited from participating in [X]?

5. What would you suggest for improving [X] in the future?

Ending questions:

6. Have we missed anything? Tell us anything you want us to know that we didn't ask about.

Appendix E

FY14 JSS Mentor Focus Group Protocol

2014 Army Educational Outreach Program
Adult Focus Group

Facilitator: "Thank you for meeting with us today so that we can learn more about your experiences in [X] program. We'd like to suggest some basic ground rules to help the group's discussion proceed smoothly and respectfully for everyone:

- What is shared in the room stays in the room.
- Only one person speaks at a time--we'll call on sites, if you have something to add or wish to build on another's idea, just type 'add' in the chat window and we'll come back to you.
- It is important for us to hear everyone's ideas and opinions. If you disagree, be respectful.
- It is important for us to hear all sides of an issue—both the positive and negative.
- Your participation is voluntary--you may choose not to answer any question, or stop participating at any time.
- We will be audio recording the session for notetaking purposes and will delete the email after the notes have been taken."

Key Questions

1. What do you perceive as the value of [X]?
    - How do you think students benefit from participating?
    - How have you benefited?

2. One AEOP objective is to increase participation of underserved and underrepresented populations in STEM. What strategies have you used this year to increase the diversity of participants in [X]?
    - What strategies seem to work the best?
    - What do you need in order to achieve greater success?

3. One AEOP objective is to increase participants' awareness of the AEOP's pipeline of STEM programs. What strategies have you used this year to educate participants about other AEOP initiatives?
    - What strategies seem to work the best?
    - What do you need in order to achieve greater success?

4. One AEOP objective is to increase participants' awareness of STEM research and career opportunities within the Department of Defense. What strategies have you used this year to expose participants to DoD STEM research and careers?
    - What strategies seem to work the best?
    - What do you need in order to achieve greater success?

5. What suggestions do you have for improving [X]?

Ending questions:

6. Have we missed anything? Tell us anything you want us to know that we didn't ask about.

Appendix F

APR Template

Program Overview

Provide a one or two paragraph overview of your program.

Accomplishments

Provide the following for *each* program objective listed in the Proposed Work section of the FY14 Annual Program Plan.

1. **What were the major activities conducted to accomplish the FY14 target for the objective. Report major activities undertaken by of the program adninistrator as well as a selection of 3-5 different site-level activities.**

2. **What were the results of those activities? Specifically, what progress was made toward achieving the FY14 target for the objective?**

3. **What is the proposed FY15 target for for the objective, considering the 5-year target?**

4. **What is planned to accomplish the FY15 target for the objective?**

The following structure can be used for each program objective (replicate as needed). Information in the top two rows ("Objective" and "FY14 Target") should be copied directly from the approved FY14APP.

Objective: [STATE OBJECTIVE] (**Supports AEOP Goal** [STATE GOAL #], **Objectives** [STATE OBJECTIVE LETTERS]) **Proposed Plan:** [STATE PROPOSED PLAN]
FY14 Target: [STATE TARGET]
Major activities: [REPORT ACTIVITIES OF PROGRAM ADMISTRATOR] [REPORT SELECTED SITE-LEVEL ACTIVITIES]
Results: [REPORT RESULTS] [REPORT PROGROSS TOWARD ACHEIVEING FY14 TARGET]
FY15 Target: [STATE TARGET]
FY15 Plan: [STATE PLAN TO ACCOMPLISH FY15 TARGET]

Changes / Challenges

1. **What changes (if any) were made to the plan for meeting FY14 targets for each objective? What were the reasons for the changes?**

2. **Do any of these changes have significant impact on budget/expenditures?**

3. **What challenges or delays (if any) prevented the program from meeting FY14 targets for each objective? What actions or plans were implemented to resolve those challenges or delays?**

4. **Do any of these challenges or delays require the assistance of the Army, the Consortium, or the Lead Organization to resolve? Please specify.**

Products

1. **For all programs, list and briefly describe any products resulting from the administration of the program (program administrator or site coordinator) during FY14.**
   - **Websites and social media (provide website urls, social media handles, etc.)**
   - **Instructional materials and other educational aids or resources**
   - **Audio or video products**
   - **Guiding documents**
   - **Marketing or promotional materials**
   - **Presentations[48] (provide citations)**
   - **Publications[49] (provide citations)**
   - **Educational research or evaluation assessments**
   - **Other**

2. **In addition to the above, how many of each product resulted from the Army/AEOP-sponsored research conducted by students participating in apprenticeship programs?**
   - **Abstracts**
   - **Presentations**
   - **Publications**
   - **Patents**

[48] Presentations include things like conference contributions (oral or poster) or presentations to the public, news media, educational agencies, and other associations. Conference booths may also be reported.

