Army Educational Outreach Program

Junior Science & Humanities Symposia Program

2014 Annual Evaluation Report

JSHS_03_06032015

U.S. Army Contacts

Jagadeesh Pamulapati, Ph.D.
Acting Executive Director, Strategic & Program Planning
Office of the Assistant Secretary of the Army
Acquisition, Logistics, and Technology
(703) 617-0309
jagadeesh.pamulapati.civ@mail.mil

Andrea Simmons-Worthen
Army Educational Outreach Program Director on behalf of the Office of the Deputy
Secretary of the Army for Research and Technology
(703) 617-0202
andrea.e.simmons.ctr@mail.mil

AEOP Cooperative Agreement Managers

Louie Lopez
AEOP Cooperative Agreement Manager
U.S. Army Research, Development, and
Engineering Command (RDECOM)
(410) 278-9858
louie.r.lopez.civ@mail.mil

Jennifer Carroll
AEOP Deputy Cooperative Agreement Manager
U.S. Army Research, Development, and
Engineering Command (RDECOM)
(410) 306-0009
jennifer.j.carroll2.civ@mail.mil

Junior Science & Humanities Symposium Program Administrators

Doris Cousens
JSHS Program Director
Academy of Applied Science
(603) 228 – 4530
dcousens@aas-world.org

Sheldon Apsell, Ph.D.
Principal Investigator
Academy of Applied Science
(603) 228-4530
sheldonapsell@gmail.com

VirginiaTech

Report JSHS_03_05152015 has been prepared for the AEOP Cooperative Agreement and the U.S. Army by Virginia Tech under award W911NF-10-2-0076.

Virginia Tech Evaluation Contacts

Tanner Bateman
Senior Project Associate, AEOP CA
Virginia Tech
(703) 336-7922
tbateman@vt.edu

Donna Augustine Burnette
Program Director, AEOP CA
Virginia Tech
(540) 315-5807
donna.augustine@vt.edu

Eric Banilower
Senior Researcher
Horizon Research, Inc.
(919) 489-1725
erb@horizon-research.com

Contents

Executive Summary

The Junior Science & Humanities Symposia Program (JSHS), administered by the Academy of Applied Science (AAS), is an AEOP pre-collegiate science, technology, engineering, and mathematics (STEM) research competition for high school students. JSHS encourages high school students to engage in original research in preparation for future STEM career pathways. In regional (R-JSHS) and national (N-JSHS) symposia, students present their research in a forum of peer researchers and practicing researchers from government (in particular the DoD), industry, and academia.

This report documents the evaluation of the FY14 JSHS 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 JSHS included questionnaires for students and mentors, one focus group with N-JSHS students and one with mentors, rapid interviews with 11 N-JSHS students and 10 mentors, and an annual program report compiled by AAS.

Regional symposia were held in 47 university campus sites nationwide. The top five students in each region received an expense-paid trip to the N-JSHS. Of these five, the top two students were invited to present their research as part of the national competition; the third place student was invited to display a poster of his/her research in a competitive poster session; and the fourth and fifth place students were invited to attend as student delegates with the option to showcase their research in a non-competitive poster session.

2014 JSHS Fast Facts	
Description	STEM Competition - Nationwide (incl. DoDEA schools), research symposium that includes 47 regional events and one national event
Participant Population	9th-12th grade students
No. of Applicants	13,373
No. of Students	7,409 Regional Participants (of whom 220 were selected to attend the National JSHS Symposium)
Placement Rate	55%
No. of Adults (Mentors, Regional Directors, Volunteers – incl. Teachers and S&Es)	3,846
No. of Army and DoD S&Es	300
No. of Army/DoD Research Laboratories	57
No. of K-12 Teachers	1,046
No. of K-12 Schools	1,100
No. of K-12 Schools – Title I	137

No. of College/University Personnel	1,800
No. of College/Universities	102
No. of DoDEA Students	140
No. of DoDEA Teachers	24
No. of Other Collaborating Organizations	120
Total Cost	$1,962,881
Scholarships/Awards Cost	$402,000
Cost of Regional Symposia (47) Support	$699,081
Cost of National Symposium (Additional cost due to Science and Engineering Festival)	$525,994
Administrative cost to AAS	$335,806
Cost per Student Participant	$265

Summary of Findings

The FY14 evaluation of JSHS collected data about participants, their perceptions of program processes, resources, and activities, and indicators of achievement related to AEOP's and JSHS's objectives and intended outcomes. A summary of findings is provided in the following table.

2014 JSHS Evaluation Findings	
Participant Profiles	
JSHS is concerned with diversity and expanding the pool of student applicants but has had limited success in serving students of historically underrepresented and underserved populations.	• JSHS appears to have been successful in attracting participation of female students—a population that is historically underrepresented in engineering fields. Student questionnaire respondents from both the Regional and National competitions included more females (R-JSHS 69%; N-JSHS 58%) than males (R-JSHS 31%; N-JSHS 42%). Registration data indicates an even split between female and male JSHS students at the national level.
	• JSHS had limited success in attracting students from historically underserved minority race/ethnicity and low-income groups. Student questionnaire respondents included a small proportion of minority students identifying as Hispanic or Latino (R-JSHS 17%; N-JSHS 5%). A majority of respondents reported that they did not qualify for free or reduced-price lunch (R-JSHS 71%; N-JSHS 93%).

	• A large majority of student questionnaire respondents attended public schools (R-JSHS 87%; N-JSHS 86%). Although over a third of respondents attended schools in urban or rural settings, which tend to have higher numbers or proportions of underrepresented and underserved groups, most attended suburban schools. JSHS provided outreach to 137 schools (12% of high schools served) in 2014.
	• 937 students from 7 states participated in JSHS regional symposia at HBCU/MSIs.
JSHS engages an extensive and diverse group of adult participants as STEM mentors, STEM ambassadors, and volunteers.	• Approximately 1,100 teachers, 1,800 college/university faculty, 300 Army/DoD scientists/engineers, and 400 adult volunteers served as research mentors or STEM ambassadors in JSHS. Additional STEM professionals from a range of business sectors participated in career day activities.
Actionable Program Evaluation	
JSHS is strongly marketed to schools and teachers serving historically underserved groups.	• JSHS employed a multi-pronged effort to market and recruit students to participate in regional symposia. These efforts stemming from AAS and regional JSHS directors included personal contact with teachers and high school administrators, printed and electronic promotional materials distributed by direct mail and email, university websites, social media (Facebook), and targeted marketing at existing other STEM-related regional initiatives (e.g., university chapter of the National Society of Black Engineers).
	• Students most frequently learned about the regional JSHS program from teachers/professors (R-JSHS 88%; N-JSHS 72%). Other significant sources for N-JSHS students were the JSHS website (33%), a friend (28%), or another past participant of JSHS (28%).
Many JSHS students are motivated by an interest in STEM or the encouragement of a teacher or professor.	• R-JSHS students were most frequently motivated to participate in JSHS by teacher or professor encouragement (R-JSHS 50%), and N-JSHS students were most frequently motivated to participate in JSHS by their interest in STEM (N-JSHS 86%). Other highly motivating factors included: desire to learn in ways that are not possible in school (R-JSHS 43%; N-JSHS 64%); desire to expand laboratory or research skills (R-JSHS 38%; N-JSHS 55%); and desire to have fun (R-JSHS 25%; N-JSHS 55%).

JSHS engages students in meaningful STEM learning through hands-on activities.	• Almost all N-JSHS students (98%) and most R-JSHS students (53%) report learning about STEM topics on most days or every day of their JSHS experience. The overwhelming majority of N-JSHS students (84-93%), but fewer R-JSHS students (44-46%), report applying STEM knowledge to real-life situations, interacting with STEM professionals, and communicating with other students about STEM most or all days of their JSHS experience. The differences between N-JSHS and R-JSHS students in overall learning about STEM were statistically significant.
	• Many students had opportunities to engage in a variety of STEM practices during their JSHS experience. For example, students reported participating in hands-on activities (R-JSHS 36%; N-JSHS 69%), coming up with creative explanations/ solutions (R-JSHS 40%; N-JSHS 56%) and posting questions or problems to investigate (R-JSHS 41%; N-JSHS 56%) on most days or every day.
	• Both R-JSHS and N-JSHS students reported greater opportunities to learn about STEM in their JSHS experience than they typically have in school. However, R-JSHS students reported lower engagement in STEM practices in their JSHS experience than they typically have in school, and N-JSHS students reported similar engagement in STEM practices in both settings.
	• Most mentors reported using strategies to help make learning activities relevant to students, support the needs of diverse learners, develop collaboration and interpersonal skills, and engage students in “authentic” STEM activities.
JSHS promotes DoD STEM research and careers but can improve marketing of other AEOP opportunities.	• The vast majority of mentors had no past participation in or no awareness of an AEOP initiative beyond JSHS. 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.
	• JSHS sites offered a variety of activities for promoting STEM careers which vary by regional event. Activities may include interactive expert panels, off- and on-campus STEM expos, and field trips to Army, university, and other research labs and facilities.
The JSHS experience is greatly valued by students and mentors.	• All N-JSHS students indicated being very satisfied with their JSHS research experience, as did 80% of R-JSHS students who had a research experience. Further, the vast majority of N-JSHS students were satisfied with most elements of N-JSHS. Satisfaction with R-JSHS was more mixed.

	• The vast majority of responding mentors indicated having a positive experience with those program features they experienced. Further, many commented on the benefits the program provides students, including engaging with real-world STEM issues or research and meeting STEM professionals and students.
Outcomes Evaluation	
JSHS had positive impacts on students' perceptions of their STEM knowledge and competencies.	• A majority of R-JSHS students and the vast majority of N-JSHS students reported large or extreme gains on their knowledge of a STEM topic or field in depth; how professionals work on real problems in STEM; research conducted in a STEM topic or field; what everyday research work is like in STEM; and the research processes, ethics, and rules for conduct in STEM. These impacts were greater for N-JSHS students than R-JSHS students, but similar across gender, race/ethnicity, and FRL status.
	• Many students also reported impacts on their abilities to do STEM, including such things as applying knowledge, logic, and creativity to propose solutions that can be tested; displaying numeric data from an investigation in charts or graphs to identify patterns and relationships; making a model that represents the key features or functions of a solution to a problem; identifying the strengths and limitations of explanations in terms of how well they describe or predict observations; and using mathematics to analyze numeric data.
JSHS had positive impacts on students' perceptions of their 21st Century Skills.	• A majority of students reported large or extreme gains on their ability to make changes when things do not go as planned, persevere with a task, and set goals and reflect on performance. Overall, minority students and FRL-eligible students reported greater gains than their counterparts.
JSHS, especially N-JSHS, positively impacted students' confidence and identity in STEM, as well as their interest in future STEM engagement.	• Almost all N-JSHS students reported a large or extreme gain in feeling like part of a STEM community (94%); feeling responsible for a STEM project or activity (94%); confidence to do well in future STEM courses (93%); and readiness for more challenging STEM activities (90%). However, R-JSHS students were less likely to report gains of this magnitude in these areas (42%, 48%, 51%, and 49% on these items, respectively). Overall, minority students reported greater gains in STEM confidence and identity than non-minority students.

	• 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 JSHS, they were more likely to participate in a STEM club, student association, or professional organization; work on a STEM project or experiment in a university of professional setting; and mentor or teach other students about STEM. N-JSHS students were more likely to indicate impacts in these areas than R-JSHS students.
JSHS succeeded in raising students' education aspirations and their aspirations for a STEM career.	• After participating in JSHS, students indicated being more likely to go further in their schooling than they would have before JSHS, with the greatest changes being in the proportions of Regional students who expected to continue their education beyond a Bachelor's degree (57% before JSHS, 87% after) and National students who aspired to a combined M.D./Ph.D. (22% before and 34% 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. There was a large increase in the proportion of R-JSHS students interested in a STEM-related career. Many N-JSHS students indicated interest in a STEM-related career both before and after JSHS, and there was not a statistically significant difference across time points.
JSHS students are largely unaware of AEOP initiatives, but students show substantial interest in future AEOP opportunities.	• Students, particularly R-JSHS students, and mentors were largely unaware of other AEOP initiatives, but 59% of R-JSHS students and 86% of N-JSHS students indicated that JSHS made them more aware of other AEOPs, and most (R-JSHS 52%; N-JSHS 80%) credited JSHS with increasing their interest in participating in other programs.
JSHS raised student awareness and appreciation of DoD STEM research and careers, as well as their interest in pursuing a STEM career with the DoD.	• Almost all N-JSHS students and most R-JSHS students reported that they had a greater awareness (R-JSHS 69%; N-JSHS 97%) and appreciation (R-JSHS 64%; N-JSHS 94%) of DoD STEM research and careers. In addition, most (R-JSHS 53%; N-JSHS 84%) indicated that JSHS raised their interest in pursuing a STEM career with the DoD.

Recommendations

1. The AEOP has the goal of broadening the talent pool in STEM fields, with a subset of the programs (e.g., REAP, UNITE) specifically targeting underrepresented and underserved populations. Although not an explicit goal of JSHS, the questionnaire data indicate that JSHS has limited success at attracting students from groups historically underrepresented and underserved in STEM on a national scale. In order to improve on this, the program should

continue to collect information from specific regional symposia as well as other AEOPs that are successfully attracting underrepresented and underserved students to then disseminate to the larger JSHS community of regional directors. Additionally, JSHS may consider ways to build on 2014 efforts to strengthen its outreach to schools that serve large proportions of such students (e.g., urban schools, Title I schools), and perhaps seek advice from groups or individuals with expertise in engaging these populations of students such as the National Action Council for Minorities in Engineering or the Society for Advancement of Hispanics/Chicanos and Native Americans in Science. JSHS might also consider the possibility of engaging with target districts through the AEOP's strategic outreach initiative opportunities which provide limited financial support to assist in the ability of a target community to engage with the AEOPs. Additionally, collecting demographic information on students participating in the R-JSHS through the centralized registration tool in FY15 and beyond will enable a more accurate representation of the JSHS participation pool.

2. Given the goal of having students progress from JSHS into other AEOP programs, JSHS should work with regional symposia to increase students' exposure to AEOP. Only about 1 in 10 mentors recommended each of REAP, HSAP, SEAP, or SMART to students, and fewer discussed other AEOPs. 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 invited speakers, career events, or their mentors, the program may want to work with each R-JSHS 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 program 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. 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. Improved communication with the individual program sites about expectations for the evaluation may help. Given the large number of participants in the Regional competitions, it may be worth randomly sampling students to respond to the questionnaire, and rechanneling efforts into getting a high response rate from the sample. 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. The R-JSHS experience is the only JSHS experience for most students, but consistent differences between R-JSHS and N-JSHS student responses suggest that N-JSHS may be having a greater impact on students than R-JSHS. Some of these differences are likely due to initial differences in interest and/or ability between students who are selected to go on to N-JSHS and those who are not. However, other differences may be related to differences in

the availability/quality of mentor support or the availability/quality of activities at each symposium. JSHS should consider what guidance and support can be provided to regional directors, mentors, and other supporters of R-JSHS to encourage active engagement in STEM activities, useful feedback from judges, and feelings of success that support a positive STEM identity among students who are not selected for N-JSHS.

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.

This report documents the evaluation of one of the AEOP elements, the Junior Science & Humanities Symposia Program (JSHS). JSHS is administered on behalf of the Army by the Academy of Applied Science (AAS) and is co-sponsored by the Navy and Air Force. 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.

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.

Program Overview

JSHS is an AEOP pre-collegiate STEM competition. JSHS encourages high school students to engage in original research in preparation for future STEM career pathways. The categories of competition are:

1. Chemistry (including geochemistry, energy-alternative fuels, materials science);
2. Engineering;
3. Environmental sciences;
4. Life sciences (including natural sciences, microbiology, molecular/cellular, biochemistry);
5. Mathematics and computer sciences;
6. Medicine & health (including behavioral sciences, neurobiology, biomedical, physiology); and

7. Physics and astronomy.

In regional (R-JSHS) and national (N-JSHS) symposia, students present their research in a forum of peer researchers and practicing researchers from government (in particular the DoD), industry, and academia. In addition, they receive public recognition and awards for their research achievements while competing for scholarship funds.

Regional symposia were held at 47 university campus sites nationwide in 2014. The top five students in each region received an expense-paid trip to the N-JSHS. Of these five, the top two students were invited to present their research as part of the national competition; the third place student was invited to display a poster of his/her research in a competitive poster session; and the fourth and fifth place students were invited to attend as student delegates with the option to showcase their research in a non-competitive poster session. The AAS has established guidelines and "Ground rules" for the student research paper competition and provides these guidelines to JSHS regional symposia and other cooperating organizations. These resources allows for a general consistency in student experience and outcome, while still allowing sites the flexibility to design the details of their program to meet the unique needs of their students. All JSHS programs are designed to meet the following objectives:

1. Promote research and experimentation in STEM at the high school level;
2. Recognize the significance of research in human affairs and the importance of humane and ethical principles in the application of research results;
3. Search out talented youth and their teachers, recognize their accomplishments at symposia, and encourage their continued interest and participation in the sciences, mathematics, and engineering;
4. Recognize innovative and independent research projects of youth in regional and national symposia;
5. Expose students to academic and career opportunities in STEM and to the skills required for successful pursuit of STEM;
6. Expose students to STEM careers in the Army and/or DoD laboratories; and
7. Increase the future pool of talent capable of contributing to the national's scientific and technological workforce.

The 47 R-JSHS sites received applications from approximately twice as many students as they had positions for the 2014 JSHS regional symposia: 13,373 students applied and 7,409 were selected. The total numbers of students and teachers selected were similar to the numbers of student and teacher participants in FY13. Table 1 summarizes interest and final selection by site.

Table 1. 2014 JSHS Site Applicant and Selection Numbers			
2014 JSHS Site	**No. of Student Applicants**	**No. of Selected Students**	**No. of Selected Teachers**
Alabama	220	140	20
Alaska	150	60	4
Arizona	200	160	20
Arkansas	110	130	30
California No. & W. Nevada	450	240	30
California Southern	190	110	25
Connecticut	580	290	40
Europe	150	60	10
Florida	440	260	64
Georgia	140	140	30
Hawaii	260	120	20
Illinois	80	120	30
Illinois-Chicago	1400	130	20
Indiana	100	90	11
Intermountain	200	180	30
Iowa	160	230	17
Kansas-Nebraska-Oklahoma	100	90	22
Kentucky	60	50	4
Louisiana	135	160	15
Maryland	190	400	30
Michigan Southeastern	100	80	10
Missouri	260	240	31
New England Northern	200	80	12
New England Southern	100	80	10
New Jersey Monmouth	715	440	34
New Jersey Northern	770	160	40
New York Long Island	370	300	35
New York Metro	360	300	30
New York Upstate	720	435	55
North Carolina	260	130	20
North Central	310	220	20
Ohio	260	200	24

Oregon	110	80	10
Pacific	120	80	14
Pennsylvania	170	120	22
Puerto Rico	860	60	14
South Carolina	540	310	47
Southwest	100	94	20
Tennessee	110	75	11
Texas	210	120	30
Virginia	390	110	12
Washington	190	135	20
Washington D.C.	520	160	14
West Virginia	70	60	8
Wisconsin	30	30	6
Western Wisconsin	150	90	11
Wyoming-Eastern Colorado	63	60	14
Total	**13,373**	**7,409**	**1,046**
National Symposium		220	60

JSHS engaged approximately 3,846 teachers, faculty, graduate students, and support personnel in conducting the symposia including approximately 300 Army/DoD STEM scientists and engineers (S&Es).

Table 2. 2014 JSHS Participation

Participant Group	No. of Participants
High school students (grades 9-12)	7,409
Graduate students (including post-baccalaureates)	300
In-service K-12 teachers	1,046
College/university faculty or other personnel	1,800
Army/DoD Scientists & Engineers	300
Other Volunteers	400
Total	**11,255**

The total cost of the 2014 JSHS program was $1,962,881, including $402,000 provided in scholarships and awards. Undergraduate tuition scholarships to winners at the R-JSHS and N-JSHS events are payable to the students' college of enrollment upon matriculation. The average cost per student participant for 2014 JSHS was $265.

Table 3. 2014 JSHS Program Costs	
2014 JSHS – Summative Cost Breakdown	
Total Cost	$1,962,881
Scholarships/Awards Cost	$402,000
Cost of Regional Symposia (47) Support*	$699,081
Cost of National Symposium (Additional cost due to Science and Engineering Festival)	$525,994
Administrative Cost to AAS	$359,255
Cost Per Student Participant	$265

** Note that regional symposia often contribute significant additional funds to support their events. Funding may come from a combination of donors including: colleges/universities, STEM organizations, industry, etc. The average cost per student at R-JSHS varies significantly by site. Costs range from a low of $12.76/per person per day to a high of $313/per person per day (Europe and Puerto Rico) or stateside $195/per person per day stateside. The median cost at R-JSHS (excluding awards) is $50.32/pp per day.*

Evidence-Based Program Change

Based on recommendations from the FY13 summative evaluation report, the AEOP identified three key priorities for programs in FY14: (1) increase outreach to populations that are historically underserved and underrepresented in STEM; (2) increase participants' awareness of Army/DoD STEM careers; and (3) increase participants' awareness of other AEOP opportunities. AAS initiated the following program changes/additions to the FY14 administration of the JSHS program in light of programmatic recommendations from the Army and LO, the key AEOP priorities, site visits conducted by AAS and the LO, and the FY13 JSHS evaluation study:

I. **Increase outreach to populations that are historically underserved and underrepresented in STEM:**
   a. Partnership with USA Science & Engineering Festival increased exposure of JSHS to approximately 300,000.
   b. Widely distributed AEOP marketing materials to nationwide schools at regional symposia level and to national symposium participants. Announcements were prepared and published at the start of the academic year, with an invitation to participate, and distributed via direct and email to targeted high school teachers, guidance counselors, and principals.
   c. Presentations at statewide teachers association meetings as well as advertising via listserves and newsletters reaching science teachers.
   d. Ongoing support of "Teacher Award," and AEOP branded participation certificates to recognize volunteer contributions and enhance the status of teacher/school participation.
   e. Partnership with STEM outreach programs and program managers to implement strategies to engaging underrepresented populations.
   f. Mentorship offered to students in underrepresented schools by STEM personnel who are members of the Alabama Academy of Sciences, administering organization for Alabama JSHS.

g. Partnerships with internal and external mentorship programs to identify students. Examples in Connecticut include coordination with Louis Stokes Alliance for Minority Participation (LSAMP) Bridge to the Doctorate, LSAMP Scholars Program, Connecticut Science and Engineering Fair and UConn Mentor Connection.
h. Coordination with outreach events hosted by undergraduate student groups including honors groups and groups serving underrepresented populations. Examples at Rutgers include: The Minority Engineering Educational Task (MEET; the Rutgers University Chapter of the National Society of Black Engineers), the Society of Women Engineers (SWE), the Society of Hispanic Engineers (SHE), and the Rutgers University Science, Mathematics & Engineering Outreach (RUSMEO).
i. Websites hosted by universities and National JSHS Program contain links to AEOP programs, guidelines for students and teachers, event schedules, registration information, video testimonials from students, and the complete list of winners.
j. Coordination with university admissions which publicizes university programs to high schools throughout the state.
k. Social media presence on Facebook, LinkedIn and Twitter.

II. Increase participants' awareness of other Army/DoD STEM careers:

a. Engagement of military personnel in National JSHS judging process.
b. Coordinated with tri-service leadership to identify laboratory participation within commuting distance of regional symposia.
c. Regional symposia reach out to military STEM personnel to engage participation in the R-JSHS as speakers and judges.
d. National JSHS programming focused on career opportunities in DoD STEM.

III. Increase participants' awareness of other AEOP opportunities:

a. Regional symposia widely distribute AEOP branded JSHS announcements through mailings to high schools, presentations to statewide teacher association meetings, partner organizations and associations, and others.
b. Increased awareness of the volunteers' role in contributing to the AEOP mission to expand the pipeline of future STEM talent. Provided feedback on success through presentations and distribution of published reports.
c. The IPA engaged JSHS alumni to volunteer with eCYBERMISSION and the White House Science Fair. Facebook links inviting participating JSHS alumni were shared on the AEOP social media feed.
d. Implemented AEOP cross-marketing initiative.

IV. Other evidence based changes or activities:

a. Contributed to the development and administration of an "Evaluation Toolkit" that was provided to regional and national participants.

b. Regional symposia administrator training to prepare and support volunteers. As a result, longstanding service of faculty members was reported across regions.

c. Several regional symposia engaged younger faculty and pre-service teachers in STEM outreach and JSHS.

FY14 Evaluation At-A-Glance

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

Inputs	Activities	Outputs	Outcomes (Short term)	Impact (Long Term)
• Tri-service sponsorship • AAS providing oversight of regional and national programs • Operations conducted by university and DoD partners • Students participating in regional and national programs • STEM professionals and educators serving as research mentors, judges, personnel and volunteers of regional and national programs • Awards for student competitors, and recognition for STEM professionals and educators in support roles • Centralized branding and comprehensive marketing • Centralized evaluation	• Students conduct "authentic" STEM and humanities research, often mentored by STEM professionals and educators • Students present their research in poster or oral presentations at 47 regional symposium • STEM professionals judge presentations and select regional winners • Regional winners advance to N-JSHS (Washington, DC). • Program activities that expose students to AEOP programs and/or STEM careers in the Army or DoD (including the U.S. Science & Engineering Festival)	• Number and diversity of student participants engaged in programs • Number and diversity of STEM professionals and educators serving as research mentors, judges, personnel and volunteers of regional and national programs • Number and diversity of DoD scientists and engineers and other military personnel engaged in programs • Number and Title 1 status of high schools served through participant engagement • Students, regional directors, national judges, and AAS contributing to evaluation	• Increased participant 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 DoD STEM research and careers • Implementation of evidence-based recommendations to improve JSHS regional and national programs	• Increased student participation in other AEOP and 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 DoD STEM careers • Continuous improvement and sustainability of JSHS

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

Key Evaluation Questions

- What aspects of regional and national JSHS programs motivate participation?
- What aspects of regional and national JSHS program structure and processes are working well?
- What aspects of the regional and national JSHS programs could be improved?
- Did participation in JSHS programs:
  - Increase student competencies in STEM?
  - Increase student interest in or motivation for future engagement in STEM?
  - Increase student awareness of and interest in other AEOP opportunities?
  - Increase student awareness of and interest in DoD STEM careers?
- To what extent were there differences in student experiences and benefits between Regional and National JSHS?