[49] Publications include things like peer reviewed articles, technical papers and reports, books or book chapters, news media releases.

- **Other**

Participants

Recruitment and selection of participants

1. **Who is the audience(s) targeted by your program and how was the program was marketed to the audience(s)? Report major activities undertaken by of the program administrator as well as a selection of 3-5 different site-level activities toward marketing and recruitment.**

2. **What criteria were used to select participants for the program? Report any efforts of the program administrator (including guidance provided to sites) as well as a selection of 3-5 different site-level criteria.**

3. **AEOP Pipeline: Explain any efforts that were made to specifically recruit alumni of other AEOP initiatives into your program? Explain any efforts to specifically recruit alumni of your program into other AEOP initiatives?**

Participant numbers and demographic characteristics

1. **How many of each participant group enrolled in the program? How many of each group applied and/or were selected/invited to participate? Report data using the following categories and enter "NA" where not applicable.**

	Applied	Selected	Enrolled
Participant Group	**No.**	**No.**	**No.**
Elementary school students (grades K-5)			
Middle school students (grades 6-8)			
High school students (grades 9-12)			
Undergraduate students (including community college)			
Graduate students (including post-baccalaureates)			
In-service K-12 teachers			
Pre-service K-12 teachers			
College/university faculty or other personnel			
Army/DoD Scientists & Engineers			
Other volunteers (e.g., if a competition program)			

2. **For the target audience(s) listed in the previous section (replicate the table as needed), how many were enrolled in the program per program site? How many of each group applied and/or were selected/invited to participate per program site?**

[Identify Participant Group]	Applied	Selected	Enrolled
Site	**No.**	**No.**	**No.**
(List each site by name)			

3. **For the target audience(s) listed in the previous section (replicate the table as needed), what are the demographic characteristics of the applicants and enrolled participants? Report data using the following categories:**

[Identify Participant Group]	Applied		Enrolled	
Demographic Category	**No.**	%	**No.**	%
Gender				
Male				
Female				
Choose not to report				
Race/ethnicity				
Native American or Alaskan Native				
Asian				
Black or African American				
Hispanic or Latino				
Native Hawaiian or Other Pacific Islander				
White				
Choose not to report				
School setting (students and teachers)				
Urban (city)				
Suburban				
Rural (country)				
Frontier or tribal School				
DoDDS/DoDEA School				
Home school				
Online school				
Choose not to report				
Receives free or reduced lunch (students only)				
Yes				

No				
Choose not to report				
English is a first language (students only)				
Yes				
No				
Choose not to report				
One parent/guardian graduated from college (students only)				
Yes				
No				
Choose not to report				
Documented disability (students only)				
Yes				
No				
Choose not to report				

4. For the target audience(s) listed in the previous section (replicate the table as needed), what are the rates of past AEOP participation of the applicants and enrolled participants? Report data using the following categories:

[Identify Participant Group]	Applied		Enrolled	
AEOP element	**No.**	%	**No.**	%
Camp Invention				
Junior Solar Sprint				
eCYBERMISSION				
West Point Bridge Design Competition				
Junior Science & Humanities Symposium				
Gains in the Education of Mathematics and Science				
UNITE				
Science and Engineering Apprentice Program				
Research and Engineering Apprenticeship Program				
High School Apprenticeship Program				
College Qualified Leaders				
Undergraduate Research Apprenticeship Program				
STEM Teachers Academy				
SMART Scholarship				
NDSEG Fellowship				

Organizations participating or served

1. How many of each organization are served by the program? Report data in the following categories:

Organizations	No.
K-12 schools	
Title 1 K-12 schools	
Colleges/universities (including community colleges)	
Army/DoD laboratories	
Other collaborating organizations (educational agencies, professional associations, external sponsors, etc.)	