The assessment strategy for JSHS included student and mentor questionnaires, one focus group with students attending N-JSHS and one with adults, rapid interviews with 12 students and 10 adults, and the Annual Program Report (APR) prepared by AAS. Tables 4-9 outline the information collected in student and instructor questionnaires, focus groups, and 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, age, 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; mentored research experience and products (students)
	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
	Future STEM Engagement: Gains in interest/intent for future STEM engagement (informal activities, education, career)
	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 JSHS, motivating factors for participation, satisfaction with and suggestions for improving JSHS 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 Group	
Category	**Description**
Profile	Gender, race/ethnicity, grade level, past participation in JSHS, past participation in other AEOP programs
Satisfaction & Suggestions	Awareness of JSHS, motivating factors for participation, involvement in other science competitions in addition to JSHS, satisfaction with and suggestions for improving JSHS programs, benefits to participants
AEOP Goal 1 and 2 Program Efforts	**Army STEM: AEOP Opportunities –** Extent to which students were exposed to other AEOP opportunities
	Army STEM: Army/DoD STEM Careers – Extent to which students were exposed to STEM and Army/DoD STEM jobs

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

Table 8. 2014 Student and Mentor Rapid Interviews	
Category	**Description**
Profile	Gender, race/ethnicity, role in JSHS
Satisfaction & Suggestions	Perceived value of JSHS, benefits to participants suggestions for improving JSHS programs

Table 9. 2014 Annual Program Report	
Category	**Description**
Program	Description of symposia categories and activities
AEOP Goal 1 and 2 Program Efforts	**Underserved Populations:** mechanisms for marketing to and recruitment of students from underserved populations
	Army STEM: Army/DoD STEM Careers – Career day exposure to Army STEM research and careers (varies by regional, national event); Participation of Army engineers and/or Army research facilities in career day activities (varies by regional, national event)
	Mentor Capacity: Local Educators - University faculty and student involvement, teacher involvement

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 and rapid interview 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

Questionnaire responses were received from students participating in the national competition, students from 19 of the 47 regional competitions, and mentors from 29 of the 47 regional sites. The FY12 evaluation recommended exploration of the extent to which R-JSHS programs nurture and support all students, not just those who advance to the N-JSHS, and the FY13 evaluation provided some evidence for how the program has impacted R-JSHS students in comparison to N-JSHS students. This report builds on the FY13 report by disaggregating R-JSHS and N-JSHS data, allowing comparisons of students' perceptions of their respective JSHS experiences and the benefits of those experiences. Mentors completed the mentor questionnaire once for all students they mentored, whether the students advanced to N-JSHS or not, and therefore their responses do not distinguish between R-JSHS and N-JSHS. Table 10 shows the number of student and mentor respondents by site.

Table 10. 2014 JSHS Site Survey Respondent Numbers

2014 JSHS Site	R-JSHS Students		N-JSHS Students		Mentors	
	No. of Participants	No. of Survey Respondents	No. of Participants	No. of Survey Respondents	No. of Participants	No. of Survey Respondents
Alabama	140	0	5	0	20	1
Alaska	60	7	5	1	4	7
Arizona	160	–†	5	–†	20	–†
Arkansas	130	1	5	1	30	1
California—Northern California & Western Nevada	240	35	5	1	30	6
California—Southern California	110	0	5	0	25	1
Connecticut	290	9	5	2	40	0
DoD Dependent Schools-Europe	60	4	5	2	10	3
DoD Dependent Schools-Pacific	80	0	5	0	64	0
District of Columbia	160	0	5	0	30	1
Florida	260	0	5	0	20	2
Georgia	140	2	5	1	30	2
Hawaii	120	0	5	1	20	2

Illinois	120	8	5	2	11	2
Illinois-Chicago	130	–†	5	–†	30	–†
Indiana	90	0	5	1	17	2
Intermountain—Colorado, Montana, Idaho, Nevada, Utah	180	0	5	2	22	1
Iowa	230	3	5	2	4	1
Kansas—Nebraska—Oklahoma	90	0	5	2	15	1
Kentucky	50	0	5	1	30	1
Louisiana	160	–†	5	–†	10	–†
Maryland	400	0	5	1	31	0
Michigan—Southeastern Michigan	80	0	5	0	12	0
Missouri	240	0	5	2	10	0
New Jersey--Monmouth	440	0	5	3	34	0
New Jersey—North New Jersey	160	10	5	1	40	14
New York—Long Island	300	3	5	1	35	8
New York—Metro	300	3	5	2	30	8
New York—Upstate	435	2	5	2	55	1
North Carolina	130	2	5	1	20	0
North Central—Minnesota, North Dakota, South Dakota	220	0	5	1	20	0
New England—Northern New England	80	0	5	0	24	0
New England—Southern New England	80	0	5	0	10	0
Ohio	200	0	5	0	14	0
Oregon	80	0	5	0	22	0
Pennsylvania	120	1	5	0	14	3
Puerto Rico	60	5	5	0	47	4
South Carolina	310	2	5	0	20	2
Southwest	94	1	5	3	11	1

Tennessee	75	0	5	3	30	4
Texas	120	0	5	1	12	1
Virginia	110	3	5	1	20	3
Washington	135	0	5	1	14	2
West Virginia	60	0	5	0	8	0
Wisconsin-Western Wisconsin & Upper Michigan	90	1	5	0	6	1
Wisconsin	30	0	5	0	11	0
Wyoming—Eastern Colorado	60	0	5	0	14	0
Unspecified‡		4		2	0	2
Total	**7409**	**149**	**220**	**43**	**1,046**	**88**

† Due to changes in R-JSHS locations following finalization of the student and mentor questionnaires, Arizona, Illinois-Chicago, and Louisiana were not listed on the questionnaire as possible R-JSHS sites.

‡ No R-JSHS site was indicated by 4 R-JSHS students, 1 N-JSHS student, and 2 mentors.

Table 11 provides an analysis of student and mentor participation in the JSHS 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.

Table 11. 2014 JSHS Questionnaire Participation

Participant Group	Respondents (Sample)	Total Participants (Population)	Participation Rate	Margin of Error @ 95% Confidence[1]
R-JSHS Students	106	7,409	1%	±9.45%
N-JSHS Students	43	220	20%	±13.44%
Mentors	88	1046	8%	±10.0%

[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.

One student focus group was conducted at the N-JSHS (focus group participants did not provide information about the R-JSHS program site). The student focus group included 4 students (1 female, 3 males) in grades 9 to 12. One mentor focus group was also conducted at N-JSHS, which included 9 mentors (3 females, 6 males). Mentors included 4 educators, 3 STEM professionals, 1 director, and 1 parent; 6 described their role in JSHS as a regional director, 2 as judges, and one as a chaperone. Focus groups were not intended to yield generalizable findings; rather they were intended to provide additional evidence of, explanation for, or illustrations of questionnaire data. They add to the overall narrative of JSHS's efforts and impact, and highlight areas for future exploration in programming and evaluation.

Rapid interviews were conducted at N-JSHS with 11 students (5 females, 6 males) and 10 mentors (6 females, 3 males, gender information was missing for 1 mentor). The students included 3 oral presenters, 6 poster presenters, and 2 non-presenters. The mentors included 3 judges, 3 chaperones, 2 regional directors, 1 competition advisor/mentor, and a parent. As with the focus groups, rapid interviews were intended to provide additional evidence of, explanation for, or illustrations of student questionnaire data; they were not intended to yield generalizable findings.

Respondent Profiles

Student Demographics

Demographic information collected from JSHS questionnaire respondents is summarized in Table 12. More females (R-JSHS 69%; N-JSHS 58%) than males (R-JSHS 31%; N-JSHS 42%) completed the questionnaire. Among R-JSHS respondents, more students identified with the race/ethnicity category of White (56%) than any other single race/ethnicity category, though there is substantial representation of Asian (17%) and Hispanic or Latino (17%) populations. N-JSHS respondents were almost evenly divided between students identified with the race/ethnicity category of Asian (44%) and White (40%). Approximately half of R-JSHS student responders were rising 12th graders (51%); among N-JSHS responders the greatest single grade level was rising college freshmen (44%). When asked if they qualified for free or reduced-price lunch (FRL)—a common indicator of low-income status—the vast majority of N-JSHS respondents (93%) and R-JSHS respondents (71%) reported that they did not qualify. As can be seen in Table 13, a similarly large majority of respondents in both groups attended public schools (R-JSHS 87%; N-JSHS 86%); most attended schools in suburban areas (R-JSHS 62%; N-JSHS 63%).

It is important to note that, based on registration data reported in the APR, survey respondents appear not to be representative of the population of participating N-JSHS students—who were 50% female and 50% male. However, the APR does not contain complete data on other characteristics to allow for a fuller comparison between the respondents and the population, nor does it contain information on the population of students participating in R-JSHS. This issue will be addressed with the use of a centralized application/registration system that allows for centralized collection of student information across the pool of JSHS participants in FY15 and beyond.

In summary, based on information from survey respondents, JSHS was successful in attracting participation from female students—a population that is historically underrepresented in some STEM fields. JSHS had limited success in providing outreach to students from historically underserved and underrepresented race/ethnicity and low-income groups despite considerable FY14 efforts to increase the involvement of these students. In addition to students from suburban schools, JSHS served students who regularly attended school in urban and rural schools, which historically have lower or limited resources compared to suburban schools. It is possible that complete participant information, which will become available through a centralized registration tool in FY15, will more accurately capture JSHS's success at serving students from historically underserved and underrepresented populations. Though not conclusive, survey respondents from R-JSHS suggests that regional symposia engage larger proportion of underserved and underrepresented groups (18% minority race/ethnicity) than the N-JSHS (12% minority race/ethnicity).

Table 12. 2014 JSHS Student Respondent Profile

Demographic Category	R-JSHS Questionnaire Respondents		N-JSHS Questionnaire Respondents	
Respondent Gender (R-JSHS n = 106, N-JSHS n = 43)				
Female	73	69%	25	58%
Male	31	29%	18	42%
Choose not to report	2	2%	0	0%
Respondent Race/Ethnicity (R-JSHS n = 106, N-JSHS n = 43)				
Asian	18	17%	19	44%
Black or African American	1	1%	3	7%
Hispanic or Latino	18	17%	2	5%
Native American or Alaska Native	0	0%	0	0%
Native Hawaiian or Other Pacific Islander	0	0%	0	0%
White	59	56%	17	40%
Other race or ethnicity (specify):†	5	5%	1	2%
Choose not to report	5	5%	1	2%
Respondent Grade Level (R-JSHS n = 103, N-JSHS n = 43)				
9th	1	1%	0	0%
10th	6	6%	2	5%
11th	22	21%	9	21%
12th	53	51%	13	30%
1st Year College Student	21	20%	19	44%
Respondent Eligible for Free/Reduced-Price Lunch (R-JSHS n = 106, N-JSHS n = 43)				
Yes	20	19%	3	7%
No	75	71%	40	93%
Choose not to report	11	10%	0	0%

† Other = "Persian" (n = 2), "Lebanese," "Mixed," "Afghan," and "Asian/Latina."

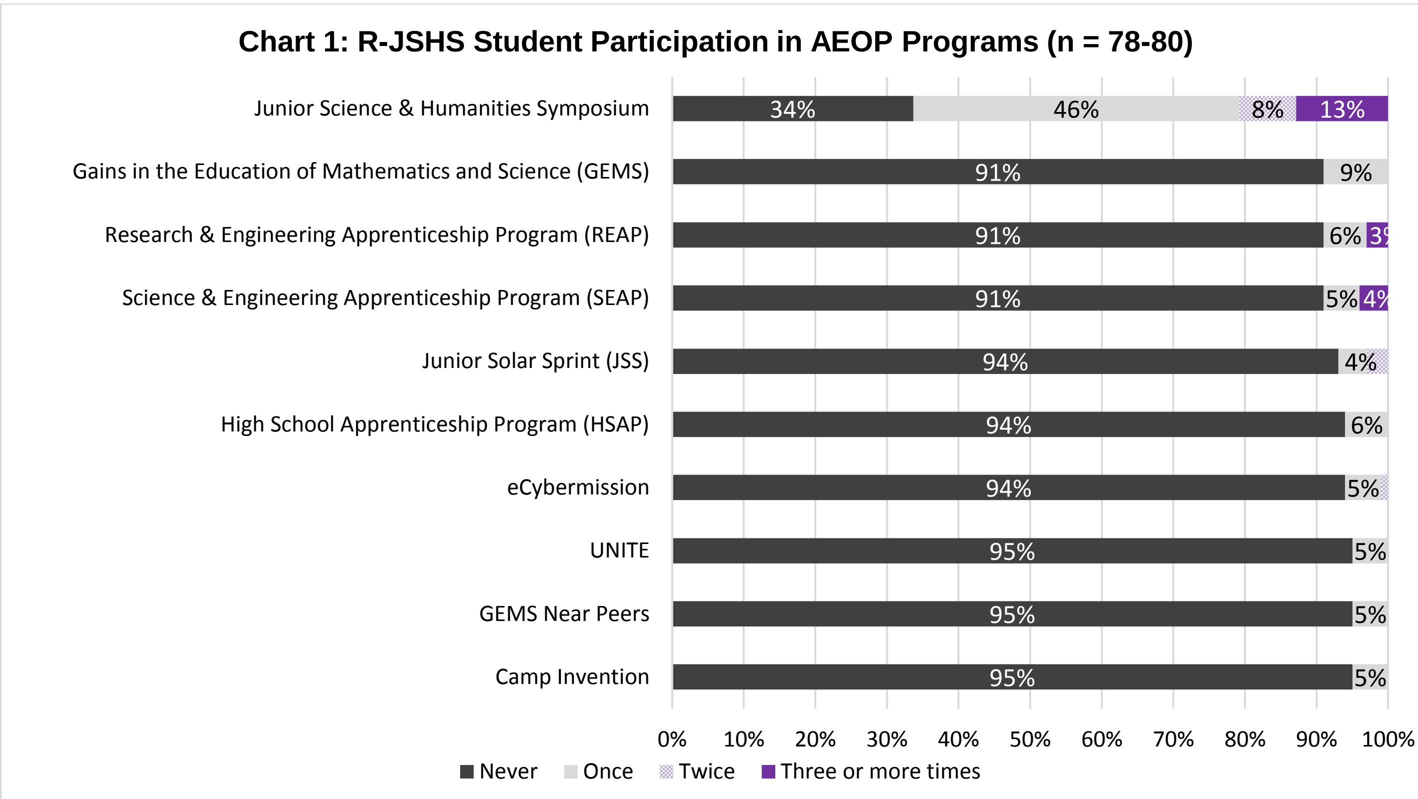
Table 13. 2014 JSHS Student Respondent School Information				
Demographic Category	**R-JSHS Questionnaire Respondents**		**N-JSHS Questionnaire Respondents**	
Respondent School Location (R-JSHS n = 106, N-JSHS n = 43)				
Suburban	66	62%	27	63%
Urban (city)	21	20%	11	26%
Rural (country)	18	17%	5	12%
Frontier or tribal school	1	1%	0	0%
Respondent School Type (R-JSHS n = 106, N-JSHS n = 43)				
Public school	92	87%	37	86%
Private school	9	8%	4	9%
Department of Defense school (DoDDS or DoDEA)	5	5%	2	5%

Table 14 summarizes the highest level of competition students reported achieving in 2014. Among R-JSHS students, 47% of responders participated in non-presenting roles (student delegate/observer), whereas 98% of N-JSHS Student respondents participated in presenting roles. These differences in student roles at R-JSHS and N-JSHS are in keeping with the emphasis placed on presenting at each level; student delegate and observer roles are intended to facilitate future participation at the R-JSHS level, and N-JSHS is designed to engage most participants as presenters.

Table 14. 2014 JSHS Student Respondent Roles		
Highest Level of Competition Achieved in 2014	**R-JSHS Questionnaire Respondents (n = 104)**	**N-JSHS Questionnaire Respondents (n = 43)**
Oral Presenter	33%	49%
Poster Presenter	22%	49%
Non-presenting Participant	47%	0%
Other	0%	2%†

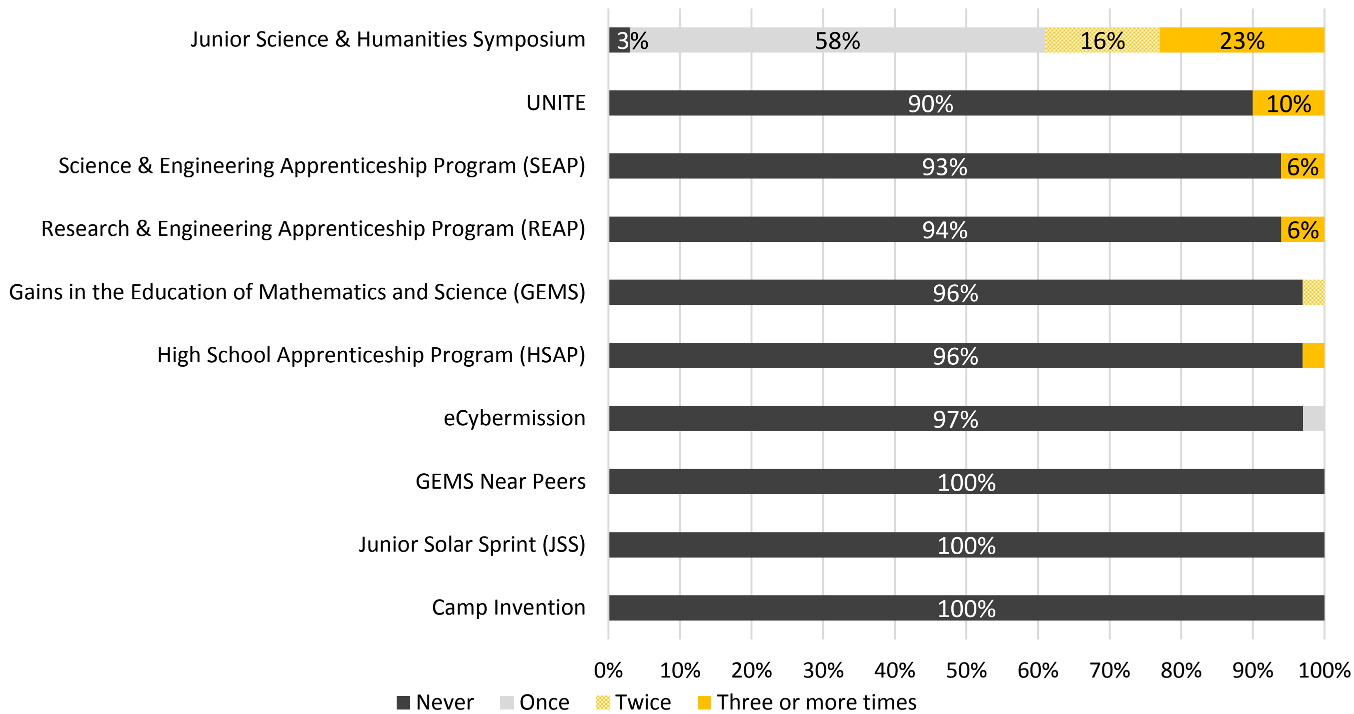
† One student who completed the N-JSHS questionnaire indicated that the highest level of competition s/he reached in 2014 was non-competitive regional poster presenter.

In addition, students were asked how many times they participated in each of the AEOP programs. As can be seen in Chart 1, 67% of responding R-JSHS students reported participating in JSHS at least once. Few students (9% or less) reported participating in any of the other AEOP programs. Students who responded to the N-JSHS survey (see Chart 2) reported greater participation in JSHS (97% at least once and 39% more than once) but similarly limited participation in other AEOP programs (10% or less). The numbers of student respondents who were repeat participants in JSHS and who participated in other AEOP programs are slightly higher than in the previous year.[2]



[2] Because of the low response rates on the student questionnaire in both years, it is impossible to determine whether any differences between the two datasets are real or an artifact of which students provided data

Chart 2: N-JSHS Student Participation in AEOP Programs (n = 29-31)



Mentor Demographics

The 2014 Mentor Questionnaire collected more extensive demographic information on the mentors than past years, which is summarized in Table 15. Slightly more responding mentors were female than male (56% vs. 43%). Similar to the responding students, most of the responding mentors identified themselves as White (77%). Mentors were primarily teachers (74%) or university educators (11%). In the JSHS program, the majority of responding mentors served as research mentors (59%); 19% served as competition advisors, and 22% in some other role, most commonly teacher or chaperone. Additional characteristics of the mentors are included in Appendix C.

Table 15. 2014 JSHS Mentor Respondent Profile		
Demographic Category	**Questionnaire Respondents**	
Respondent Gender (n = 88)		
Female	49	56%
Male	38	43%
Choose not to report	1	1%
Respondent Race/Ethnicity (n = 88)		
Asian	5	6%
Black or African American	1	1%
Hispanic or Latino	5	6%
Native American or Alaska Native	1	1%
Native Hawaiian or Other Pacific Islander	0	0%
White	68	77%
Other race or ethnicity, (specify):†	3	3%
Choose not to report	5	6%
Respondent Occupation (n = 88)		
Teacher	65	74%
Other school staff	1	1%
University educator	10	11%
Scientist, Engineer, or Mathematician in training (undergraduate or graduate student, etc.)	3	3%
Scientist, Engineer, or Mathematics professional	4	5%
Other, (specify):‡	5	6%
Respondent Role in JSHS (n = 86)		
Research Mentor	51	59%
Competition advisor	16	19%
Other, (specify)§	19	22%

† Other = "German," "American," & "Human."

‡ Other = "mentor & research director," "Physician-Scientist," "volunteer/adm asst/codirector VAJSHS," "science supervisor," "University Lab Technician (staff)."

§ Other ="teacher" (n = 10), "chaperone" (n = 6), "co-director" (n = 2), & "student advisor."

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 4-9.

A focus of the Actionable Program Evaluation is efforts toward the long-term goal of JSHS 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. JSHS regional symposia are engaged in expanded outreach efforts to identify underrepresented populations who are capable of succeeding in JSHS. Thus, it is important to consider how JSHS is marketed and ultimately recruits student participants, the factors that motivate students to participate in JSHS, 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 student and mentor perceptions that pertain to current programmatic efforts and recommend evidence-based improvements to help JSHS achieve outcomes related to AEOP programs and objectives—specifically, to help JSHS continue to expand participation from and support STEM education for students from underrepresented groups.

Marketing and Recruiting Underrepresented Populations

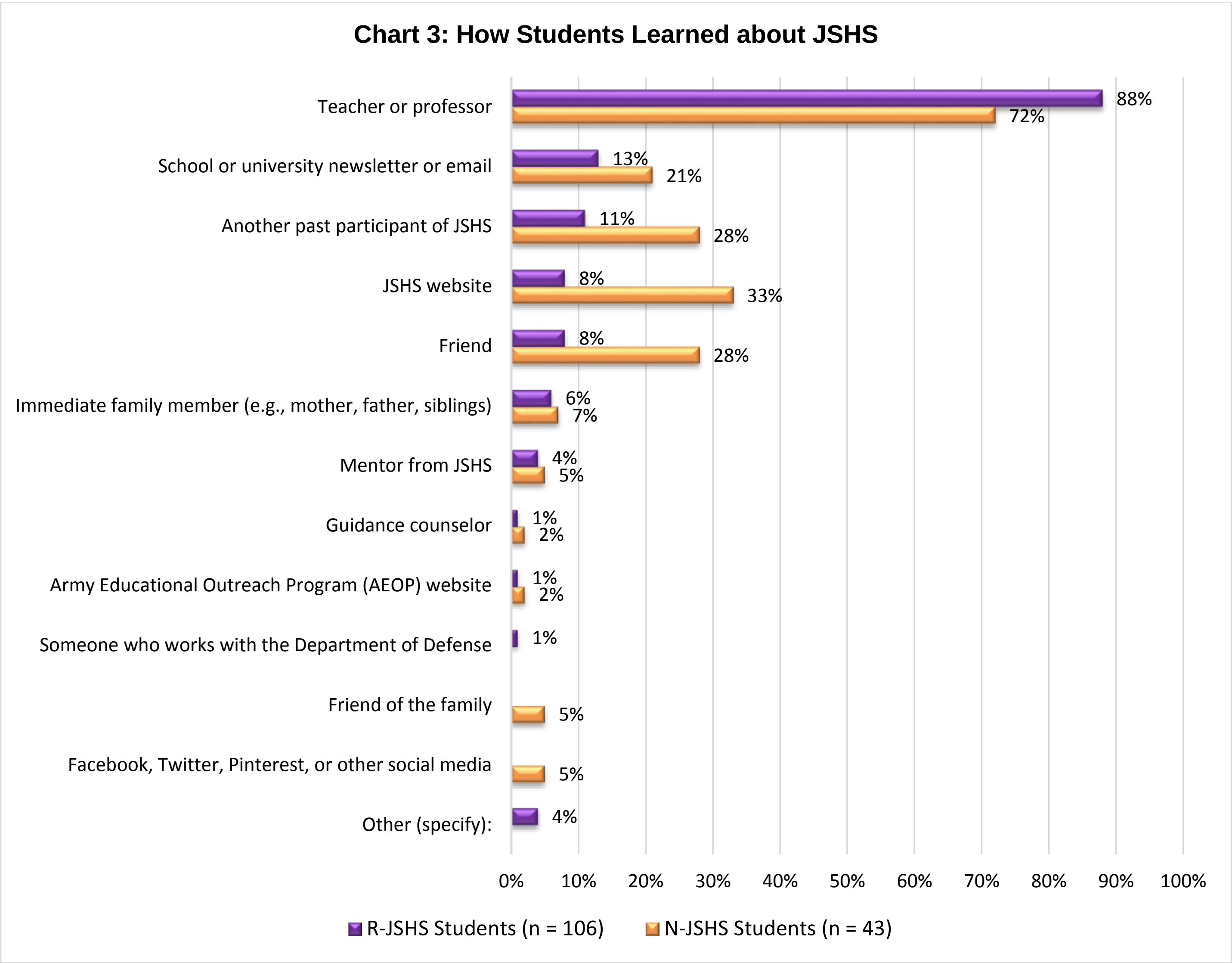
JSHS regional symposia are engaged in outreach efforts to identify underrepresented populations who are capable of succeeding in JSHS. Specific strategies for recruiting underrepresented populations include: developing partnerships with internal and external mentorship programs, heightening awareness among high schools in diverse areas, hosting workshops at the regional symposium or through externally funded teacher training workshops, and travel support for schools. More generally, program announcements were prepared and published in the fall, or at the start of the academic school year, to invite participation, and distributed by direct mail and electronic mail to targeted high school teachers, guidance counselors and principals. Other recruitment methods in 2014 included:

- Personal contact and networking with individual teachers and high school administration;
- Presentations at statewide teachers association meetings;
- Advertising via listserves and newsletters reaching science teachers;
- University-hosted websites and newsletters;
- Coordination with university admissions departments which publicize university programs to high schools throughout their states;
- Partnerships with internal and external mentorship programs to identify students; and
- Coordination with outreach events hosted by undergraduate student groups, including honors groups and groups serving underrepresented populations, such as the National Society of Black Engineers.

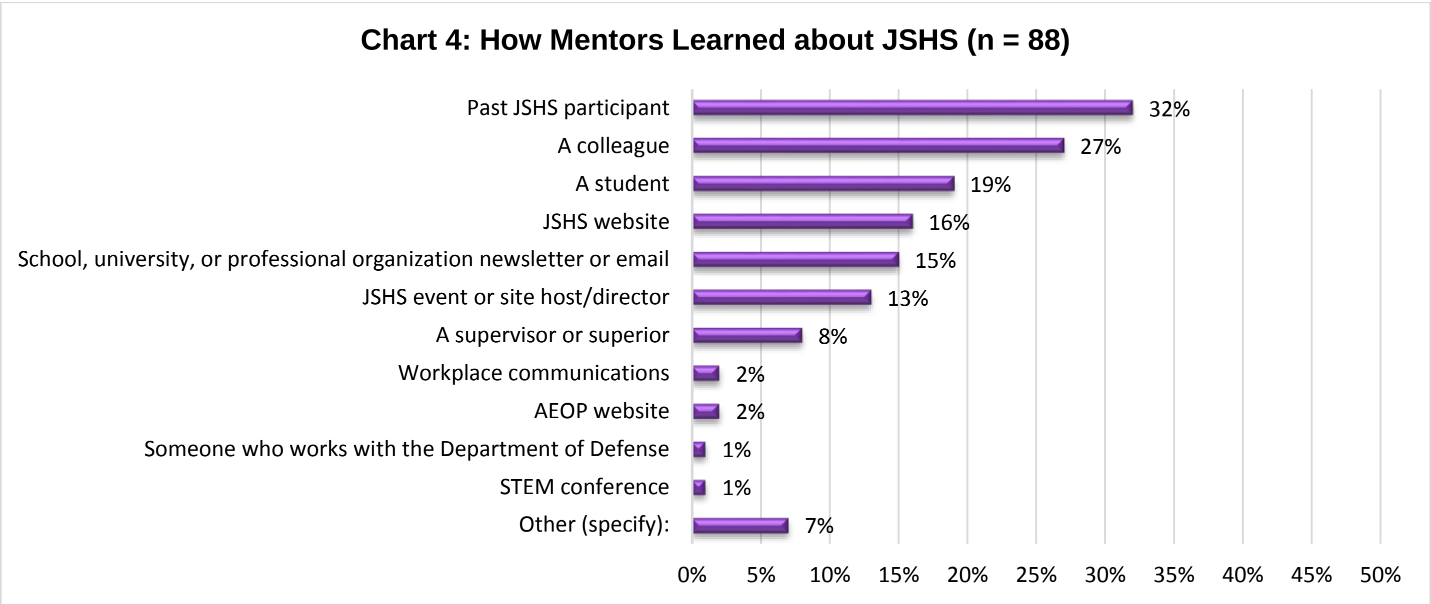
In order to understand which recruitment methods are most effective, the questionnaire asked students to select all of the different ways they heard about JSHS. Chart 3 summarizes students' responses. The most frequently mentioned source of information about the JSHS program was a teacher or professor (R-JSHS 88%, N-JSHS 72%). Other significant sources for N-JSHS student responders were the JSHS website (33%), a past participant of JSHS (28%), friends (28%), and school or university newsletter or email (21%).

These data were analyzed by student subgroups (gender, race/ethnicity, FRL, and regional/national participation)[3] to determine if different groups of youth learned about the JSHS program in a different manner. No meaningful differences were found among student subgroups in how they learned about JSHS 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).



Mentors were also asked how they learned about JSHS (see Chart 4). The most frequent responses were personal contacts, including a past JSHS participant (32%), a colleague (27%), or a student (19%). In addition, 16% indicated learning about the program from the JSHS website, 15% from a school/university/professional organization newsletter or email, and 13% from a JSHS event or site host/director.



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. Between 62% and 86% of responding mentors indicated never hearing of the other AEOP programs; 8% reported that they had not heard of JSHS, perhaps because the questionnaire did not include the acronym. For each AEOP program other than JSHS, no more than 5% of respondents indicated ever participating in the specified AEOP program.

Factors Motivating Student Participation

Student questionnaires and the focus group included questions to explore what motivated students to participate in JSHS. Specifically, the questionnaire asked how motivating a number of factors were in their decision to participate. As can be seen in Table 16, there were some similarities in the factors motivating regional students and national students. For example, the top three motivating factors for R-JSHS responders, teacher or professor encouragement (50% selecting "extremely motivating"), interest in STEM (49%), and learning in ways that are not possible in school (43%), were also extremely motivating for many National students (45%, 86%, and 64%, respectively). However, there were numerous differences between the groups. Regional students rated teacher or professor encouragement more highly[4] than did National students (a small effect size[5] of d = 0.418 standard deviations). In contrast, National students were moderately

[4] Two-tailed independent samples t-test, $t(143) = 2.29$, $p = 0.023$.

[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

more motivated than Regional students by having fun (d = 0.744 standard deviations), their interest in STEM (d = 0.730 standard deviations), their interest in STEM careers with the Army (d = 0.711 standard deviations), networking opportunities (d = 0.687 standard deviations), learning in ways that are not possible in school (d = 0.503 standard deviations) and serving the community or country (d = 0.548 standard deviations), and slightly more motivated by the opportunity to use advanced laboratory technology (d = 0.379 standard deviations).[6]

Table 16. "Extremely Motivating" Factors for Students to Participate in JSHS

Item	R-JSHS Questionnaire Respondents (n = 101-103)	N-JSHS Questionnaire Respondents (n = 42)
Teacher or professor encouragement	50%	45%
Interest in science, technology, engineering, or mathematics (STEM)	49%	86%
Learning in ways that are not possible in school	43%	64%
Desire to expand laboratory or research skills	38%	55%
Exploring a unique work environment	34%	40%
Desire to learn something new or interesting	33%	45%
Résumé or college application building	31%	31%
Opportunity to use advanced laboratory technology	28%	38%
Having fun	25%	55%
Networking opportunities	25%	43%
Parent encouragement	24%	26%
Serving the community or country	21%	38%
The program mentor(s)	21%	33%
An academic requirement or school grade	21%	17%
Opportunity to do something with friends	20%	31%
Earning money over the summer	10%	24%
Interest in STEM careers with the Army	8%	26%

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-tests: having fun $t(142) = 4.04$, $p < 0.001$; interest in STEM $t(143) = 3.97$, $p < 0.001$; interest in STEM careers with the Army $t(143) = 3.88$, $p < 0.001$; networking opportunities $t(142) = 3.73$, $p < 0.001$; learning in ways that are not possible in school $t(143) = 2.70$, $p = 0.008$; serving the community or country $t(143) = 3.00$, $p = 0.003$; and opportunity to use advanced laboratory technology $t(143) = 2.06$, $p = 0.042$.

For each item in Table 16, differences between females and males, minority students and non-minority students, and FRL-eligible students and non-FRL-eligible students were tested to identify whether different factors were more or less motivating for different student groups. Minority students were more likely than non-minority students to indicate being motivated by their interest in STEM careers with the Army[7] (d = 0.472 standard deviations). Likewise, students eligible for FRL were more likely than those not eligible for FRL to be motivated by their interest in STEM careers with the Army (d = 0.458 standard deviations) as well as serving the community or country[8] (d = 0.636 standard deviations).

One motivating factor that was not on the questionnaire, scholarships and prizes, was brought up by 3 of the 4 focus group participants when they were asked why they chose to participate in JSHS. As one student replied:

> *I had some free time and I figured it's a great opportunity because there are scholarships available and it would look good on a college resume, and I was just interested in doing some research.* (N-JSHS Student)

The JSHS Experience

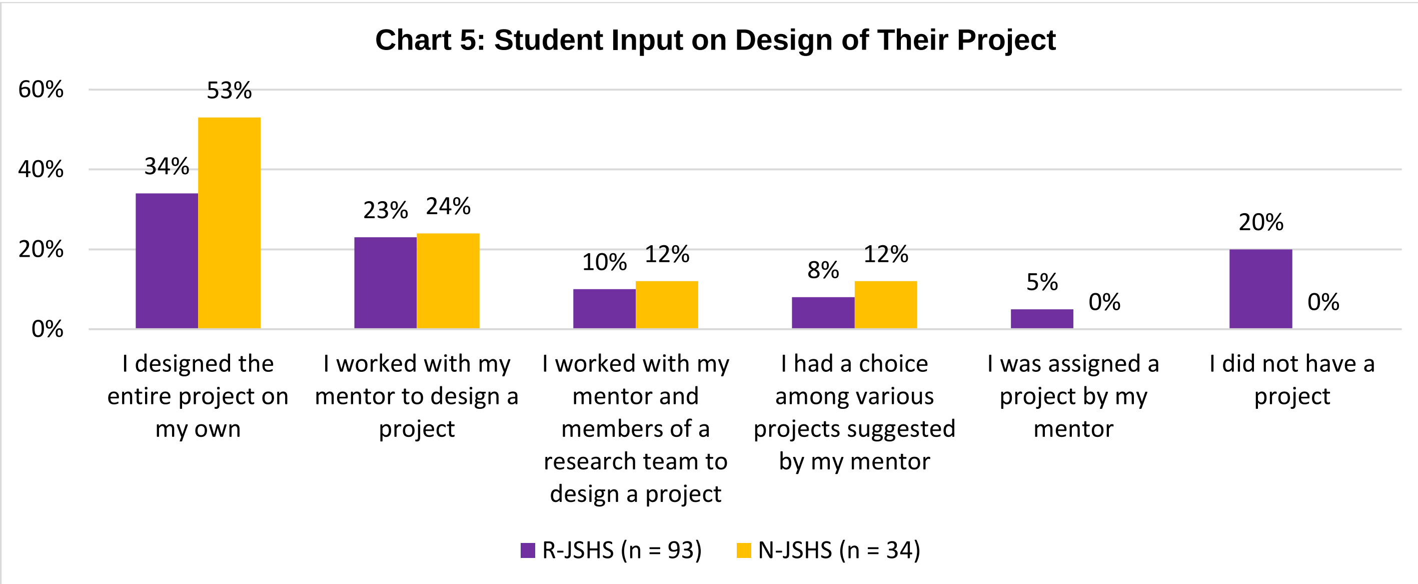
The student questionnaire included several items asking about the nature of students' experience in JSHS, and how that experience compared to their STEM learning opportunities in school. When asked what field their JSHS experience focused on, a large majority of responding Regional students and slightly more than half of National students selected science (R-JSHS 80%; N-JSHS 53%), followed by engineering (R-JSHS 13%; N-JSHS 21%), technology (R-JSHS 5%; N-JSHS 18%), and mathematics (R-JSHS 1%; N-JSHS 9%). Mentors were asked similar questions about the nature of their students' projects. Overall, their responses paint a similar picture of the JSHS experience (responses to these items can be found in Appendix C).[9]

As can be seen in Chart 5, about a third of Regional students and half of National students indicated that they designed the entire project on their own, and one-fourth of the students in each group worked with their mentor to design a project. The remaining students reported working with their mentor and research team to design a project (R-JSHS 10%; N-JSHS 12%), having a choice among various projects suggested by their mentor (R-JSHS 8%; N-JSHS 12%), or being assigned a project by their mentor (R-JSHS 5%; N-JSHS 0%). As noted earlier, students are encouraged to participate in the R-JSHS as delegates or observers, as well as competitors, and 1 in 5 Regional responders did not have a project.

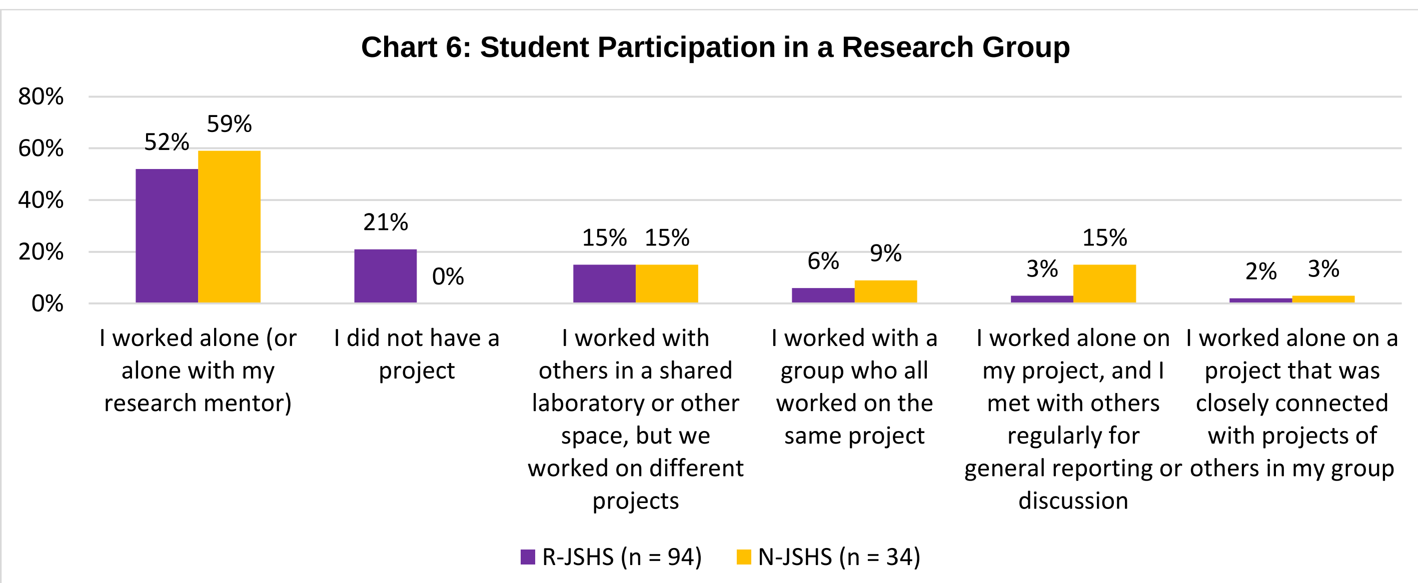
[7] Two-tailed independent samples t-test, $t(132) = 2.09$, $p = 0.039$.

[8] Two-tailed independent samples t-tests: interest in STEM careers with the army $t(133) = 1.99$, $p = 0.048$; serving the community or country $t(133) = 2.78$, $p = 0.006$.

[9] 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.



Most students worked alone (or alone with their research mentor) on their projects (R-JSHS 52%; N-JSHS 59%). Some reported working in a shared laboratory/space with others, but on different projects (R-JSHS 15%; N-JSHS 15%), or worked alone but met with others regularly to discuss their projects (R-JSHS 3%, N-JSHS 15%). Very few students (R-JSHS 6%; N-JSHS 9%) reported working with a group on a single project (see Chart 6).



Students were also asked about several types of STEM-related activities they engaged in during their experience. As can be seen in Charts 7 and 8, National respondents tended to report engaging in the activities more frequently than Regional respondents. Most Regional respondents indicated learning about new STEM topics and communicating with other students about STEM on most days or every day of the experience. Over 40% of R-JSHS students also reported interacting with STEM professionals, applying STEM knowledge to real-life situations, learning about different STEM careers, and learning about cutting-edge STEM research on most days or every day. In contrast, for each of the six activities, over 60% of National respondents reported engaging in the activity daily. Almost all National respondents reported engaging in learning about new STEM topics (98%) on most days or every day, and 93% reported interacting with STEM professionals, learning about cutting-edge STEM research, and learning about different STEM careers on most days or every day. Given that the students who attended N-JSHS were selected based on the quality of their projects, it is not surprising that their JSHS experiences included more frequent learning about STEM.

Although differences between the groups were not statistically tested for each individual activity, a composite score[10] was calculated for the set of activities, titled "Learning about STEM in JSHS."[11] 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 there were differences in student experiences by Regional or National JSHS participation, gender, race/ethnic group (minority vs. non-minority students), and FRL status. R-JSHS students had, on average, lower scores than N-JSHS students on the "Learning about STEM in JSHS" composite [12] (a very large effect of d = 1.197 standard deviations). There were no other differences by group.

Mentors were asked similar questions about the nature of their students' experiences. Overall, their responses more closely resembled Regional students' responses than National students' responses, with over three fourths indicating that their students had opportunities to engage in these activities a few times, most days, or every day.

[10] 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.

[11] The Cronbach's alpha reliability for these 6 items was 0.966.

[12] Two-tailed independent samples t-test: $t(137) = 6.35$, $p < 0.001$.

Chart 7: Nature of Student Activities in JSHS for R-JSHS Respondents (n = 96-97)

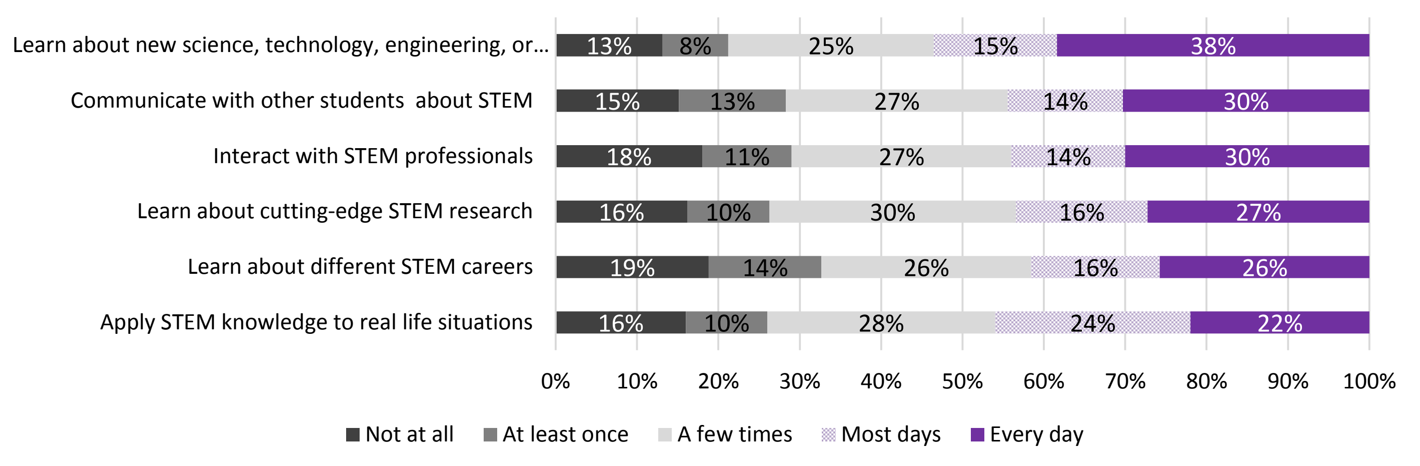
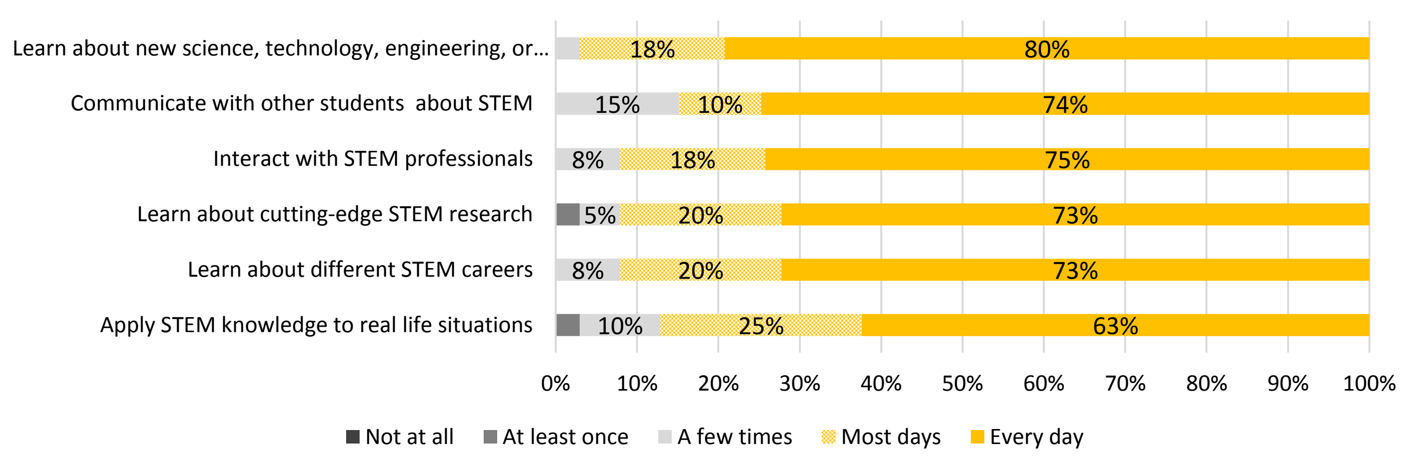


Chart 8: Nature of Student Activities in JSHS for N-JSHS Respondents (n = 39-40)



Students were also asked about ways they had disseminated their research during their JSHS experience. Regional student responders appeared to have lower engagement with research dissemination activities[13] than National students, possibly related to differences in the quality of their projects. Most respondents in each group had presented a talk or poster to

[13] Differences between the R-JSHS and N-JSHS responses to these items were not tested for statistical significance.

other students or faculty (R-JSHS 55%; N-JSHS 72%). Approximately two-thirds of National students and almost half of Regional students also reported that they had attended a symposium or conference (67% and 46%, respectively), presented a talk or poster at a professional symposium or conference (63% and 33%, respectively), and/or won an award or scholarship based on the research (65% and 30%, respectively). In addition, 28-40% of National students planned such dissemination activities in the future. Although respondents may have included some JSHS-sponsored events/activities when answering this question, almost one-fourth of National students reported having written or co-written a paper for publication in a research journal (see Table 17).

Table 17. Students Engagement with Research Dissemination Activities During JSHS

	R-JSHS Questionnaire Respondents (n = 106)	N-JSHS Questionnaire Respondents (n = 43)
I presented a talk or poster to other students or faculty	55%	72%
I attended a symposium or conference	46%	67%
I presented a talk or poster at a professional symposium or conference	33%	63%
I won an award or scholarship based on my research	30%	65%
I will attend a symposium or conference	12%	40%
I will present a talk or poster to other students or faculty	8%	33%
I will present a talk or poster at a professional symposium or conference	8%	28%
I wrote or co-wrote a paper that was/will be published in a research journal	8%	23%
I wrote or co-wrote a technical paper or patent	5%	19%
I will write or co-write a technical paper or patent	4%	12%
I will write or co-write a paper that was/will be published in a research journal	1%	16%

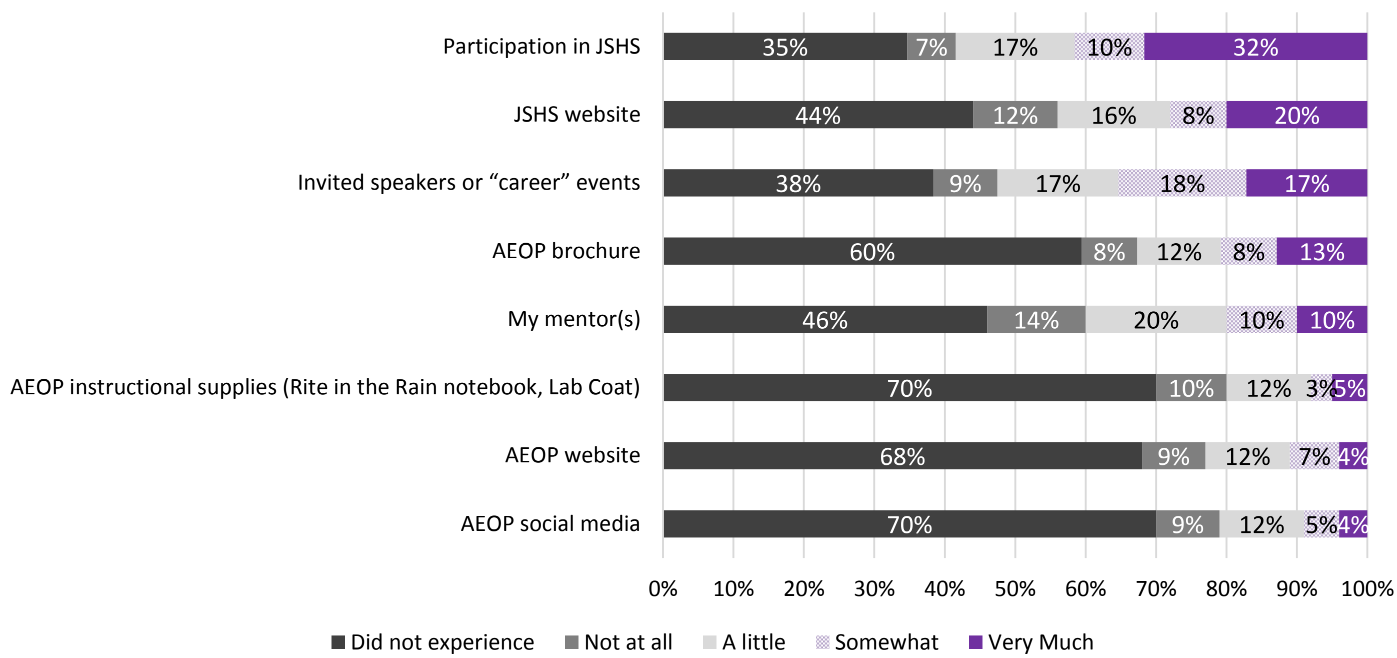
Because increasing the number and diversity of students who pursue STEM careers is one goal of the AEOP, the student questionnaire also asked how many jobs/careers in STEM in general, and STEM jobs/careers in the DoD more specifically, students learned about during their experience. As can be seen in Table 18, the vast majority of Regional students reported learning about at least one STEM job/career, and almost half (46%) reported learning about five or more. Most Regional students reported learning about at least one DoD STEM job/career, and half reported learning about multiple different STEM jobs/careers in the DoD. All National students reported learning about at least three STEM jobs/careers and at least two DoD STEM jobs/careers, with about three-fourths learning about five or more of each type of job/career.