2. Please list all colleges/universities served by the program.

3. Please list all Army/DoD laboratories served by the program.

4. Please list other collaborating organizations served by the program.

Other Impacts

Have the FY14 program activities impacted human and/or infrastructure resources in any additional areas beyond the primary objectives of the program? If so, please describe any activities and results of those activities, especially pertaining to the following:

- **Engagement opportunities for the public (beyond those persons typically considered program participants) to increase interest in STEM, perception of STEM's value to their lives, or their ability to participate in STEM**
- **Professional development for pre-service or in-service STEM teachers to improve their content knowledge and pedagogical skills**
- **Development and/or dissemination of instructional materials or educational resources**
- **Support for the development or advancement of STEM personnel (i.e., Army Scientists & Engineers, Army-sponsored university faculty and other personnel), programs, or other physical infrastructure**
- **Contributions having intellectual merit or broader impact to the field of informal science education and outreach**

If any of these activities are conducted through websites and/or social media, the summary of results should include the analysis of key website or social media analytics.

Funding, Budget, and Expenditures

1. Provide an overview of FY14 funding

FY14 Funding Overview	Amount
Carry-forward funding from FY13	
New funding received in FY14	
Total budget for FY14 (FY13 carry-over plus FY14 new funding)	
Total FY14 expenses (estimate for 30 Sept)	
Carry-forward funding from FY14 into FY15 (total FY14 budget minus estimate of total FY14 expenses)	

2. Funding to the cooperative agreement comes from a variety of sources (general purpose funds, laboratory specific stipend funds, and Navy and Air Force funds for JSHS, etc.). The type of funding is indicated on AEOP CA modifications. What type of funds supported your program in FY14 (include funding carried over from FY13 in your totals)?

FY14 AEOP CA Funding Type/Source	Amount
General purpose funds	
Laboratory specific stipend funds - [Indicate Laboratory and replicate row as needed so that each contributing laboratory is represented on a separate line]	
Total laboratory specific stipend funds	
Air Force/ Navy JSHS funds	
Total FY14 funding (add types of funding, should be equivalent to "Total budget for FY14" in table above)	

3. **How do your actual FY14 expenditures (estimate for 30 Sept cut-off) compare with your approved FY14 budget? Report totals in the following categories:**

	Approved FY14 Budget (includes FY13 carry-over and new FY14 funding)	Actual FY14 Expenditures (estimate through 30 Sept)	Carry-over from FY14 into FY15
Marketing & Outreach (include additional funding received through special AEOP Cross-Marketing RFP process)			
National Event (where applicable)			
Scholarships/awards			
Stipends			
Other direct costs (including salary & fringe); Number of FTEs =[Indicate number of FTEs including PT wage workers]			
Overhead – Indirect Rate= [Indicate Indirect Rate and to which costs the indirect applies (i.e. labor, direct costs, etc.)]			
TOTALS (should match totals provided in tables above)			

4. **Calculate average cost per student and explain how the calculation was made.**

Fast Facts

Complete the summary chart below. Report data using the following categories and enter "NA" where not applicable.

FY14 [Enter Program Name]	No.
Applications & Participants	
Student Applications	
Student Participants	
Student Participation Rate (no. participants/no. applications x 100)	%
Teacher Applications	
Teacher Participants	
Teacher Participation Rate	%
Near-Peer Mentor Applications	
Near-Peer Mentor Participants	
Near-Peer Mentor Participation Rate	%
Partners	
Participating Colleges/Universities (including community colleges)	
Participating Army/DoD Laboratories	
Science & Engineer Participants	
Apprenticeships, Awards & Stipends	
Apprenticeships Provided	
Scholarships/Awards Provided	
Expenses Toward Scholarships/Awards	$
Expenses Toward Stipends	$
Budget & Expenses	
FY14 Total Budget (including carry-over from FY13 and new FY14 funding)	$
FY14 Total Expenses (estimate through 30 Sept)	$
Carry-Over from FY14 to FY15	$
Average cost per student	$