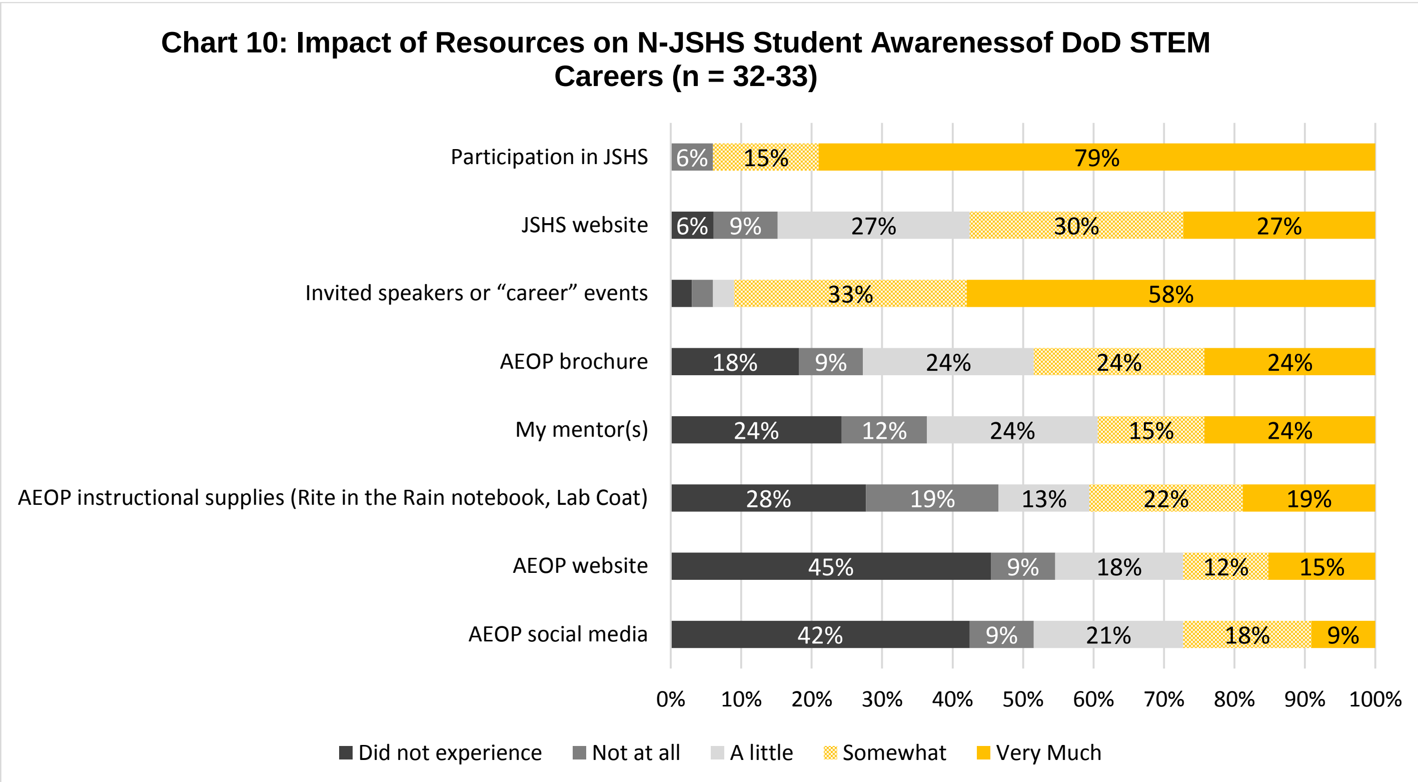
Table 18. Number of STEM Jobs/Careers Students Learned about During JSHS				
	R-JSHS Questionnaire Respondents (n = 83)		N-JSHS Questionnaire Respondents (n = 31)	
	STEM Jobs/Careers	DoD STEM Jobs/Careers	STEM Jobs/Careers	DoD STEM Jobs/Careers
None	16%	40%	0%	0%
1	4%	10%	0%	0%
2	6%	7%	0%	6%
3	17%	13%	16%	13%
4	12%	5%	6%	6%
5 or more	46%	25%	77%	74%

Students were also asked which resources impacted their awareness of DoD STEM careers. National students appeared to have experienced more of the resources than Regional students. Over half of National student responders had experienced all of the resources with the exception of the Army STEM Career Magazine, whereas over half of Regional students reported that they did not experience the AEOP brochure, AEOP instructional supplies, or the AEOP website, AEOP social media (see Charts 9 and 10). Accordingly, National students tended to report greater impacts due to these resources than Regional students. Responses to this series of questions were analyzed to determine whether differences between National and Regional students were statistically significant. National students reported greater impacts,[14] on average, for invited speakers or "career" events (very large effect of d = 1.186 standard deviations), participation in JSHS (very large effect of d = 1.049 standard deviations), and my mentor(s) (moderate effect of d = 0.518 standard deviations).

[14] Two-tailed independent samples t-tests: invited speakers or "career" events, $t(86) = 5.28$, $p < 0.001$; participation in JSHS, $t(90) = 4.74$, $p < 0.001$; my mentor(s), $t(72) = 2.10$, $p = 0.040$.

Chart 9: Impact of Resources on R-JSHS Student Awareness of DoD STEM Careers (n = 90-92)





Differences between groups on these items were also tested based on gender, race/ethnicity, and FRL status. Minority students reported greater average impacts than non-minority students[15] for the AEOP brochure (large effect of d = 0.923 standard deviations), their mentor (large effect of d = 0.885 standard deviations), and the JSHS website (large effect of d = 0.835 standard deviations. A significant difference was also found for the AEOP brochure based on FRL status, with FRL-eligible students reporting much more impact (a large effect of d = 0.790 standard deviations) than non-FRL-eligible students.[16] No significant differences were found based on gender.

Students in the focus group were asked whether they had learned about STEM job/career opportunities in the DoD as part of JSHS. During the discussion about DoD STEM jobs/careers, each student mentioned learning about DoD opportunities from the invited speakers they had seen at N-JSHS. Overall, all agreed that they had learned about DoD STEM jobs/careers, but put different emphasis on the importance of R-JSHS activities and N-JSHS activities for increasing their awareness. As three said:

[15] Two-tailed independent samples t-test: AEOP brochure, $t(58) = 2.97$, $p = 0.004$; my mentor(s), $t(67) = 2.83$, $p = 0.006$; JSHS website, $t(72) = 2.99$, $p = 0.004$.

[16] Two-tailed independent samples t-test, $t(72) = 2.61$, $p = 0.011$.

I know that the military has all kinds of different jobs and experiments going on, but I mostly know what I heard in the talks today and yesterday about the jobs available. (N-JSHS student)

I did learn about some Navy things that they talked about yesterday, but, more at my regional fair, they also had the Army demonstration—like robots and everything, they actually had the little mini fair—so I kind of learned more there at that level. (N-JSHS student)

In regionals we learned more about the job opportunities available in STEM. I'm not sure, it was a little while ago, so I'm not sure if they stressed that it was DoD or if it was all DoD, but they definitely emphasized the opportunities that are available in STEM-related jobs. (N-JSHS student)

The questionnaire also asked students how often they engaged in various STEM practices during JSHS. Results indicate that National students were actively engaged in doing STEM on all or most days in JSHS (see Chart 11). For example, 69% of responding N-JSHS students reported participating in hands-on activities on most days or every day, 64% indicated working as part of a team, and 64% reported coming up with creative explanations or solutions. In addition, students indicated being integrally involved the work of STEM on most days or every day, including posing questions to investigate (56%), analyzing or interpreting data (57%), drawing conclusions from an investigation (60%), designing investigations (53%), and building/simulating something (55%).

In contrast (see Chart 12), 40% or more of Regional students reported having engaged in only two of the activities on most days or every day: posing questions to investigate (41%) and coming up with creative explanations or solutions (40%). Over a third analyzed or interpreted data (39%); drew conclusions from an investigation (37%), participated in hands-on activities (36%), and/or worked as part of a team (34%). In addition, for each of the activities listed, between 16% and 29% of Regional students reported that they had not engaged in the activity at all in JSHS.

Chart 11: R-JSHS Student Engagement in STEM Practices in JSHS (n = 92-97)

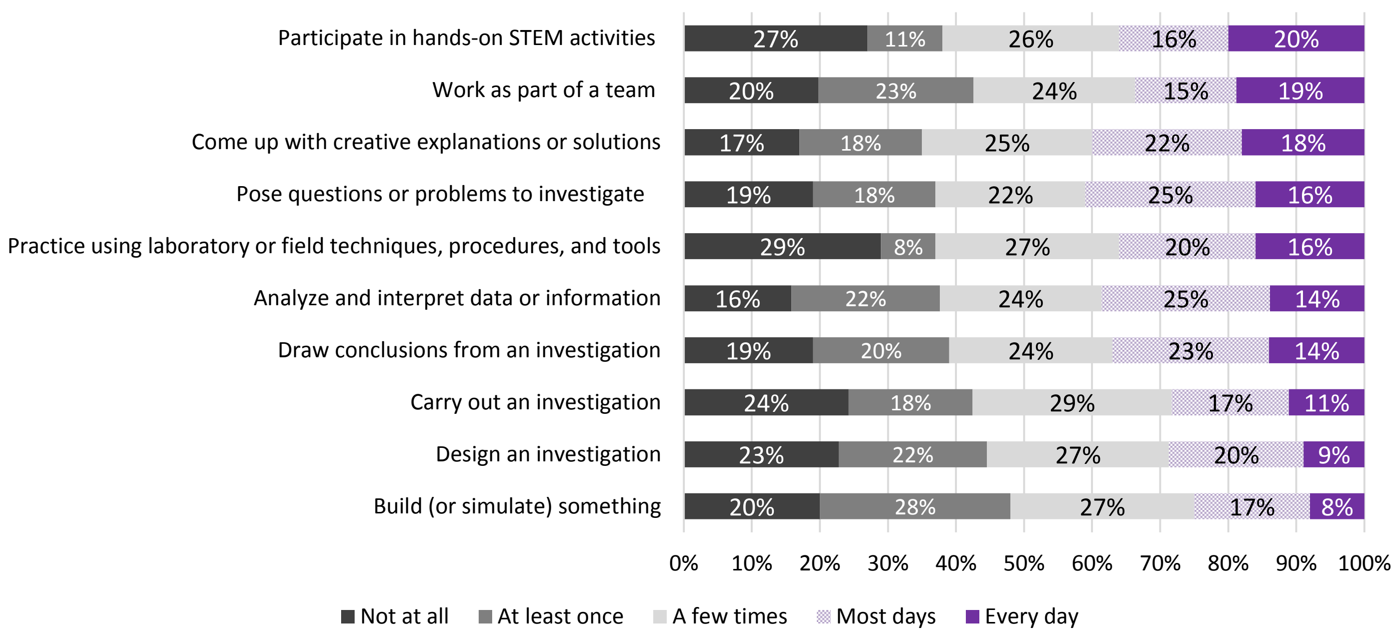
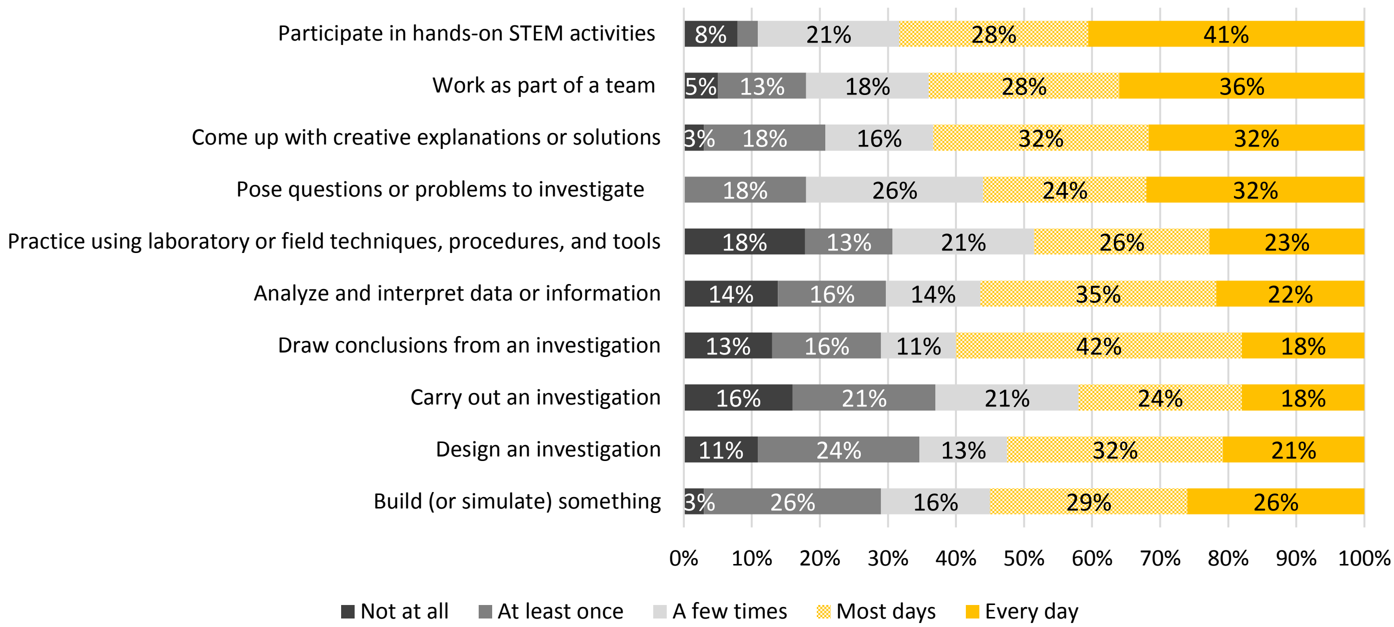


Chart 12: N-JSHS Student Engagement in STEM Practices in JSHS (n = 37-39)



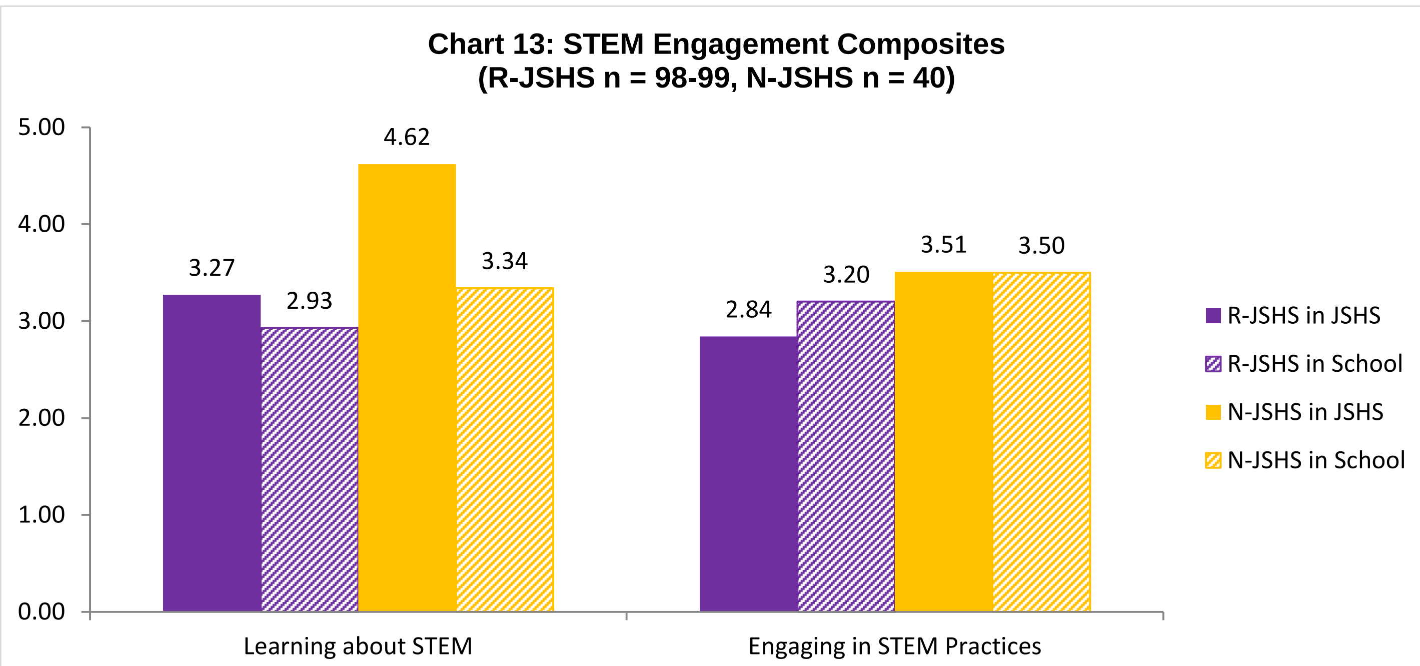
A composite score was calculated for this set of items, titled "Engaging in STEM Practices in JSHS."[17] Response categories were converted to a scale of 1 = "Not at all" to 5 = "Every day" and the average across all items in the scale was calculated. The composite score was used to test whether there were differences in student experiences by Regional or National JSHS participation, gender, race/ethnicity group (minority vs. non-minority students), and FRL status. There was a significant difference in scores by Regional vs. National participation. Regional students had, on average, lower scores than National students on the Engaging in STEM Practices in JSHS composite[18] (a medium effect of d = 0.591 standard deviations). There were no significant differences by gender, race/ethnicity, or FRL status.

Data from the mentor questionnaire generally indicated that mentors' students had opportunities to engage in the activities somewhat more frequently than R-JSHS students reported engaging in the activities, but not as frequently as N-JSHS students. For example, over 50% of mentors reported that their students had opportunities to pose questions or problems to investigate (55%), participate in hands-on STEM activities (57%), draw conclusions from an investigation (53%), come up with creative explanations or solutions (54%), practice using laboratory or field techniques, procedures, and tools (57%), analyze and interpret data or information (52%), and carry out an investigation (52%).

[17] The Cronbach's alpha reliability for these 10 items was 0.954.

[18] Two-tailed independent samples t-test, $t(136) = 3.13$, $p = 0.002$.

To examine how the JSHS experience compares to their typical school experience, students were asked how often they engaged in the same activities in school. The responses were combined into composites[19] that are parallel to the ones asking about JSHS (individual item responses can be found in Appendix B). Scores were higher on the "in JSHS" version of "Learning about STEM" than on the "in school" version[20] for both Regional (a small effect of d = 0.281 standard deviations) and National (a very large effect of d = 1.200 standard deviations) students. However, for the "Engaging in STEM Practices" composite, the "in school" score was higher[21] than the "in JSHS" version (a small effect of d = 0.286 standard deviations) for Regional students. National students reported engaging in STEM practices almost equally in JSHS and in school (see Chart 13). These data indicate that JSHS provides students, particularly N-JSHS students, with more intensive STEM learning experiences than they would typically receive in school in some ways, but not in others.



The Role of Mentors

Mentors play a critical role in the JSHS program. Mentors provide one-on-one support to students, chaperone students, advise students on educational and career paths, may provide opportunities for students to use laboratory space and/or

[19] "Learning about STEM in School" had a Cronbach's alpha reliability of 0.912. "Engaging in STEM Practices in School" had a Cronbach's alpha reliability of 0.964.

[20] Two-tailed independent samples t-tests: R-JSHS, $t(99) = 2.798$, $p = 0.006$; N-JSHS, $t(40) = 7.580$, $p < 0.001$.

[21] Two-tailed independent samples t-test, $t(98) = 2.830$, $p = 0.006$.

equipment, and generally serve as STEM role models for JSHS students. Over 70% of mentors responding to the mentor questionnaire reported working with 5 or fewer students, with a range of 0 to 50 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: [22]

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 19). For example, the vast majority tried to learn about the students and their interests at the beginning of the program (86%) and made explicit provisions for students wishing to carry out independent studies (86%). Many also encouraged students to suggest new readings, activities, or projects (79%); gave students real-life problems to investigate or solve (77%); and helped students see how STEM can affect them or their communities (73% and 70%, respectively). About two-thirds asked students to relate outside events or activities to topics covered in the program (67%), or selected readings or activities related to students' backgrounds (66%).

[22] 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.

Table 19. Mentors Using Strategies to Establish Relevance of Learning Activities (n = 76-78)	
Item	**Questionnaire Respondents**
Finding out about students' backgrounds and interests at the beginning of the program	86%
Making explicit provisions for students who wish to carry out independent studies	86%
Encouraging students to suggest new readings, activities, or projects	79%
Giving students real-life problems to investigate or solve	77%
Helping students become aware of the roles STEM plays in their everyday lives	73%
Helping students understand how STEM can help them improve their communities	70%
Asking students to relate outside events or activities to topics covered in the program	67%
Selecting readings or activities that relate to students' backgrounds	66%

Similarly, mentors reported using a variety of strategies to support the diverse needs of students as learners. As can be seen in Table 20, 90% of mentors reported treating all students the same way, regardless of gender or race/ethnicity. The strategies of using diverse teaching/mentoring activities and helping students find additional support if needed were each used by 85% of mentors. Many mentors used gender neutral language (81%) and provided extra support for students who lacked background knowledge (80%). Most also integrated activities intended to support women underrepresented students and tried to find out about student learning styles (63% each).

Table 20. Mentors Using Strategies to Support the Diverse Needs of Students as Learners (n = 79-80)	
Item	**Questionnaire Respondents**
Interacting with all students in the same way regardless of their gender or race and ethnicity	90%
Using diverse teaching/mentoring activities to address a broad spectrum of students	85%
Directing students to other individuals or programs if I can only provide limited support	85%
Using gender neutral language	81%
Providing extra readings, activities, or other support for students who lack essential background knowledge or skills	80%
Finding out about students' learning styles at the beginning of the program	63%
Integrating ideas from the literature on pedagogical activities for women and underrepresented students	63%

Mentors reported using many strategies to support students' development of collaboration and interpersonal skills (see Table 21). For example, nearly all of those responding to the questionnaire indicated having students participate in giving and receiving feedback (93%) and listen to the ideas of others with an open mind (91%). The vast majority also had students explain difficult ideas to others (85%) and work as members of a team on activities or projects (83%).

Table 21. Mentors Using Strategies to Support Student Development of Collaboration and Interpersonal Skills (n = 78-80)

Item	Questionnaire Respondents
Having students participate in giving and receiving feedback	93%
Having students listen to the ideas of others with an open mind	91%
Having students explain difficult ideas to others	85%
Having students work on collaborative activities or projects as a member of a team	83%
Having students exchange ideas with others whose backgrounds or viewpoints are different from their own	75%
Having students pay attention to the feelings of all team members	72%
Having students develop ways to resolve conflict and reach agreement among the team	71%
Having students tell others about their backgrounds and interests	59%

When asked about strategies used to support student engagement in authentic STEM activities, 94% of responding mentors reported allowing students to work independently as appropriate for their self-management abilities and STEM competencies, and 90% of mentors indicated giving constructive feedback to improve students' STEM competencies (see Table 22). Encouraging students to seek support from other team members (88%), helping students practice STEM skills with supervision (88%), demonstrating the use of laboratory/field techniques, procedures, and tools (87%), having students access and critically review technical texts or media (83%), and encouraging opportunities in which students could learn from others (83%) were also widely used strategies. Teaching/assigning readings about specific STEM subject matter was reported by 73% of mentors.

Table 22. Mentors Using Strategies to Support Student Engagement in "Authentic" STEM Activities (n = 77-78)	
Item	**Questionnaire Respondents**
Allowing students to work independently as appropriate for their self-management abilities and STEM competencies	94%
Giving constructive feedback to improve students' STEM competencies	90%
Helping students practice STEM skills with supervision	88%
Encouraging students to seek support from other team members	88%
Demonstrating the use of laboratory or field techniques, procedures, and tools students are expected to use	87%
Having students access and critically review technical texts or media to support their work	83%
Encouraging opportunities in which students could learn from others (e.g., team projects, team meetings, journal clubs)	83%
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 (see Table 23).[23] The vast majority of the responding mentors reported sharing their own experiences, attitudes, and values about STEM (88%) and asking students about their educational and career interests (84%). Many also provided guidance to students, either about educational pathways that would prepare them for a STEM career (77%); by critically reviewing their résumé, application, or interview preparations (74%); or by recommending extracurricular programs that align with their educational goals (72%).

Given the JHSH goal of broadening the talent pool in STEM fields, it is somewhat surprising that two-thirds or fewer of the responding mentors reported: (1) discussing STEM career opportunities outside of the DoD or other government agencies (64%), (2) highlighting the under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM (49%), or (3) discussing STEM careers within the DOD or government (30%). In addition, given the interest in having students graduate into other AEOP opportunities, it is also surprising that only 18% of mentors recommended other AEOP programs to students.

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

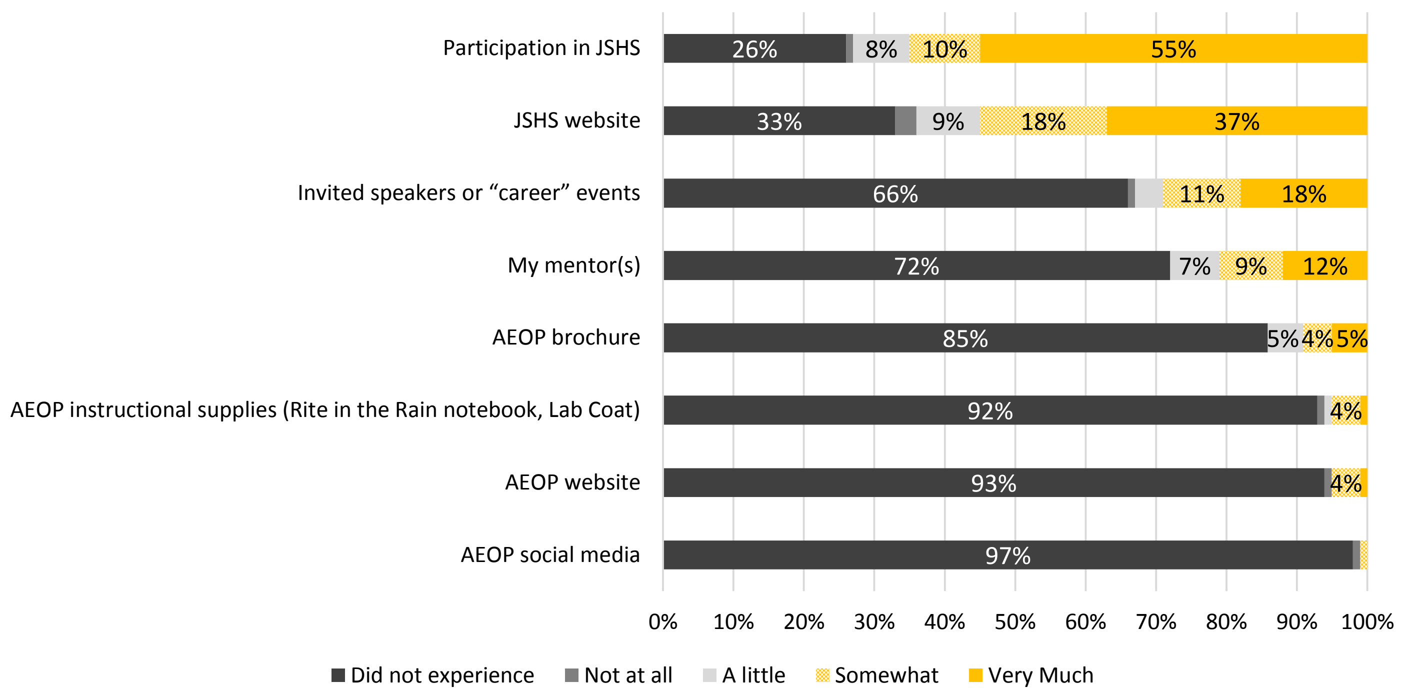
Table 23. Mentors Using Strategies to Support Student STEM Educational and Career Pathways (n = 73-76)	
Item	**Questionnaire Respondents**
Sharing personal experiences, attitudes, and values pertaining to STEM	88%
Asking about students' educational and career interests	84%
Providing guidance about educational pathways that would prepare students for a STEM career	77%
Critically reviewing students' resume, application, or interview preparations	74%
Recommending extracurricular programs that align with students' educational goals	72%
Discussing STEM career opportunities outside of the DoD or other government agencies (e.g., private industry, academia)	64%
Discussing non-technical aspects of a STEM career (e.g., economic, political, ethical, and/or social issues)	60%
Helping students build effective STEM networks	57%
Recommending student and professional organizations in STEM	55%
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	49%
Discussing STEM career opportunities with the DoD or other government agencies	30%
Recommending Army Educational Outreach Programs that align with students' educational goals	18%

A separate item on the mentor questionnaire asked which of the AEOP programs mentors explicitly discussed with their students during JSHS. Not surprisingly, the most frequently discussed program was JSHS (75%), as can be seen in Table 24. Few of the responding mentors indicated discussing other AEOPs with students; of those who did, the most frequently discussed programs were REAP (11%), HSAP, (11%), SEAP (10%), and SMART (10%).

Table 24. Mentors Explicitly Discussing AEOPs with Students (n = 70-75)	
Item	**Questionnaire Respondents**
Junior Science & Humanities Symposium	75%
Research & Engineering Apprenticeship Program (REAP)	11%
High School Apprenticeship Program (HSAP)	11%
Science & Engineering Apprenticeship Program (SEAP)	10%
Science Mathematics, and Research for Transformation (SMART) College Scholarship	10%
Undergraduate Research Apprenticeship Program (URAP)	7%
Gains in the Education of Mathematics and Science (GEMS)	6%
National Defense Science & Engineering Graduate (NDSEG) Fellowship	4%
GEMS Near Peers	3%
UNITE	3%
College Qualified Leaders (CQL)	3%

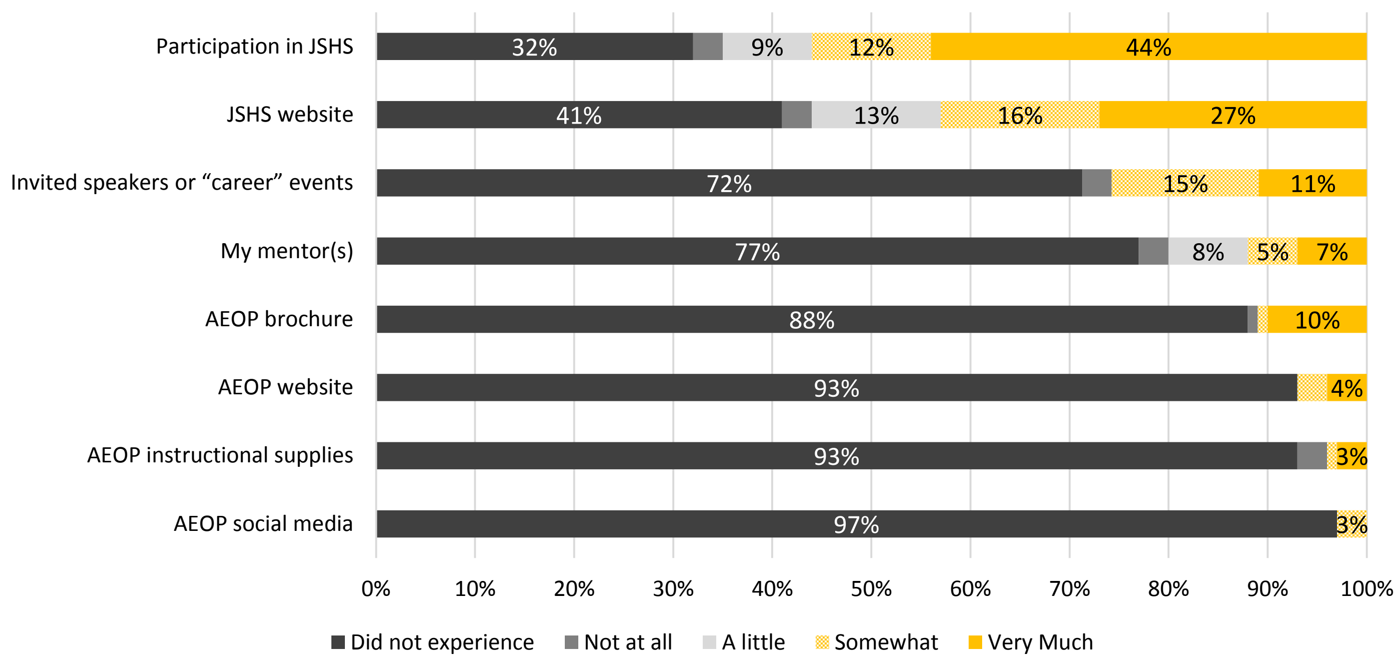
Mentors were also asked how useful various resources were in their efforts to expose students to the different AEOPs. As can be seen in Chart 14, participation in JSHS (55%) and the JSHS website (37%) were most often rated as "very much" useful. Materials provided by the AEOP program tended not to be seen as very useful, with the majority of responding mentors indicating they did not experience these resources. For example, 85% of responding mentors reported not experiencing the AEOP brochure, and only 5% rated them as "very much" useful. Similarly, over 90% of responding mentors did not experience the AEOP instructional supplies (e.g., Rite in the Rain notebooks, lab coats), website, or social media; fewer than 5% found these resources very useful.

Chart 14: Usefulness of Resources for Exposing Students to AEOPs (n = 75-77)



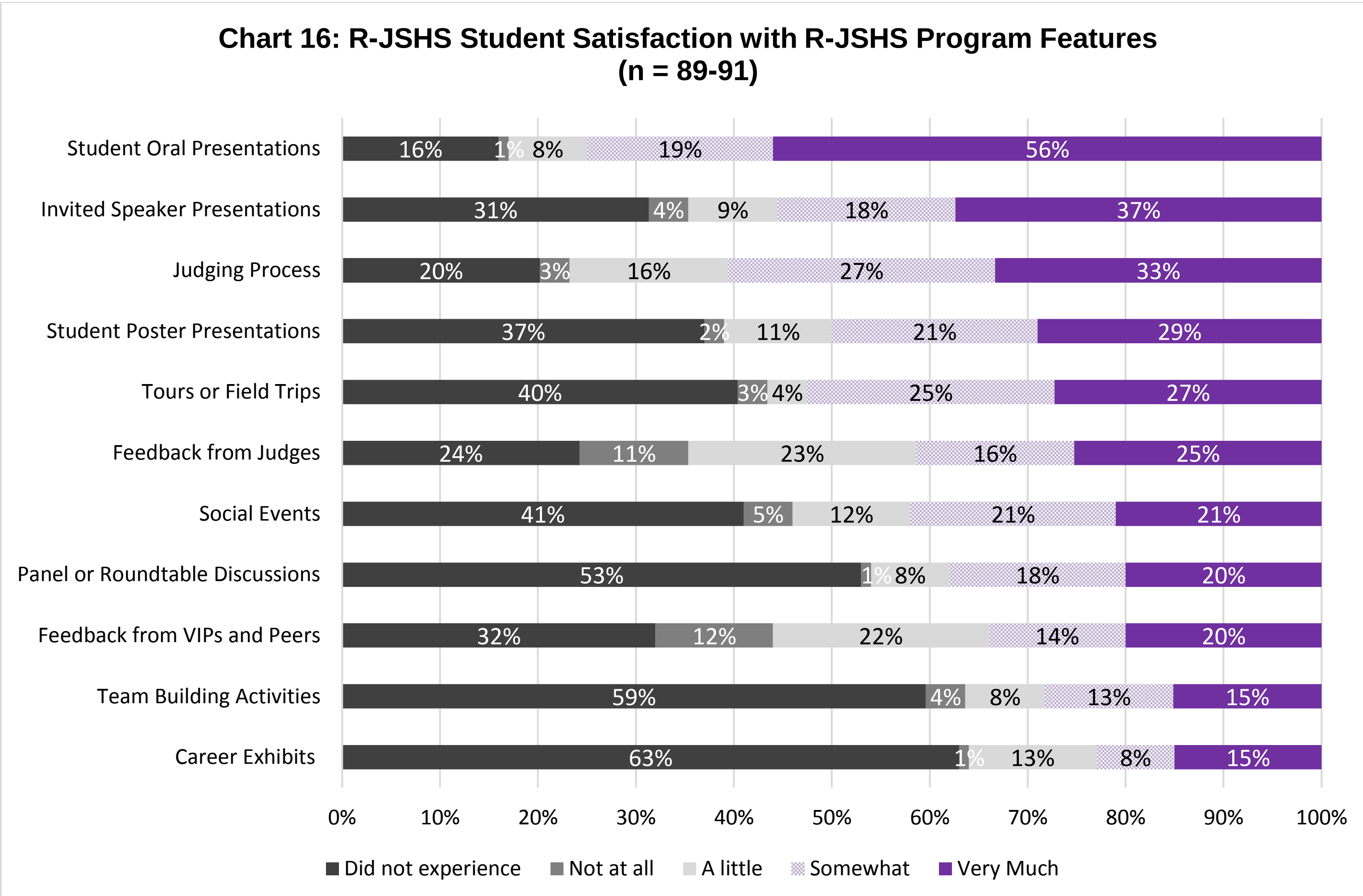
Mentors were also asked how useful these resources were for exposing students to DoD STEM careers (see Chart 15). As with the previous item, mentors were most likely to rate participation in JSHS as useful, with 44% selecting "very much." The JSHS website was seen as very useful by 27% of responding mentors. Again, AEOP materials were less likely to be seen as very useful for this purpose (a range of 0-10%), with over 85% of mentors indicating they did not experience each of these resources.

Chart 15: Usefulness of Resources for Exposing Students to DoD STEM Careers (n = 73-75)



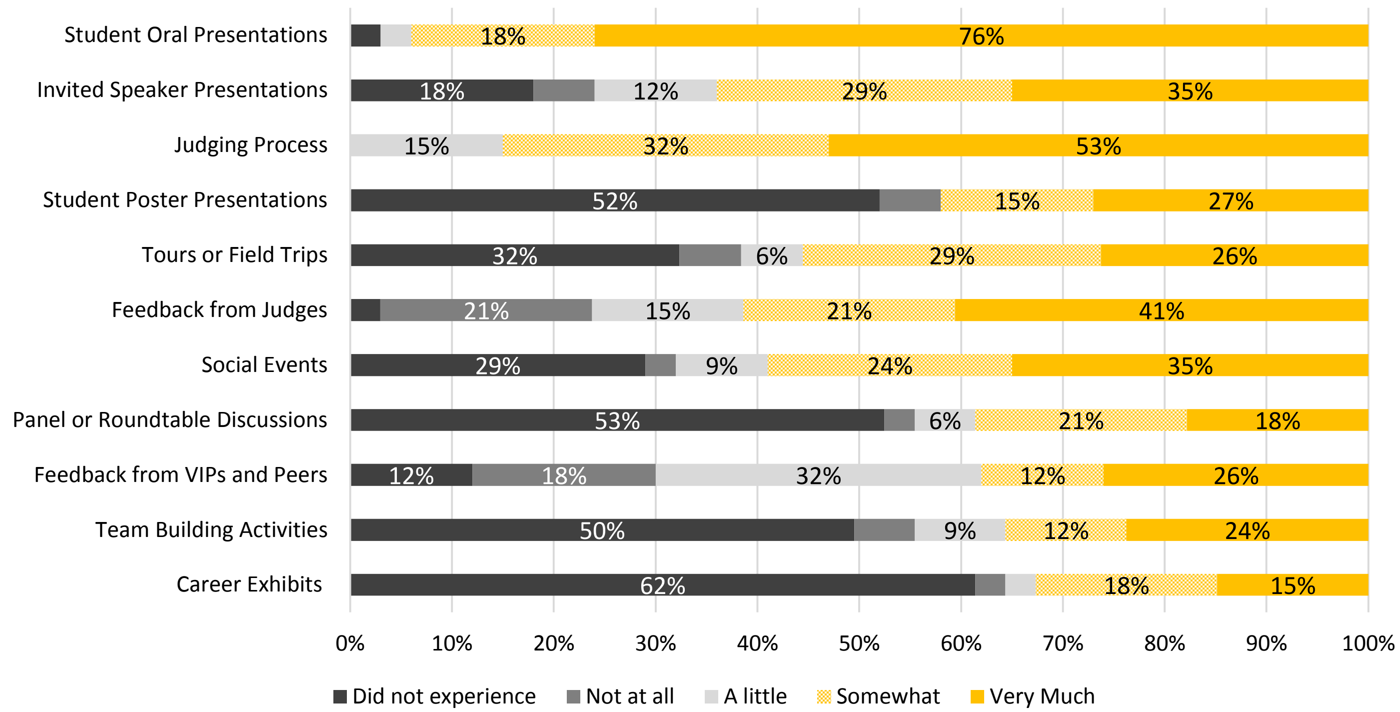
Satisfaction with JSHS

Students and mentors were asked how satisfied they were with a number of features of the JSHS program. As can be seen in Chart 16, most responding Regional students were somewhat or very much satisfied with the student oral presentations (75%), the judging process (60%), invited speaker presentations (55%), and tours or field trips (52%). A substantial portion of the students did not experience many of the listed program features, such as career exhibits (63%), team building activities (59%), and panel or roundtable discussions (53%). About 1 in 10 reported that they were "not at all" satisfied with feedback from judges (11%) and/or VIPs and peers (12%).

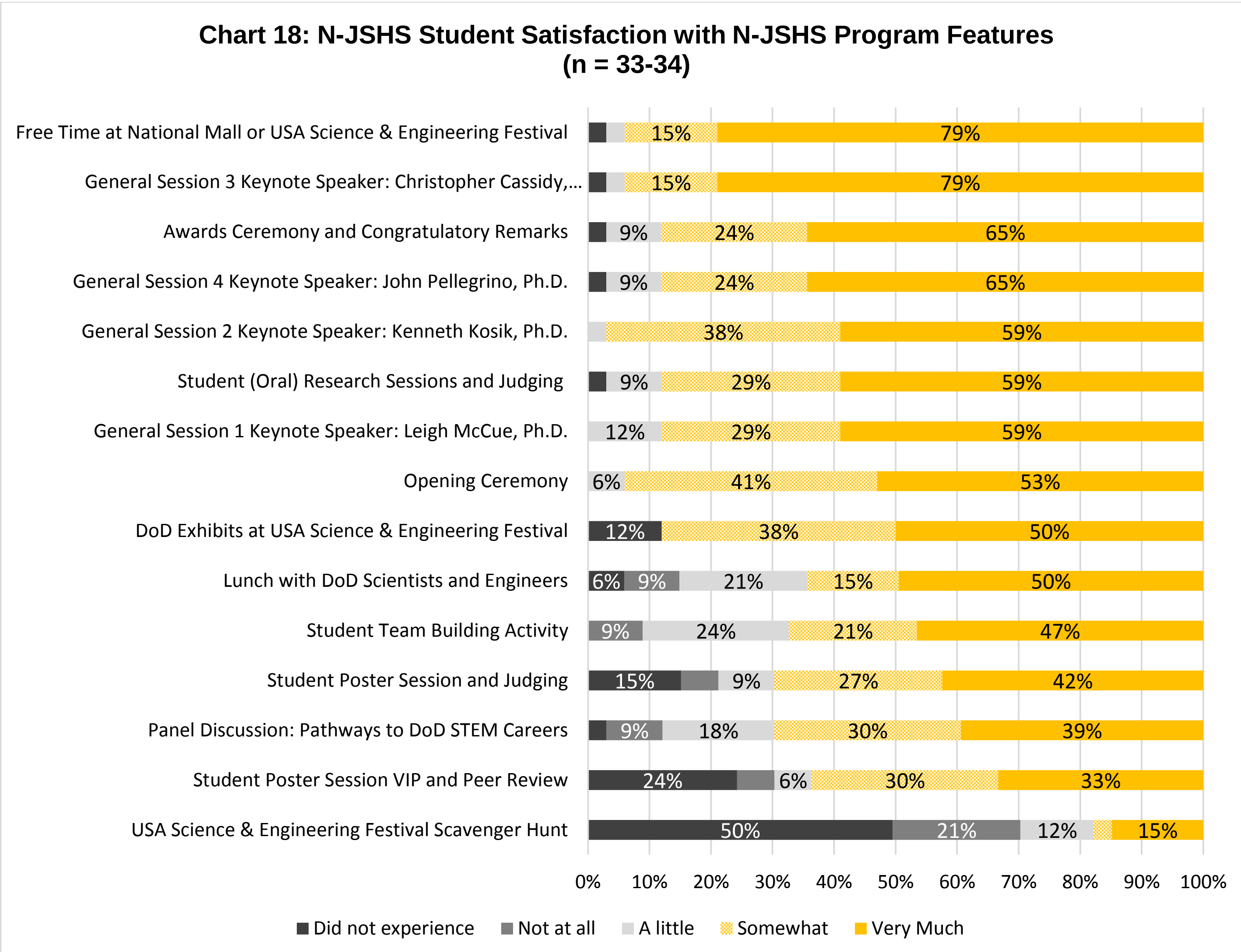


National students were also asked about their satisfaction with their R-JSHS program features. As can be seen in Chart 17, the vast majority reported being somewhat or very much satisfied with the student oral presentations (94%) and the judging process (85%). Invited speaker presentations (64%), feedback from judges (62%), social events (59%), and tours or field trips (55%) were rated at least somewhat satisfying by over half of the National students. As with the Regional students, half or more of the National students did not experience a number of the program elements, in particular, career exhibits (62%), panel or roundtable discussions (53%), student poster presentations (52%), and team building activities (50%). In addition, about 1 in 5 National students were not satisfied with feedback from judges (21%) and/or VIPs and peers (18%).

Chart 17: N-JSHS Student Satisfaction with R-JSHS Program Features (n = 32-34)



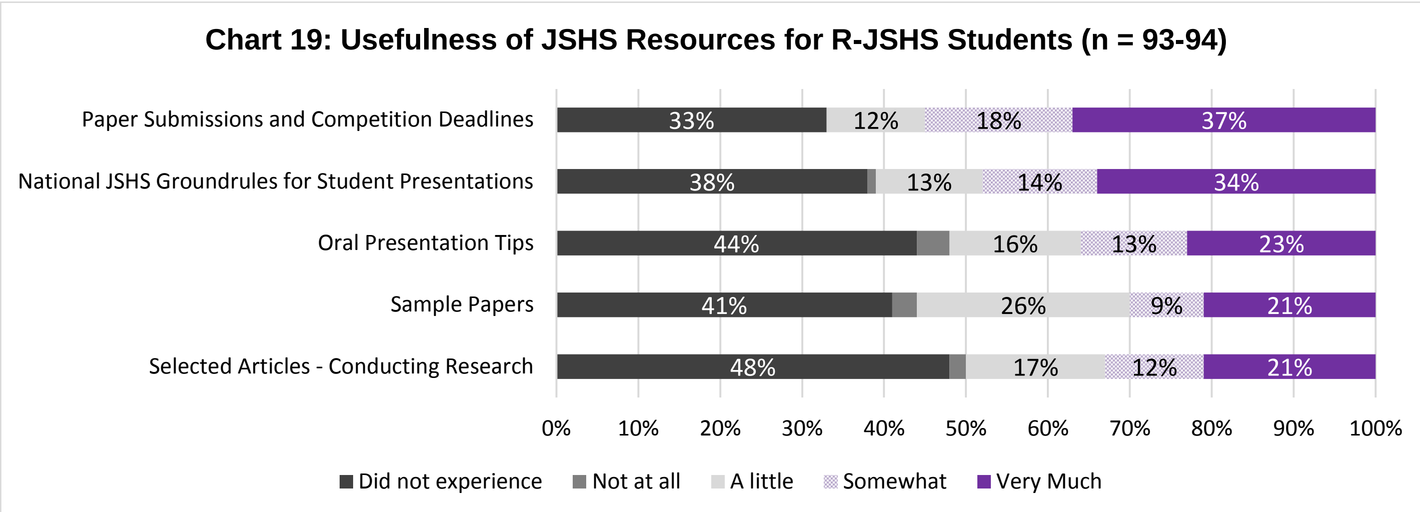
As can be seen in Chart 18, the vast majority of responding National students were somewhat or very much satisfied with all but a few of the listed features of the N-JSHS. Free time at the National Mall or USA Science & Engineering Festival and the General Session 3 Keynote Speaker were highlights, with each being rated as very satisfying by 79% of responding students and somewhat satisfying by an additional 15%. Other program features rated as somewhat or very satisfying by large numbers of student responders were: the opening ceremony (94%), the awards ceremony (89%), DoD exhibits at USA Science & Engineering Festival (88%), oral research sessions and judging (88%), and the remaining keynote speakers (88-97%). In contrast to several of the activities at R-JSHS, almost all students reported that they experienced each of the program elements, with the exception of the scavenger hunt (50% did not experience) and the student poster session VIP and peer review (24% did not experience).

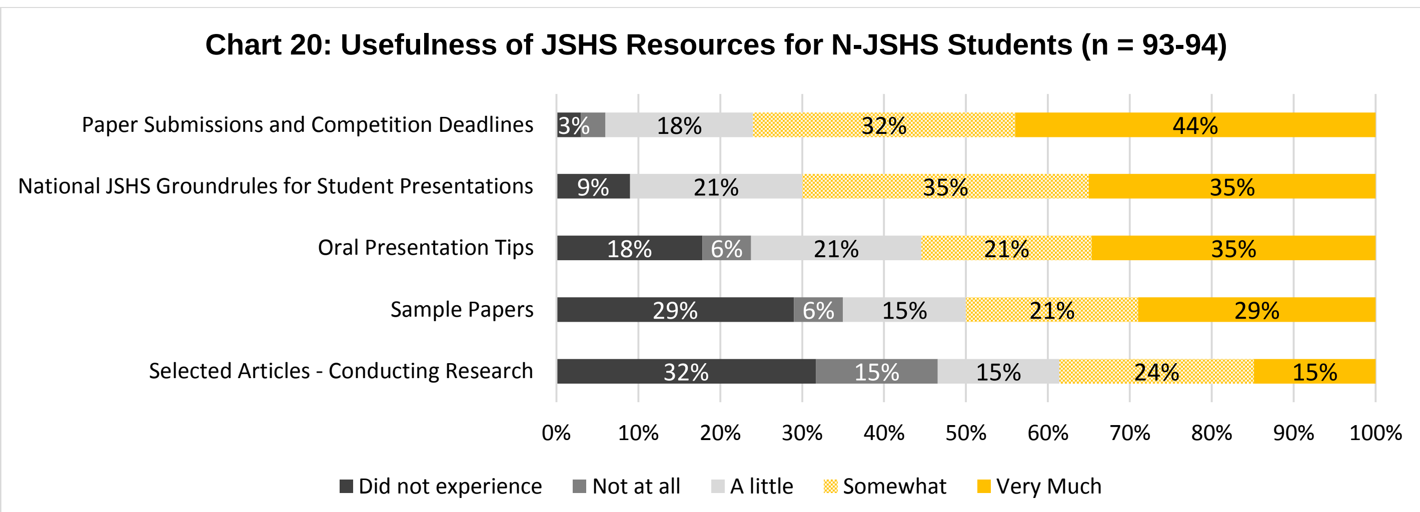


Students were asked their opinions on the usefulness of various online resources available to them. As can be seen in Charts 19 and 20, there appear to be differences[24] between Regional and National students, with National students reporting the resources as more useful. For example, just over half of Regional students (55%) but a large majority of National students (76%) reported that the paper submissions and competition guidelines were "somewhat" or "very much" useful. Half or more of the National students found the National JSHS Ground rules for Student Presentations (70%), oral presentation tips (56%), and sample papers (50%) at least somewhat useful, compared to 48%, 36%, and 30%

[24] Differences between the R-JSHS and N-JSHS responses to these items were not tested for statistical significance.

of Regional students, respectively. Although at least 30% of Regional students found each resource at least somewhat useful, for each resource listed there was also a sizeable portion (33% to 48%) of Regional students who reported that they did not experience the resource.





As a follow-up to the resources listed in Charts 19 and 20, an open-ended item asked students which resources were most useful for their participation in JSHS. The Ground rules were most frequently mentioned among the 47 Regional and 25 National students who responded (R-JSHS 34%; N-JSHS 32%). Other resources mentioned by several students included sample papers (R-JSHS 19%; N-JSHS 16%); deadlines and other general information on the website (R-JSHS 17%; N-JSHS 16%); and a mentor, teacher, or regional director (R-JSHS 9%; N-JSHS 8%).

Students were also asked what resources could be improved or added to better support their participation. The 28 Regional and 22 National students who responded to this open-ended question offered a variety of suggestions, few of which were made by more than a couple of students. Providing additional sample papers and/or a wider variety of sample papers was mentioned by 4 students in each group (R-JSHS 14%; N-JSHS 18%); 2 Regional and 6 National students suggested adding or clarifying poster guidelines (R-JSHS 7%; N-JSHS 27%), 5 Regional and 1 National student suggested improving the layout of the website (R-JSHS 18%; N-JSHS 5%). In the words of 3 students:

> *The sample papers would be much more helpful if a paper from different fields, e.g. environmental science, were posted to show different model writing styles pertaining to more understandable material.* (R-JSHS Student)

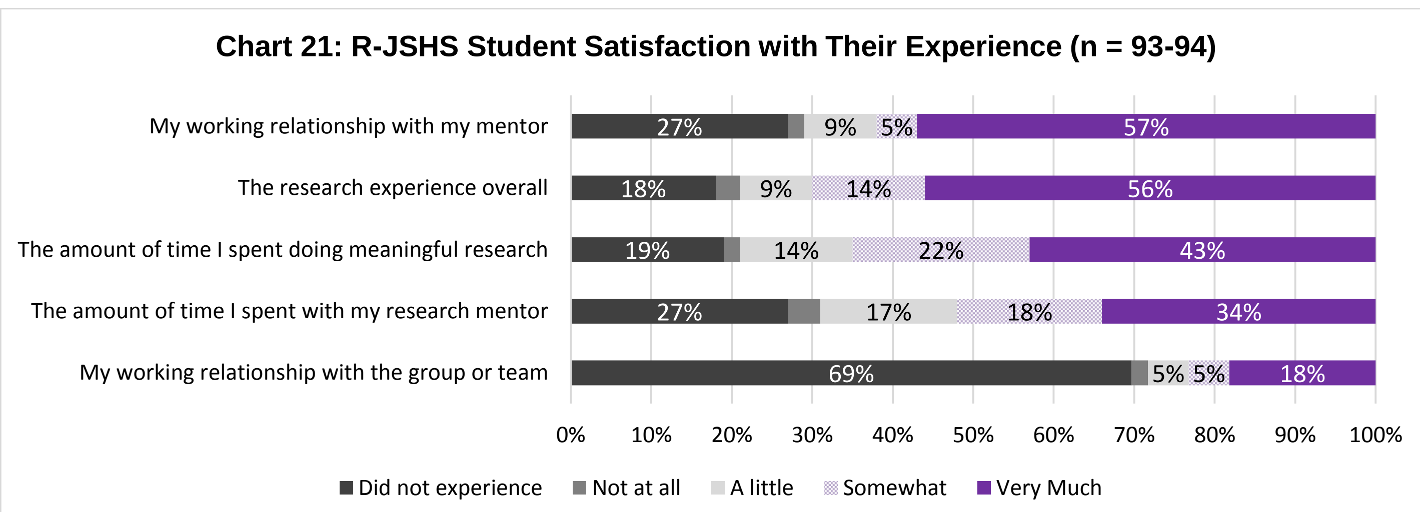
> *More clear protocol for the poster would be helpful. This would have helped me with how my poster should have been laid out and I would have been more confident in presenting my poster.* (R-JSHS Student)

> *I think adding more samples of paper and having some insight on how the judges judge the oral and paper presentations.* (N-JSHS Student)

The student questionnaire also asked about students' satisfaction with access to their mentor. As can be seen in Table 25, almost half of responding students indicated their mentor was always available (R-JSHS 47%; N-JSHS 41%), and few students indicated that their mentor was available half of the time or less. Although 22% of Regional students indicated that they did not have a mentor, compared to 12% of National students, the difference was not statistically significant. In contrast, in FY13 over a third of Regional students reported they did not have a research mentor, a significantly higher proportion.

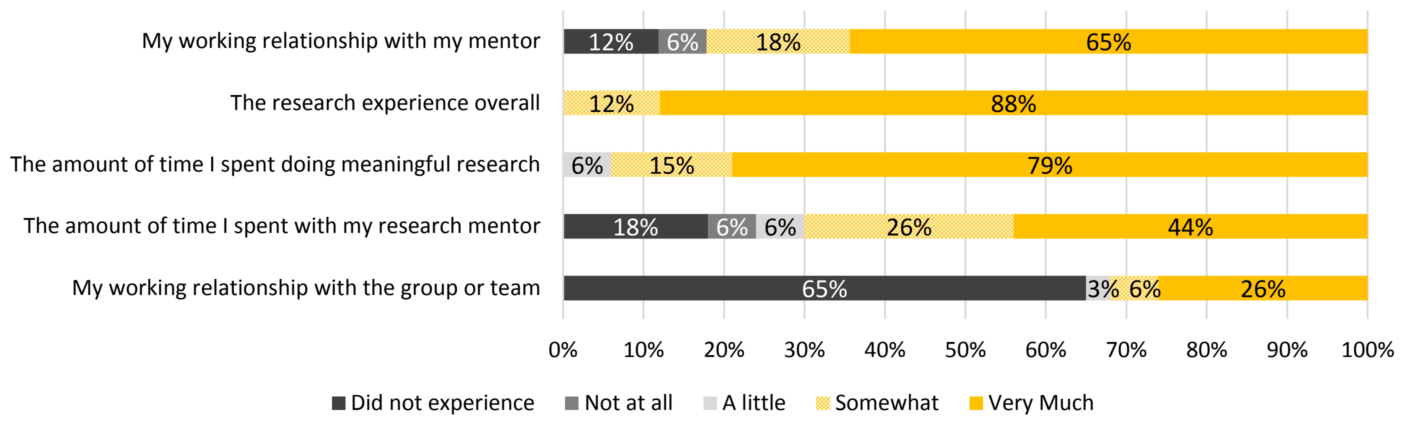
Table 25. Student Reports of Availability of Mentors		
Item	**R-JSHS Questionnaire Respondents (n = 94)**	**N-JSHS Questionnaire Respondents (n = 34)**
The mentor was always available	47%	41%
The mentor was available more than half of the time	14%	15%
The mentor was available about half of the time of my project	4%	15%
The mentor was available less than half of the time	11%	15%
The mentor was never available	2%	3%
I did not have a mentor	22%	12%

Students were asked about their satisfaction with the research experience, including their mentors (see Charts 21 and 22). National students were more satisfied[25] than Regional students with the amount of time spent doing meaningful research (a moderate effect size of d = 0.559 standard deviations) and the research experience overall (a moderate effect size of d = 0.530 standard deviations). Despite these differences, the majority of students in both groups indicated being "very much" or "somewhat" satisfied with each of the features, with the exception of their working relationship with the group or team, which most students (R-JSHS 69%; N-JSHS 65%) did not experience. Most notably, 100% of National students and 70% of Regional students were at least somewhat satisfied with the research experience overall. Similarly, 94% of National students and 65% of Regional students were at least somewhat satisfied with the time they spent doing meaningful research.



[25] Two-tailed independent samples t-tests: amount of time spent doing meaningful research, $t(107) = 2.67$, $p = 0.009$; research experience overall, $t(108) = 2.56$, $p = 0.012$.

Chart 22: N-JSHS Student Satisfaction with Their Experience (n = 34)



These student questionnaire items were combined into a composite variable,[26] and on average, National students reported greater overall satisfaction[27] than Regional students (a low to moderate effect of d = 0.431 standard deviations). The composite scores were also used to compare student experiences across groups based on gender, race/ethnicity, and FRL status. Female students were, on average, more satisfied[28] with the overall experience than male students (a moderate effect size of d = 0.454 standard deviations). There were no differences on the composite score by race/ethnicity or FRL status, although students who were eligible for FRL were more satisfied with the amount of time they spent with their research mentor than students who were not eligible (a large effect size of d = 0.826 standard deviations).[29]

An open-ended item on the questionnaire asked student about their overall satisfaction with their JSHS experience. The responses were overwhelmingly positive. Of the 43 Regional students and 19 National students who answered this question, 32 (74%) and 16 (84%), respectively, commented on only positive aspects of the program. These responses were sometimes as simple as, "Overall I extremely enjoyed this experience. I want to start a new project in the fall and think that the exposure this gives students in invaluable." Other times, more detail about what they enjoyed about the program was provided, such as in the following examples:

[26] The Cronbach's alpha reliability for these 5 items was 0.911.

[27] Two-tailed independent samples t-test, $t(109) = 2.08$, $p = 0.040$.

[28] Two-tailed independent samples t-test, $t(107) = 2.19$, $p = 0.031$.

[29] Two-tailed independent samples t-test, $t(88) = 2.88$, $p = 0.005$.

I was very pleased with the JSHS experience. Everyone was very nice and informative, and I ultimately learned a lot about presentation skills and information in fields that interest me, not only from guest speakers and a tour but also from my peers' projects. (R-JSHS Student)

I am very glad I attended the conference. JSHS was a wonderful experience because it provided me greater knowledge in different fields and job opportunities to choose from. JSHS has further instilled in me a higher interest in STEM related activities. (R-JSHS Student)

JSHS was one of the most valuable experiences I've ever had. I have been to several research competitions, and this is by far my favorite. The speakers were amazing, the organization and directors were wonderful, and the judges that I had in my category were extremely impressive and amazing. I had a great time getting to know the different people from all across the country, and I made some long lasting friends. It was wonderful to get to experience other people's research that they had worked so hard on, just as I had worked hard on my own research. I made some great connections as well with professionals in my field that have already been extremely helpful. I love JSHS and will definitely participate next year. Thank you so much for the work that was put into it to give me such a wonderful experience. (N-JSHS Student)

JSHS was overall a great experience. Meeting STEM professionals and forming a community with other high school students was invaluable. The speakers were engaging and the U.S.A. Science and Engineering Festival was a nice addition. (N-JSHS Student)

Most of the other responses included positive comments but had some caveats (6 R-JSHS 14%; 3 N-JSHS 16%). For example, one Regional student enjoyed the student presentations but found the accommodations lacking. Another Regional student found the religious invocation objectionable and cited constitutional and scientific reasons for not including it. A National student who had worked with a research partner was disappointed that only one of the pair could attend. In this student's words:

The whole thing was really awesome, although I'm really annoyed that my research partner didn't get to go to nationals just because I was the one that made the presentation. I understand that people could try to abuse such

"I am very glad I attended the conference. JSHS was a wonderful experience because it provided me greater knowledge in different fields and job opportunities to choose from. JSHS has further instilled in me a higher interest in STEM related activities." – R-JSHS Student

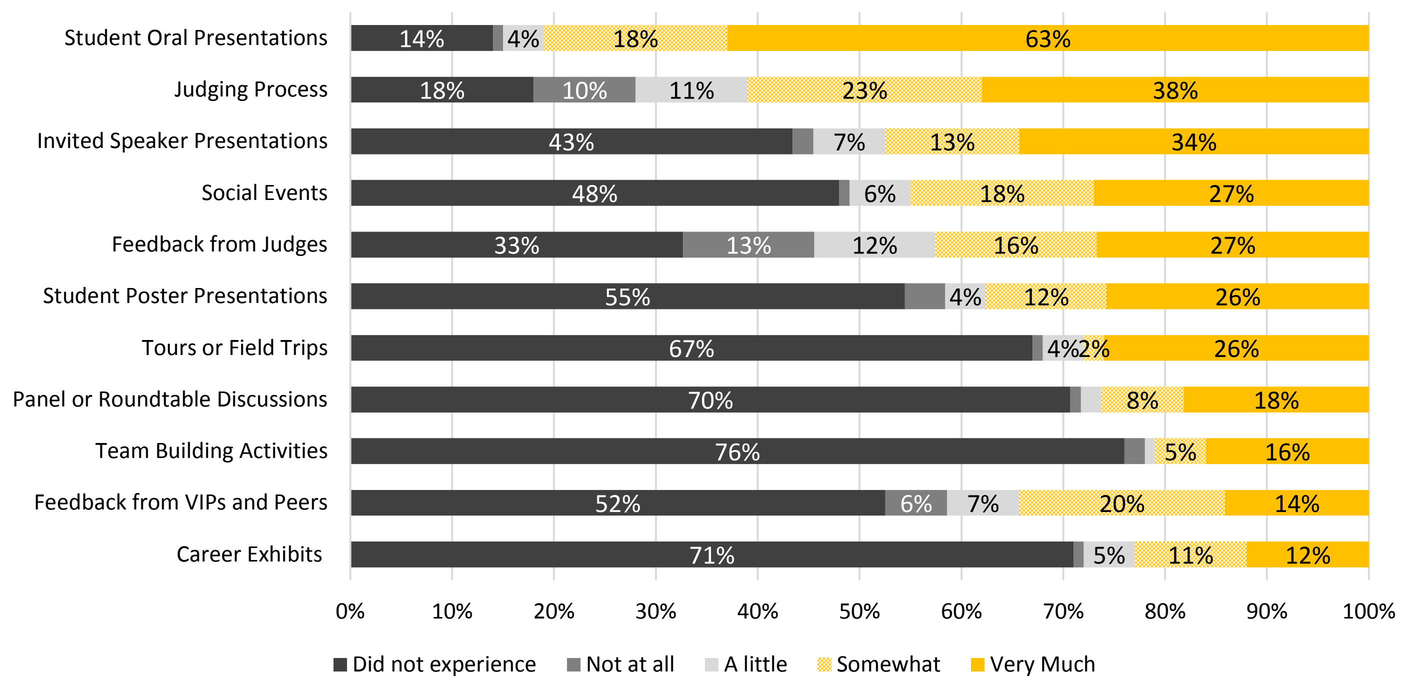
a system by forming one-sided partnerships but still, it kind of makes people less interested in doing partner research, which is usually a lot more fun and teaches you more, which is a shame. (N-JSHS Student)

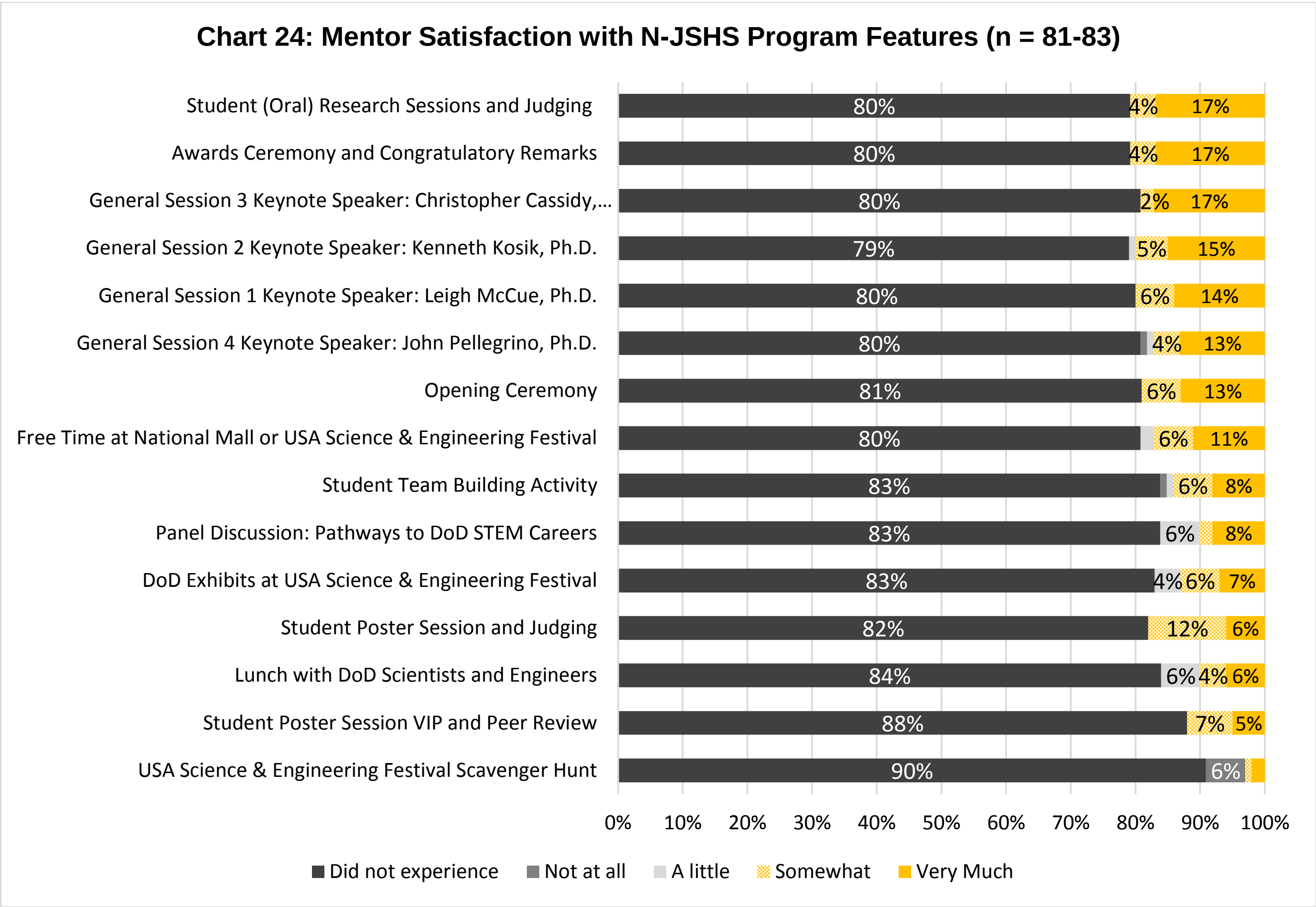
When asked how the program could be improved, 65 students answered, though 8 (7 R-JSHS 16%; 1 N-JSHS 5%) indicated that no improvements were necessary. The most common theme in the responses to this open-ended item, described by 7 Regional and 5 National students (R-JSHS 16%; N-JSHS 24%), was to increase time for students to interact while presenting, socially, or in both situations. Other suggestions included clarifying or improving the judging process (R-JSHS 18%; N-JSHS 5%), adjusting the timing of activities in some way (R-JSHS 11%; N-JSHS 19%), and improvements to the poster competitions (R-JSHS 11%; N-JSHS 19%).

Mentors also reported being somewhat or very much satisfied with the program features they experienced, although a large proportion reported that they did not experience many of the R-JSHS components, and approximately four-fifths did not experience each of the N-JSHS components (see Charts 22 and 23). For example, regarding the regional competition, 94% of those who experienced the student oral presentations were at least somewhat satisfied with them (n = 71), 88% with the panel or roundtable discussions (n = 25), 86% with the social events (n = 43), 85% each with the field trips (n = 27) and team building activities (n = 20), 84% with the judging process (n = 67), and 83% with the invited speaker presentations (n = 47). For the national competition, the General Session 3 Keynote Speaker, student (oral) research sessions and judging, awards ceremony and congratulatory remarks, general session 1 keynote speaker, opening ceremony, student poster session VIP and peer review, and student poster session and judging were rated “somewhat” or “very much” satisfying by all mentors experiencing those features.

“It was wonderful to get to experience other people's research that they had worked so hard on, just as I had worked hard on my own research. I made some great connections as well with professionals in my field that have already been extremely helpful.” – N-JSHS Student

Chart 23: Mentor Satisfaction with R-JSHS Program Features (n = 82-83)





As with the student questionnaire, the mentor questionnaire included open-ended items asking for their opinions about the program. One item asked them to identify the three most important strengths of JSHS; 55 mentors responded to this question. Although several important aspects of the program were listed, the most frequently described was providing an opportunity for students to actively work on a STEM project and share their results (33 mentors, or 60%). Mentors wrote things like, "Opportunities for students to experience a science conference to introduce them to the expectations and social aspects," and, "Allows for students to share their research and develop oral presentation skills." This sentiment was echoed in the mentor focus group. As two mentors said:

> *I think it gives the students that already know they want to go into STEM an opportunity to actually experience it, in a real way—working with mentors, faculty members, researchers who are active in the field—so it gives them an outlet to really practice what they're thinking about.* (JSHS Mentor)

> *I'd say, in my mind, one of the biggest benefits for the students is to be given the opportunity to synthesize, to bring to a closure a long period of work that often times seems disparate and fragmented, and have it come together to have a final package that can be presented and bragged about.* (N-JSHS Mentor)

Other strengths noted in responses to this item focused on the opportunities JSHS provides to meet with STEM professionals (33%), engage with real-world STEM issues or research (27%), and meet other STEM students (22%). In addition, 13 (24%) described specific features of JSHS, such as the judges, and 7 (13%) identified students' development of skills beyond those involved in research and presentation.

Another open-ended item asked mentors to describe three ways JSHS could be improved for future participants. Of the 55 individuals who responded to this question, about one fourth (27%) suggested that the judging process or selection of judges be improved. Although there were not consistent themes among the open-ended responses regarding ways to improve judging, a concern that arose in the focus group was how to fairly compare projects completed by students working along to those completed in lab or university situations in which more sophisticated equipment and expert guidance were available. Similarly, several participants in the focus group and rapid interviews brought up particular challenges to rural students or students in remote international locations, including travel challenges and difficulty accessing resources that are more easily available to students who live near research universities. As one interview expressed it:

> *We need to really look at the rural students and how to encourage them to be more successful. For example, students [who] are connected to large research-1 institutions definitely have an advantage over our students who are extremely rural—who are not near a university. And I find the tendency with the presentations are—someone who is connected to a research [institution] may be taking a grad student or a professor's research and doing one component of it. Where with our rural students, the research is totally theirs…So there is a real difference with how the presentations are developed and brought forward. And sometimes I feel that my rural students are disadvantaged because of that.* (JSHS Regional Director)

One suggestion made by several focus group members was to increase the time available for judges to question students about their projects so that judges could better understand the contexts in which students were working.

Other suggestions described in responses to the questionnaire, though none made by a large number of mentors, included improving the website (16%); increasing the number of students who can participate, particularly at the Regional level (16%); increased DoD involvement (9%); and more free time or structured social time at events (7%). An additional concern that came up in the rapid interviews was miscommunication or insufficient communication between organizers and judges, primarily related to logistics. One judge suggested clearer guidance was needed to ensure consistency between different judges, and all three of the judges who were interviewed brought up the need for clearer scheduling, as indicated in this response:

> *"JSHS is one of the greatest programs available for bringing youth together and allowing them to work side by side with the foremost people in science, engineering and research. The exposure to STEM through JSHS is invaluable to increasing students' desires to follow career pathways."* – JSHS Mentor

> *There was some confusion for the judges as far as the prior planning is concerned, where to be, when to be there, who was judging what.* (N-JSHS Judge)

The final open-ended questionnaire item asked mentors to share their overall satisfaction with their JSHS experience. The responses were largely positive. Of the 50 individuals who responded to this question, nearly all of the responses included a positive comment about the program, along with listing one or more ways in which the program was beneficial to student participants. For example:

> *Overall, excellent experience at the National JSHS. This was by far one of the most exciting and well-orchestrated symposia. Student presentations were good and the keynote speakers were really good and connected with the high school audience.* (JSHS Mentor)

> *JSHS is one of the greatest programs available for bringing youth together and allowing them to work side by side with the foremost people in science, engineering and research. The exposure to STEM through JSHS is invaluable to increasing students' desires to follow career pathways.* (JSHS Mentor)

> *It is a good opportunity for students to conduct an independent project and share results. I've participated in two regions in New Jersey and there are differences in terms of the student interactions and expectations at each. But, despite the differences, the focus is on student research and this is paramount to anything else, making it a rewarding experience for the students involved.* (JSHS Mentor)

Outcomes Evaluation

The evaluation of JSHS 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 toward research, and their knowledge of and interest in participating in additional AEOP opportunities.[30] 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 JSHS 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 Charts 25 and 26, nearly all responding JSHS students reported gains in their STEM knowledge as a result of the JSHS program. Given the inherent differences between Regional and National students and the differences they reported in their JSHS experiences, it is not surprising that National students tended to report greater impacts than Regional students, with a slim majority of Regional respondents and a large majority of National students indicating large or extreme gains in each area. For example, large or extreme gains were reported by 57% of Regional students and 85% of National students on knowledge of a STEM topic or field in depth, and by 51% of Regional students and 88% of National students on their knowledge of how professionals work on real problems in STEM. Similar patterns of impact were reported by students on their knowledge of research conducted in a STEM topic or field (R-JSHS 57%; N-JSHS 85%) and their knowledge of what everyday research work is like in STEM (R-JSHS 54%; N-JSHS 82%). Mentors were asked a similar set of questions, and their estimates of students' gains paint a similar picture to students' own responses, with mentors' average scores for each item falling between the Regional and National averages.

---

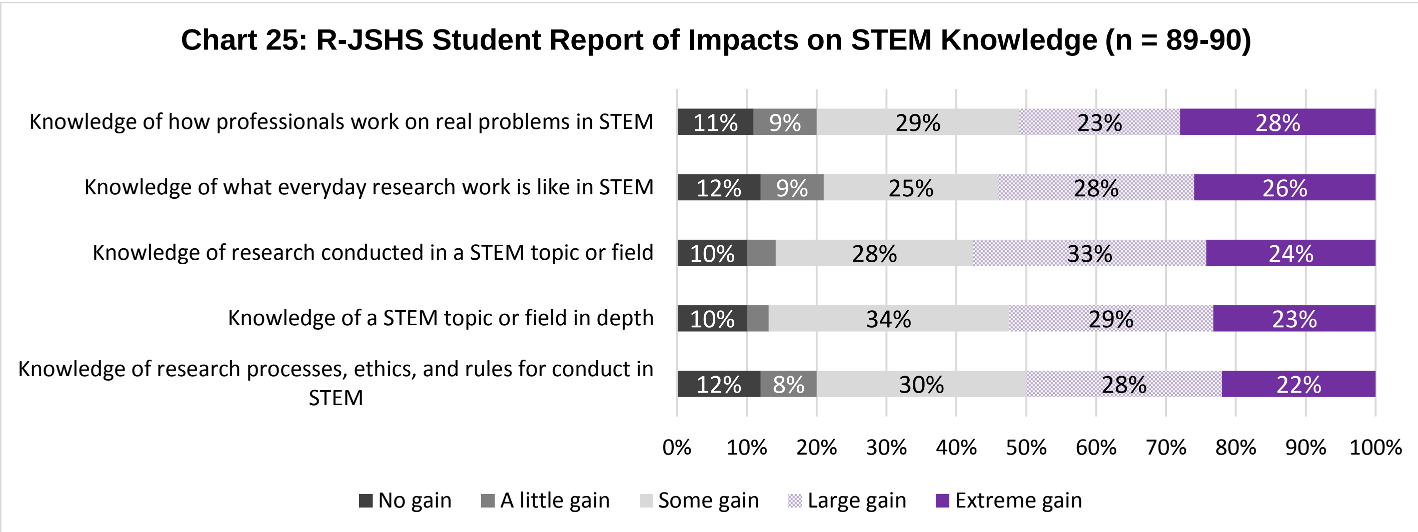
[30] The outcomes measured in the evaluation study were informed by the following documents:

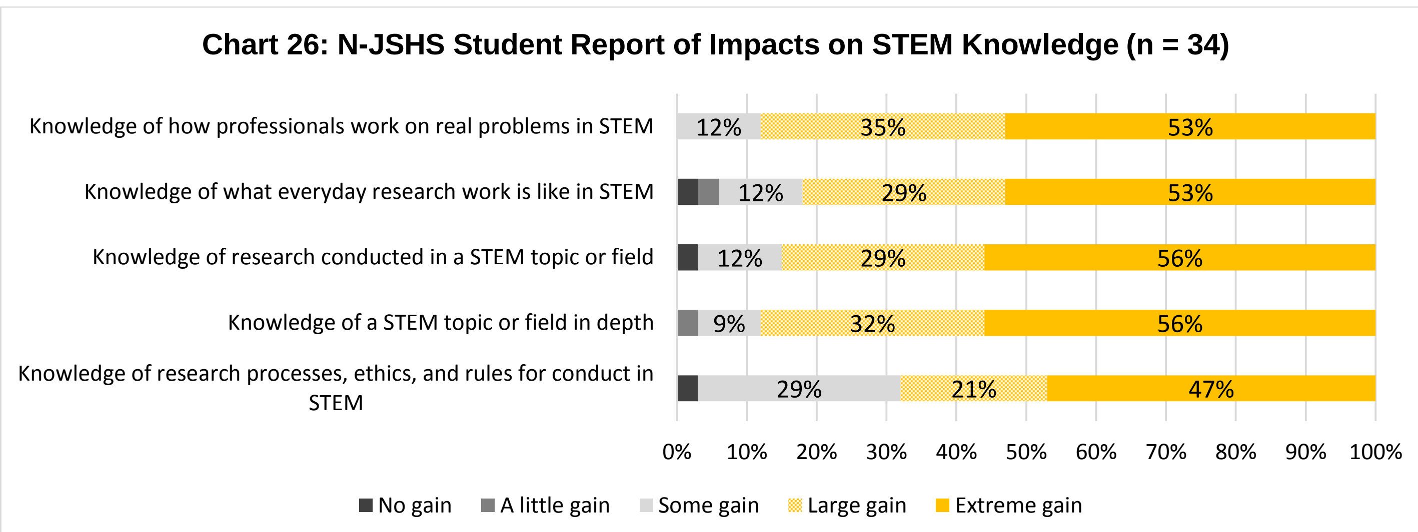
Committee on STEM Education. (2013*). Federal Science, Technology, Engineering, and Mathematics (STEM) education 5-year strategic plan: A report from the Committee on STEM Education, National Science and Technology Council.* Washington, DC: The White House, Office of Science and Technology Policy.

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.





These student questionnaire items were combined into a composite variable[31] to test for differential impacts across subgroups of students. National students reported greater gains in this area than Regional students (moderate to large effect size, d = 0.774 standard deviations).[32] There were no significant differences between male and female students,

[31] The Cronbach's alpha reliability for these 5 items was 0.957.

[32] Two-tailed independent samples t-test, t(122) = 3.82, p < 0.001.

between minority and non-minority students, or between students eligible for FRL and those not eligible. In other words, these subgroups of students reported similar impact of the program on their STEM knowledge.

The student questionnaire also asked about perceived impacts on STEM skills, i.e., students' abilities to use STEM practices. Students were presented with different sets of items depending on the focus of their JSHS experience (science vs. technology, engineering, or mathematics). Table 26 shows the percentage of responding students reporting large or extreme gains in science-related practices. Over half of the responding Regional students reported large or greater gains on their ability to apply knowledge, logic, and creativity to propose explanations that can be tested with investigations (62%); ask a question (about a phenomenon) that can be answered with one or more investigations to support an explanation with data from investigations (55%); display numeric data from an investigation in charts or graphs to identify patterns and relationships (54%); decide what type of data to collect in order to answer a question (53%); identify the strengths and limitations of explanations in terms of how well they describe or predict observations (53%); read technical or scientific texts, or using other media, to learn about the natural or designed worlds (52%); identify the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts (52%); and use data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon (51%).

In general, responding National students reported greater gains than Regional students. The areas of large or extreme gains selected by the greatest number of National students were: identifying the strengths and limitations of explanations in terms of how well they describe or predict observations (82%); communicating information about your investigations and explanations in different formats (e.g., orally, written, graphically, mathematically) (77%); using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon (76%); deciding what additional data or information may be needed to find the best explanation for a phenomenon (76%); integrating information from multiple sources to support your explanations of phenomena (76%); supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge (76%); and designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected (75%).

Table 26. Students Reporting Large or Extreme Gains in their STEM Competencies – Science Practices

Item	R-JSHS Questionnaire Respondents (n = 69-71)	N-JSHS Questionnaire Respondents (n = 16-17)
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	62%	65%
Asking a question (about a phenomenon) that can be answered with one or more investigations	55%	65%
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	54%	71%

Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	53%	82%
Deciding what type of data to collect in order to answer a question	53%	63%
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	52%	65%
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	52%	59%
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	51%	76%
Using mathematics to analyze numeric data	50%	70%
Making a model to represent the key features and functions of an observed phenomenon	50%	62%
Testing how changing one variable affects another variable, in order to understand relationships between variables	50%	47%
Communicating information about your investigations and explanations in different formats (e.g., orally, written, graphically, mathematically)	49%	77%
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	49%	76%
Carrying out procedures for an investigation and recording data accurately	49%	71%
Asking questions to understand the data and interpretations others use to support their explanations	49%	70%
Asking questions based on observations of real-world phenomena	49%	65%
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	48%	75%
Integrating information from multiple sources to support your explanations of phenomena	47%	76%
Identifying the limitations of data collected in an investigation	47%	65%
Supporting a proposed explanation (for a phenomenon) with data from investigations	47%	59%

Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	46%	76%
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	45%	59%
Using data or interpretations from other researchers or investigations to improve an explanation	44%	64%
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	37%	53%

Students whose experience focused on the other STEM areas (technology, engineering, and mathematics) were asked about perceived impacts on their abilities to use key engineering practices. Between 40% and 60% of Regional student responders indicated "some" gain for each of the engineering practices listed on the questionnaire, with many reporting large or extreme gains. As can be seen in Table 27, 40% indicated large or extreme gains in the following practices: making a model that represents the key features or functions of a solution to a problem, using data or interpretations from other researchers or investigations to improve a solution, and integrating information from multiple sources to support your solution to a problem. For other practices, fewer Regional students indicated large or extreme gains. For example, 20% reported large or extreme gains in their abilities to use computer-based models to investigate cause and effect relationships of a simulated solution, mathematics to analyze numeric data, or data from investigations to defend an argument that conveys how a solution meets design criteria.

In contrast, National students appear to have reported greater gains. For example, over three-fourths of the National students described large or extreme gains for five of the practices: defining a problem that can be solved by developing a new or improved object, process, or system (93%); applying knowledge, logic, and creativity to propose solutions that can be tested with investigations (93%); identifying real-world problems based on social, technological, or environmental issues (87%); communicating information about your design processes and/or solutions in different formats (e.g., orally, written, graphically, mathematically) (80%); and using computer-based models to investigate cause and effect relationships of a simulated solution (80%). Further, over half of the respondents reported large or extreme gains in each of the practices listed.

Table 27. Students Reporting Large or Extreme Gains in their STEM Competencies – Engineering Practices

Item	R-JSHS Questionnaire Respondents (n = 14-15)	N-JSHS Questionnaire Respondents (n = 15)
Integrating information from multiple sources to support your solution to a problem	40%	74%

Using data or interpretations from other researchers or investigations to improve a solution	40%	67%
Making a model that represents the key features or functions of a solution to a problem	40%	60%
Communicating information about your design processes and/or solutions in different formats (e.g., orally, written, graphically, mathematically)	34%	80%
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	34%	73%
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	34%	67%
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	33%	93%
Defining a problem that can be solved by developing a new or improved object, process, or system	33%	93%
Identifying real-world problems based on social, technological, or environmental issues	33%	87%
Deciding what type of data to collect in order to test if a solution functions as intended	33%	67%
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	33%	67%
Deciding what additional data or information may be needed to find the best solution to a problem	33%	60%
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	29%	67%
Asking questions to understand the data and interpretations others use to support their solutions	27%	73%
Supporting a proposed solution (for a problem) with data from investigations	27%	66%
Considering alternative interpretations of data when deciding if a solution functions as intended	27%	60%
Identifying the limitations of the data collected in an investigation	27%	60%

Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	27%	60%
Displaying numeric data in charts or graphs to identify patterns and relationships	26%	67%
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	21%	60%
Carrying out procedures for an investigation and recording data accurately	21%	53%
Using computer-based models to investigate cause and effect relationships of a simulated solution	20%	80%
Using mathematics to analyze numeric data	20%	66%
Using data from investigations to defend an argument that conveys how a solution meets design criteria	20%	60%

Interestingly, mentors' reports of student gains in science practices, National students' reports, and Regional students' reports were generally aligned in terms of which practices evidenced the greatest gains, but the ranking of engineering practices varied among the three groups. In some cases mentors reported greater gains than did either group of students, and in other cases National students' reported gains were higher. These inconsistencies may be due to the data quality concerns described previously, or differences in perspectives between students and mentors.

Composite scores were calculated for each set of practices items[33] on the student questionnaire to examine whether the JSHS program had differential impacts on subgroups of students. There were significant differences between minority and non-minority students[34] and by FRL status[35] for the science practices, with minority students (large effect of d = 0.878 standard deviations) and FRL-eligible students (very large effect of d = 1.136 standard deviations) reporting higher gains. In addition, there was a very large difference (d = 1.031 standard deviations) on the engineering practices by gender, with female students reporting greater gains than male students.[36] However, the apparent differences between Regional and National students were not significant, perhaps in part due to large differences between the R-JSHS and N-JSHS sample sizes for the science practices and the small number of students who responded about the engineering practices.

[33] The science practices composite has a Cronbach's alpha reliability of 0.991; the engineering practices composite has a Cronbach's alpha reliability of 0.986.

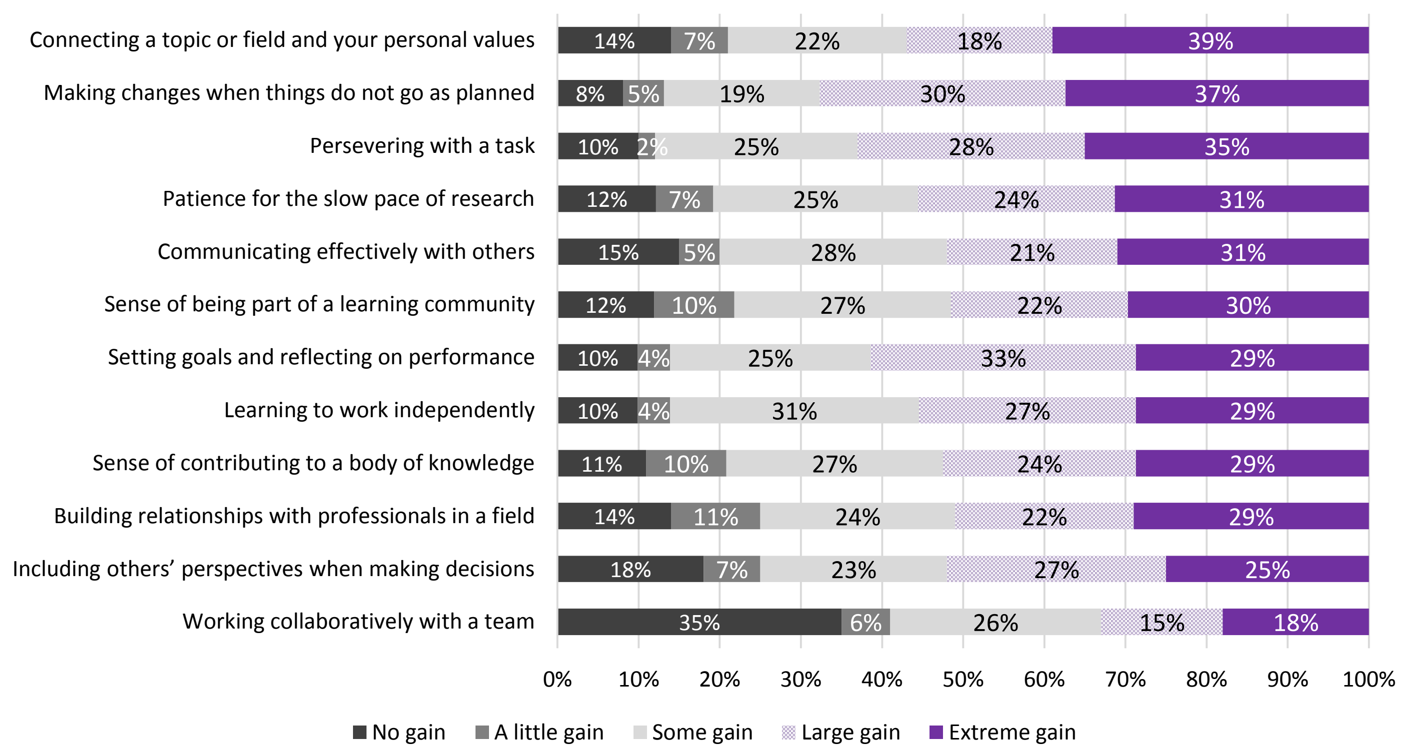
[34] Two-tailed independent samples t-test, $t(79) = 3.03$, $p = 0.003$.

[35] Two-tailed independent samples t-test, $t(77) = 3.58$, $p = 0.001$.

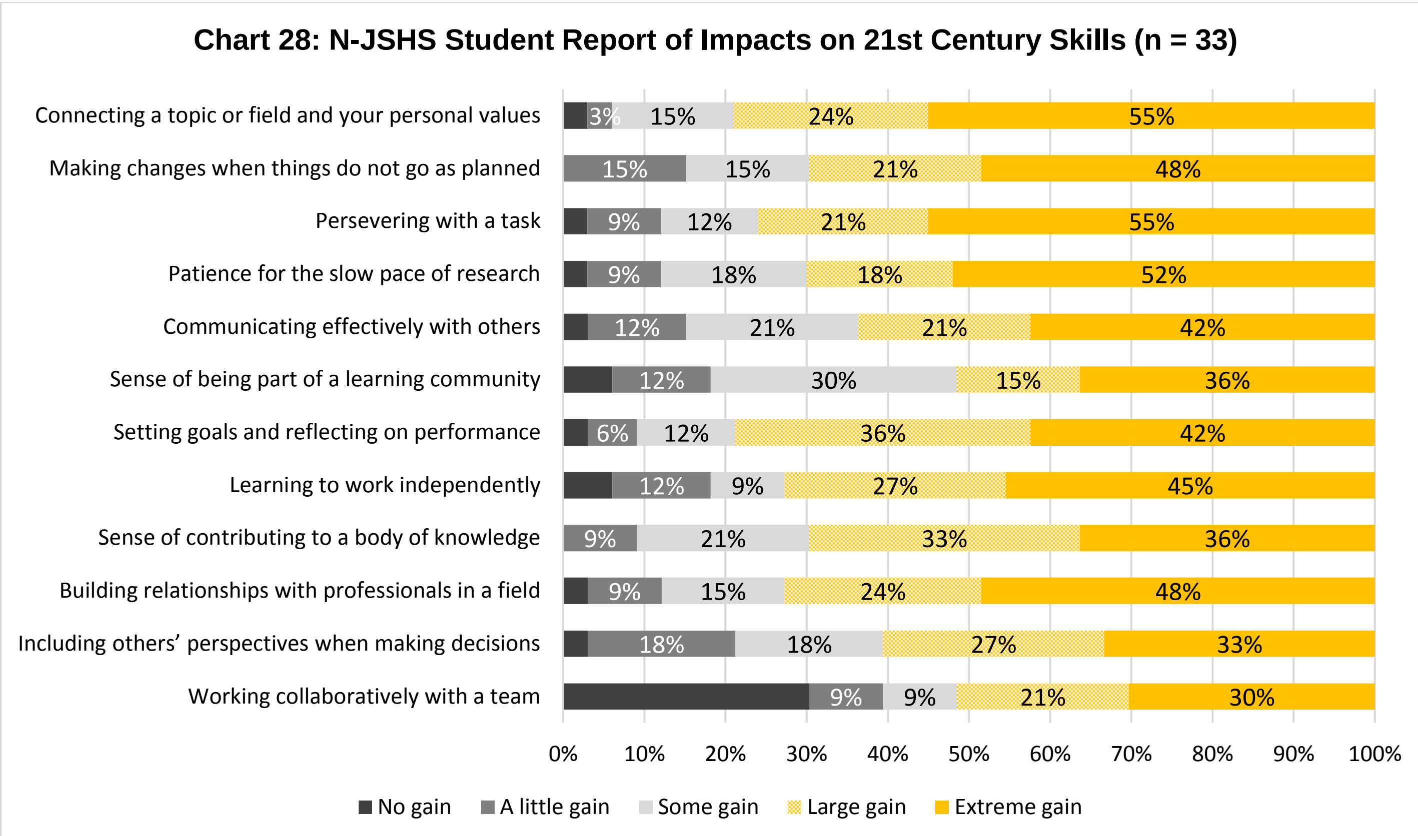
[36] Two-tailed independent samples t-test, $t(28) = 2.63$, $p = 0.014$.

The student questionnaire also asked students about the impact of JSHS on their "21st Century Skills" that are necessary across a wide variety of fields. As can be seen in Chart 27, over 60% of Regional student respondents reported large or extreme gains for making changes when things do not go as planned (67%), persevering with a task (63%), and setting goals and reflecting on performance (62%). A majority reported large or extreme gains in connecting a topic or field to their personal values (57%), learning to work independently (56%), having patience for the slow pace of research (55%), having a sense of contributing to a body of knowledge (53%), communicating effectively with others (52%), having a sense of being part of a learning community (52%), including others' perspectives when making decisions (52%), and building relationships with professionals in a field (51%).

Chart 27: R-JSHS Student Report of Impacts on 21st Century Skills (n = 80-83)



Over half of National students reported large or extreme gains in each of the listed skills (see Chart 28). Further, about three-quarters indicated such gains on several of the items such as connecting a topic or field to their personal values (79%), setting goals and reflecting on performance (78%), persevering with a task (76%), building relationships with professionals in a field (72%), and learning to work independently (72%).



Mentors were also asked about the impact of JSHS on students' 21st Century Skills. Overall, mentors identified communicating effectively with others and learning to work independently as the top two areas of student gains. Otherwise, mentors' responses resembled students' responses, with the mean mentor response generally falling between the Regional and National student means.

Comparing results on a composite created from these items[37] on the student questionnaire, minority students and FRL-eligible students reported greater gains in STEM identity[38] than non-minority (moderate effect of d = 0.638 standard deviations) and non-FRL-eligible students (large effect of d = 0.797 standard deviations), respectively. There were no differences in impact based on gender or Regional/National status.

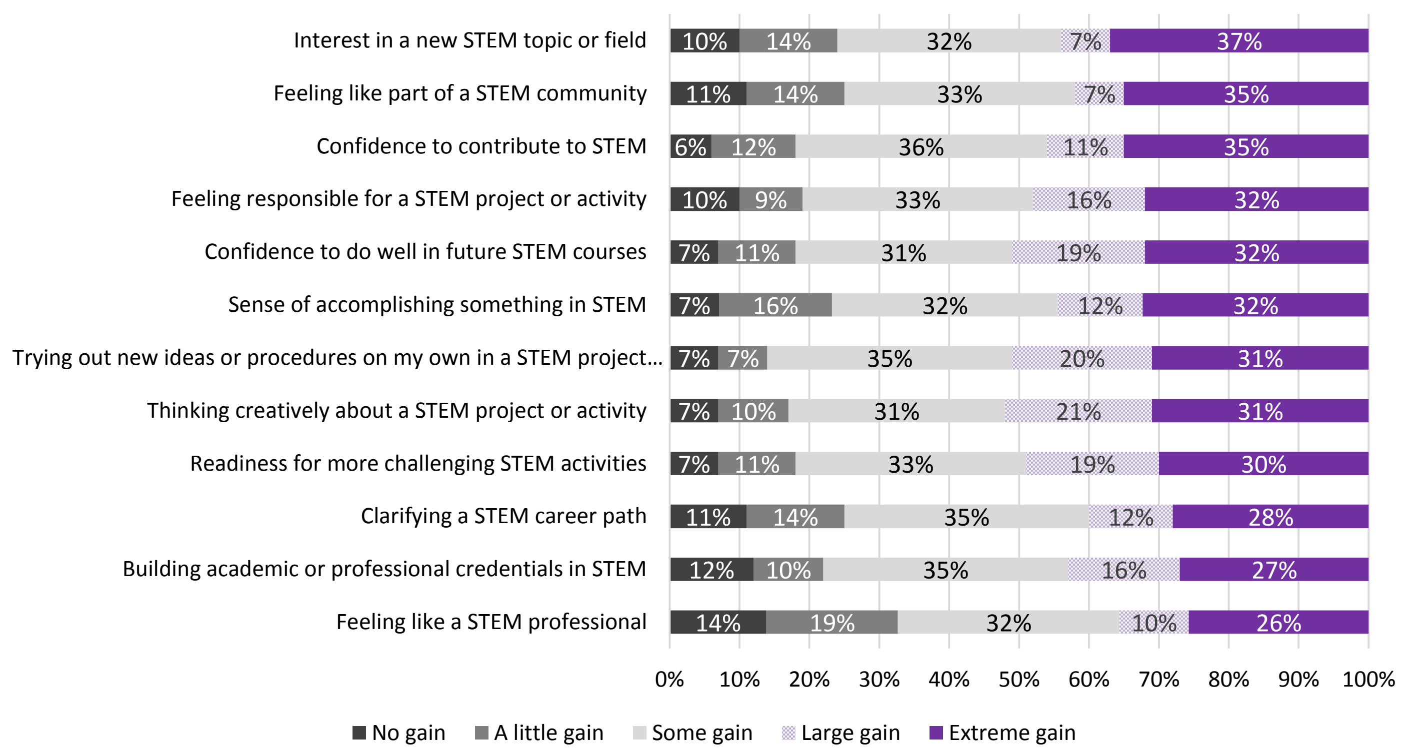
[37] The Cronbach's alpha reliability for these 12 items was 0.961.

[38] Two-tailed independent samples t-tests: minority/non-minority $t(105) = 2.64$, $p = 0.009$; FRL status $t(104) = 3.12$, $p = 0.002$.

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.[39] Consequently, the student questionnaire included a series of items intended to measure the impact of JSHS on students' STEM identity. These data are shown in Charts 29 and 30 and strongly suggest that the program has had a positive impact in this area. A large majority of Regional students reported at least some gain in each of the areas listed, with a majority indicating large or extreme gains in their ability to think creatively about a STEM project or activity, confidence to do well in future STEM courses, and ability to try out new ideas or procedures on their own in a STEM project or activity.

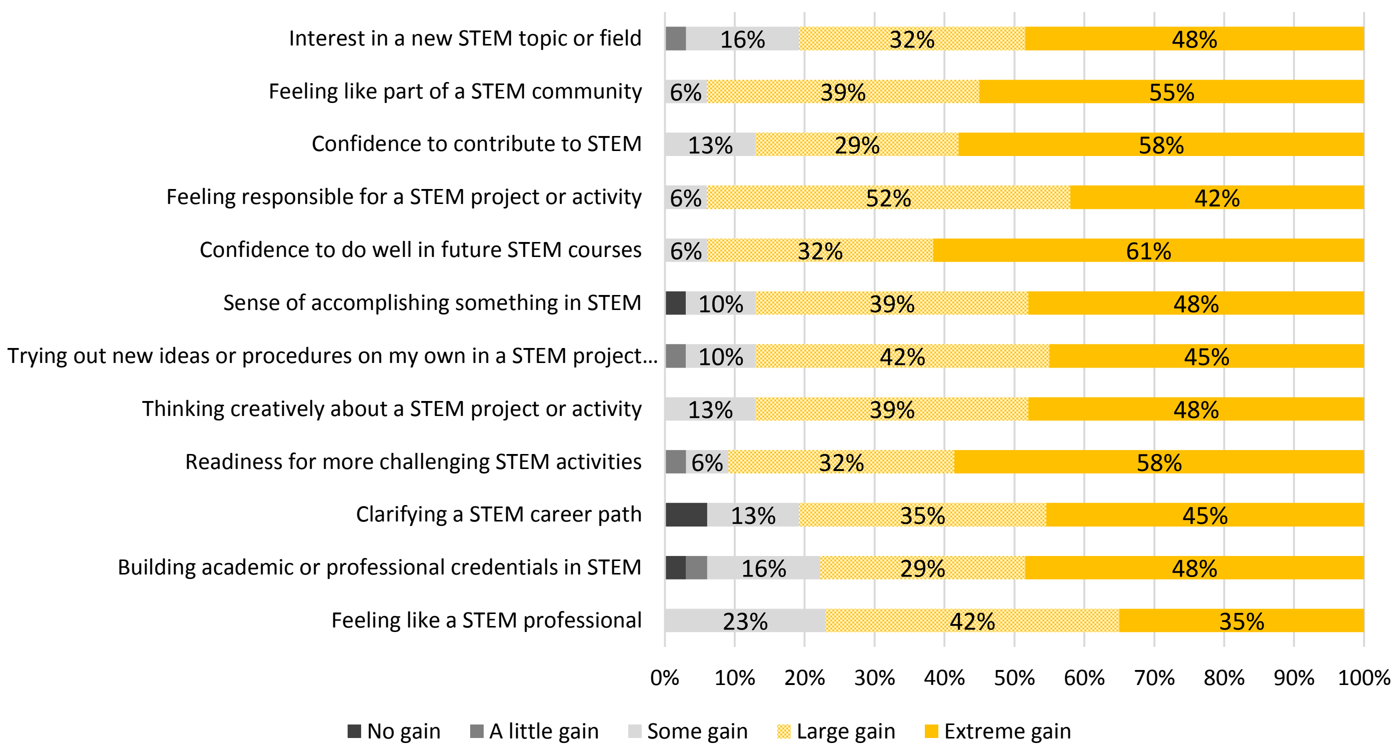
Chart 29: R-JSHS Student Report of Impacts on STEM Identity (n = 81)



[39] 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.

At the National level, large majorities of students reported large or extreme impacts in each area listed. For example, the vast majority of responding National students reported a large or extreme gain in feeling like part of a STEM community (94%), feeling responsible for a STEM project or activity (94%), their confidence to do well in future STEM courses (93%), and readiness for more challenging STEM activities (90%).

Chart 30: N-JSHS Student Report of Impacts on STEM Identity (n = 31)



Composite scores were calculated for the STEM identity composite[40] to examine whether the JSHS program had differential impacts on subgroups of students. National student responders reported much greater gains[41] than Regional students (a large effect of d = 0.835 standard deviations). In addition, minority students reported moderately greater gains[42] than non-minority students (d = 0.495 standard deviations). Students reported similar gains regardless of gender or FRL status.

[40] The Cronbach's alpha reliability for these 12 items was 0.980.

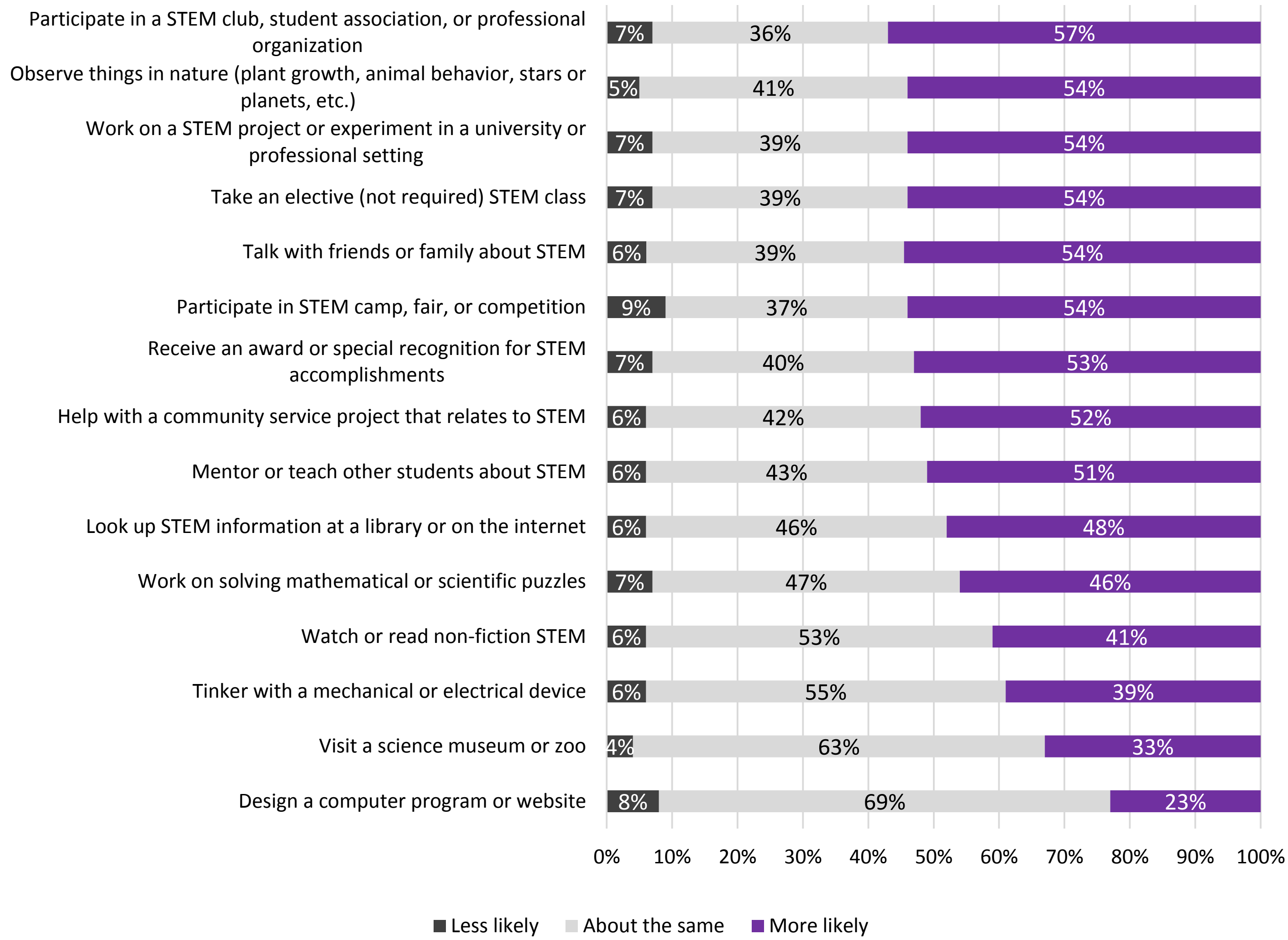
[41] Two-tailed independent samples t-test, $t(110) = 3.87$, $p < 0.001$.

[42] Two-tailed independent samples t-test, $t(101) = 2.04$, $p = 0.044$.

Interest and Future Engagement in STEM

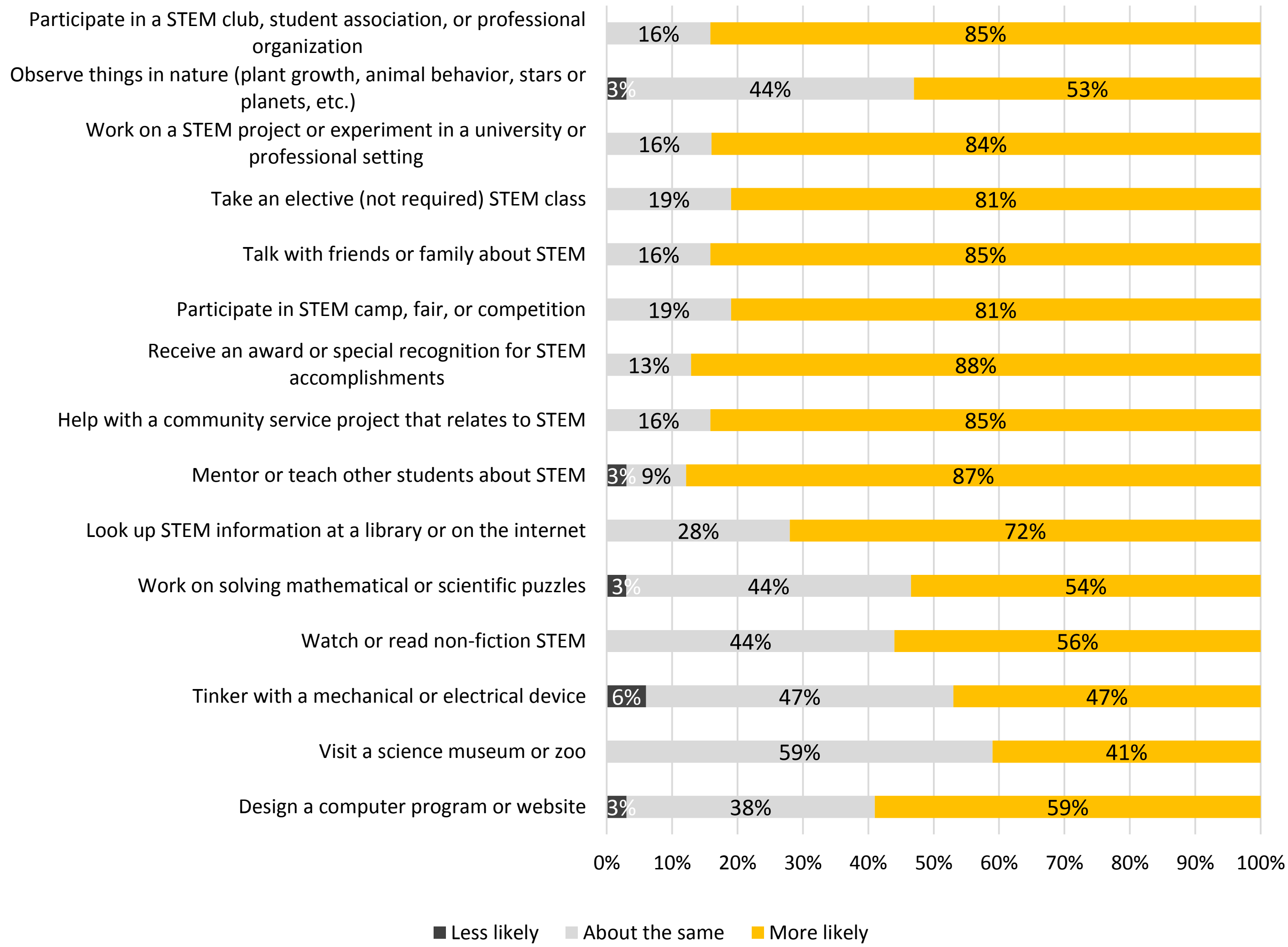
A key goal of the AEOP program is to develop a STEM-literate citizenry. To do so, students need to be engaged, both in and out of school, with high-quality STEM activities. In order to examine the impact of JSHS on students' interest in future engagement in STEM, the questionnaire asked them to reflect 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. Among Regional students (see Chart 31), the activity most frequently rated as likely to increase was participating in a STEM club, student association, or professional organization (57%). In addition, 54% indicated they were more likely to participate in a STEM camp, fair, or competition; talk with friends or family about STEM; take an elective (not required) STEM class; work on a STEM project or experiment in a university or professional setting; and/or observe things in nature (plant growth, animal behavior, stars or planets, etc.).

Chart 31: Change in Likelihood R-JSHS Students Will Engage in STEM Activities Outside of School (n = 82-83)



As can be seen in Chart 32, over 80% of National students indicated they were more likely to receive an award or special recognition for STEM accomplishments (88%); mentor or teach other students about STEM (87%); help with a community service project that relates to STEM (85%); talk with friends or family about STEM (85%); participate in a STEM club, student association, or professional organization (85%); work on a STEM project or experiment in a university or professional setting (84%); participate in STEM camp, fair, or competition (81%); and/or take an elective (not required) STEM class (81%).

Chart 32: Change in Likelihood N-JSHS Students Will Engage in STEM Activities Outside of School (n = 32)



A composite was created from these items,[43] and composite scores were compared across subgroups of students. National students were moderately more likely to engage in activities (d = 0.611 standard deviations) than Regional students.[44] There were no statistically significant differences by gender, race/ethnicity, or FRL status.

[43] These 15 items had a Cronbach's alpha reliability of 0.966.

[44] Two-tailed independent samples t-test, $t(113) = 2.91$, $p = 0.004$.

Students were also asked how interested they are in participating in future AEOP programs. As can be seen in Chart 33, Regional students expressed the greatest interest in participation again in JSHS (60% responding “somewhat” or “very much”), followed by SMART (48%), URAP (44%), and SEAP (38%), and HSAP (38%). Nearly half expressed no interest in UNITE (47%) or GEMS Near Peers (46%).

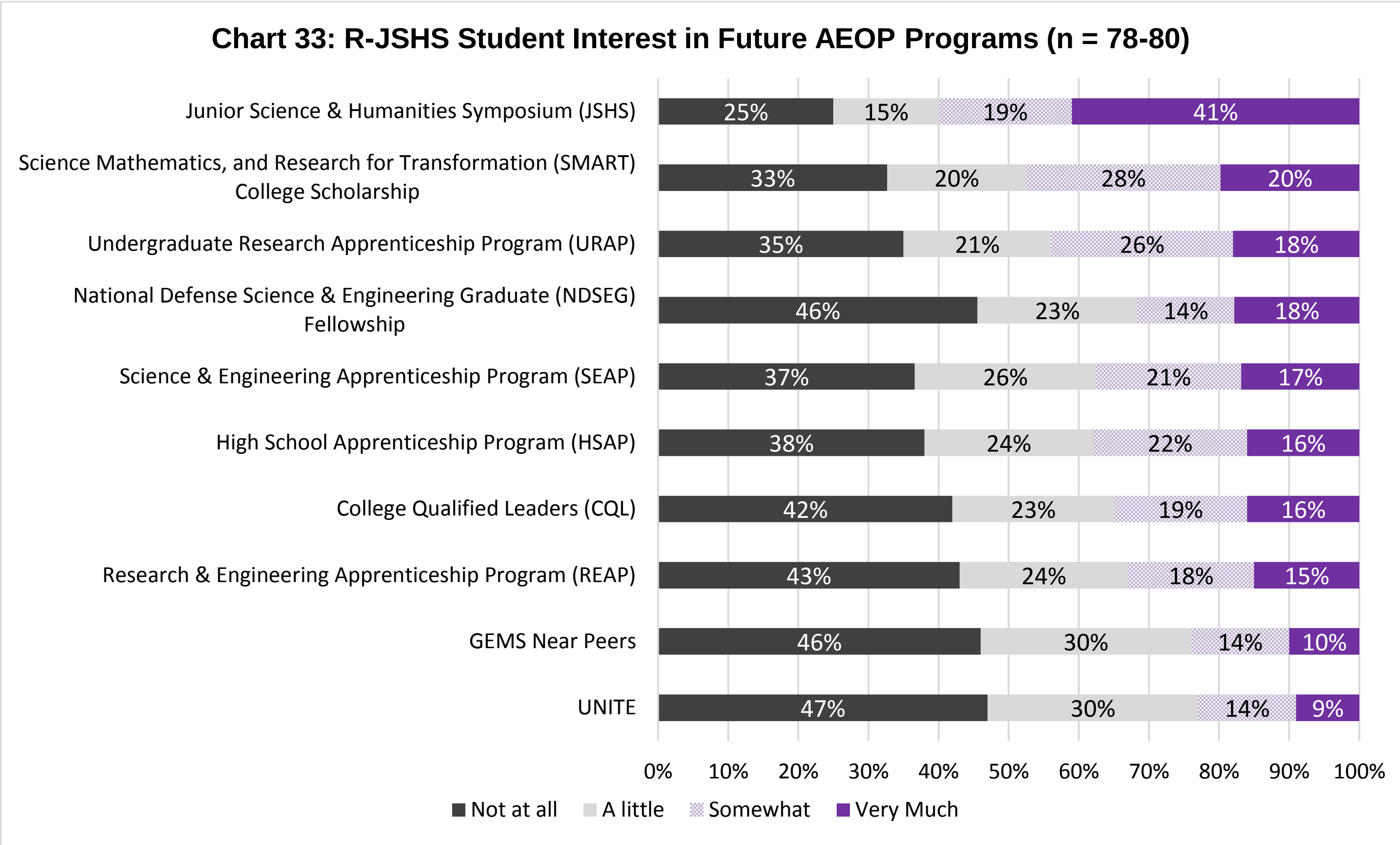
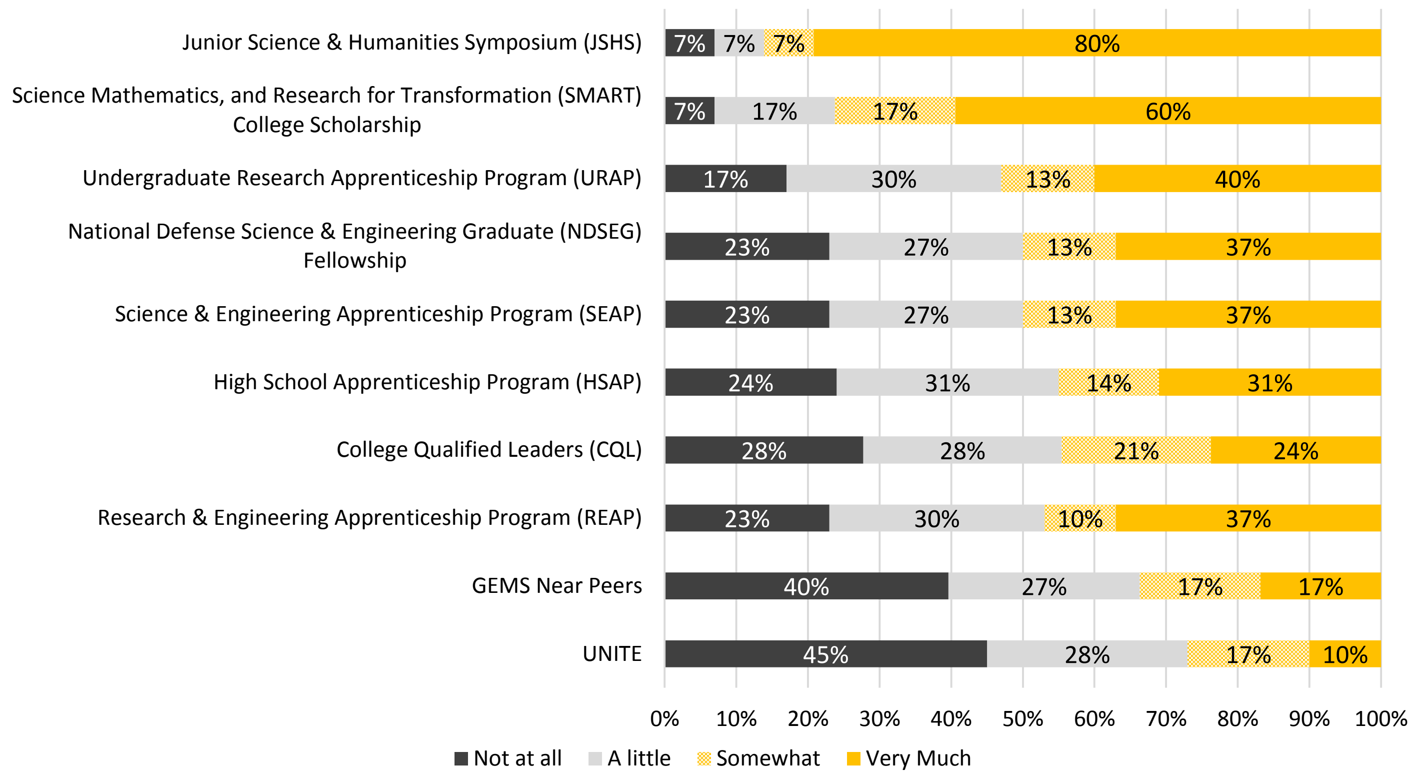


Chart 34 shows responses to this item from National students. Nearly all expressed some interest in participating again is JSHS and SMART, with 87% and 77% being at least somewhat interested, respectively. A majority of respondents indicated being at least somewhat interested in URAP (53%), NDSEG (50%), and SEAP (50%). As with the Regional students, many expressed no interest in UNITE (45%) or GEMS Near Peers (40%).

Chart 34: N-JSHS Student Interest in Future AEOP Programs (n = 29-30)



Students were asked which resources impacted their awareness of the various AEOPs. As can be seen in Charts 35 and 36, simply participating in JSHS was most likely to be rated as impacting their awareness "somewhat" or "very much," although National students on average reported a greater impact[45] than did Regional students (a moderate effect of d = 0.692 standard deviations). In addition to JSHS participation, National students' ratings of invited speakers or career events[46] and AEOP social media[47] were higher than Regional students' ratings (large effect sizes of d = 0.899 and d = 0.738 standard deviations, respectively). Among National students, invited speakers or career events appeared particularly influential, with 58% of students reporting "very much" impact and another 33% reporting "somewhat."

---

[45] Two-tailed independent samples t-test, $t(93) = 3.15$, $p = 0.002$.

[46] Two-tailed independent samples t-test, $t(84) = 3.98$, $p < 0.001$.

[47] Two-tailed independent samples t-test, $t(44) = 2.41$, $p = 0.020$.

Chart 35: Impact of Resources on R-JSHS Student Awareness of AEOPs (n = 93)

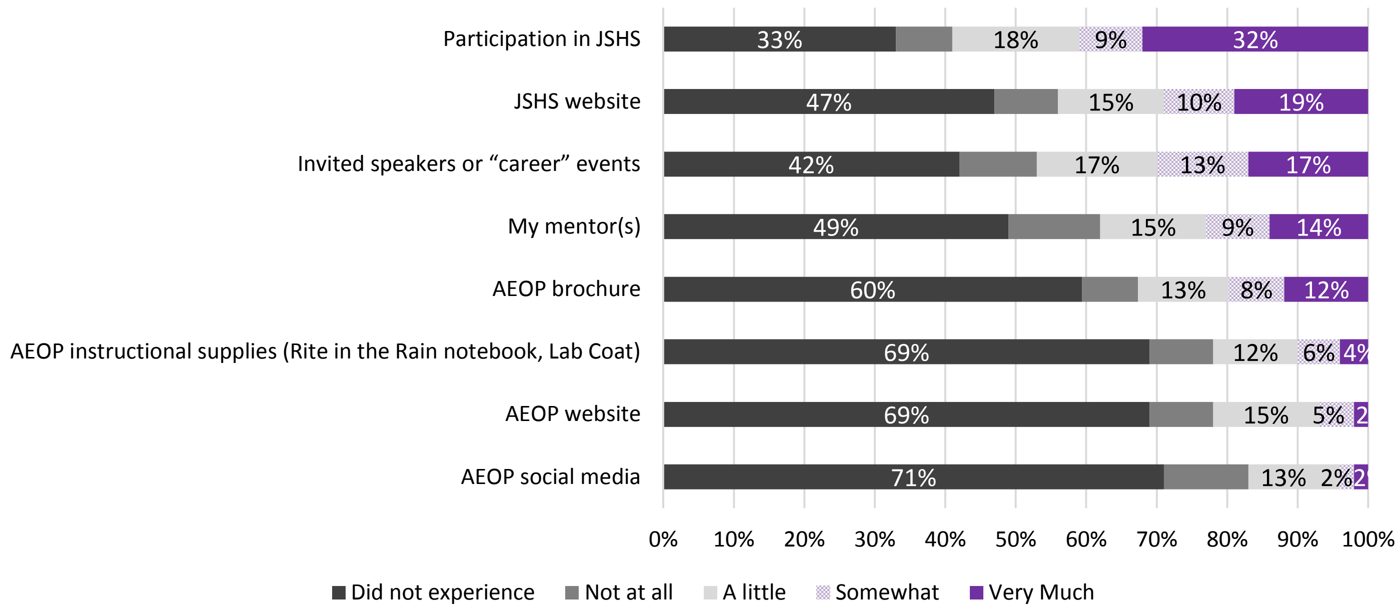
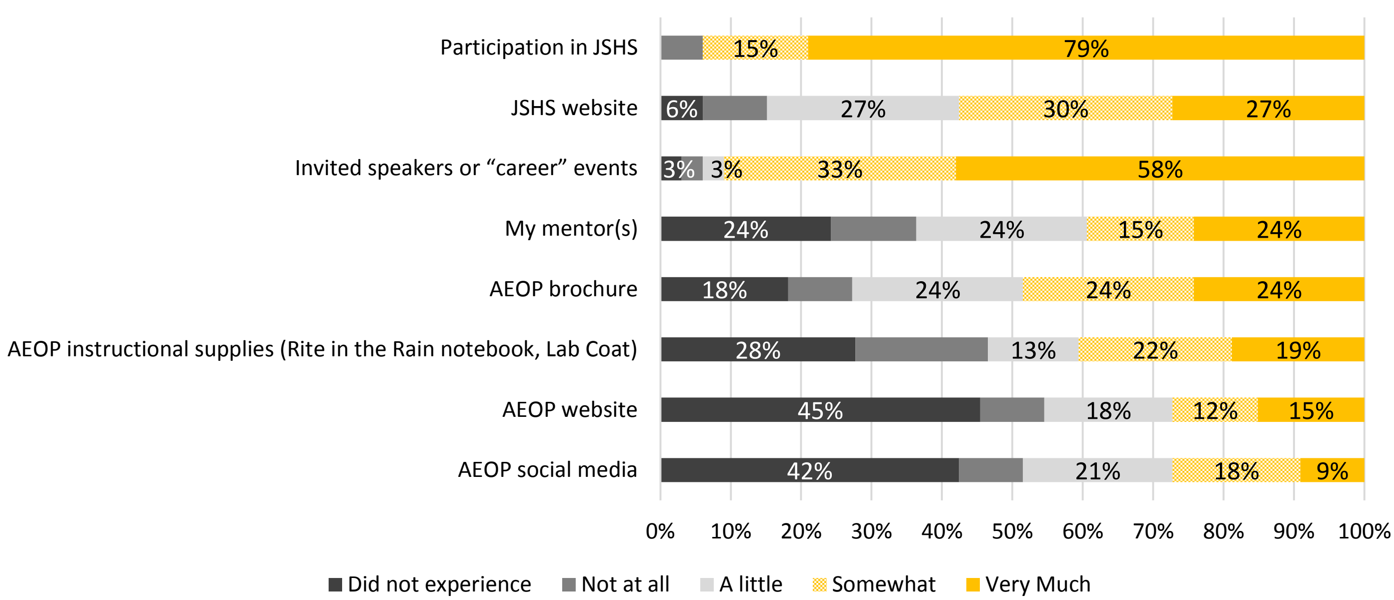
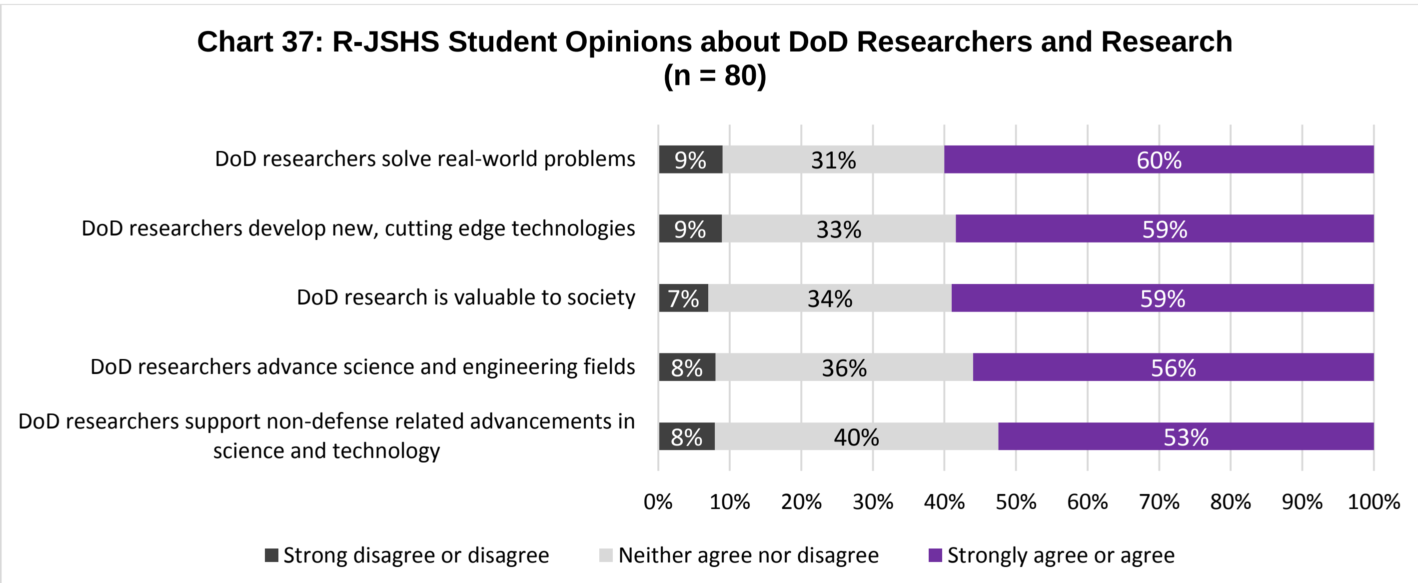


Chart 36: Impact of Resources on N-JSHS Student Awareness of AEOPs (n = 32-33)



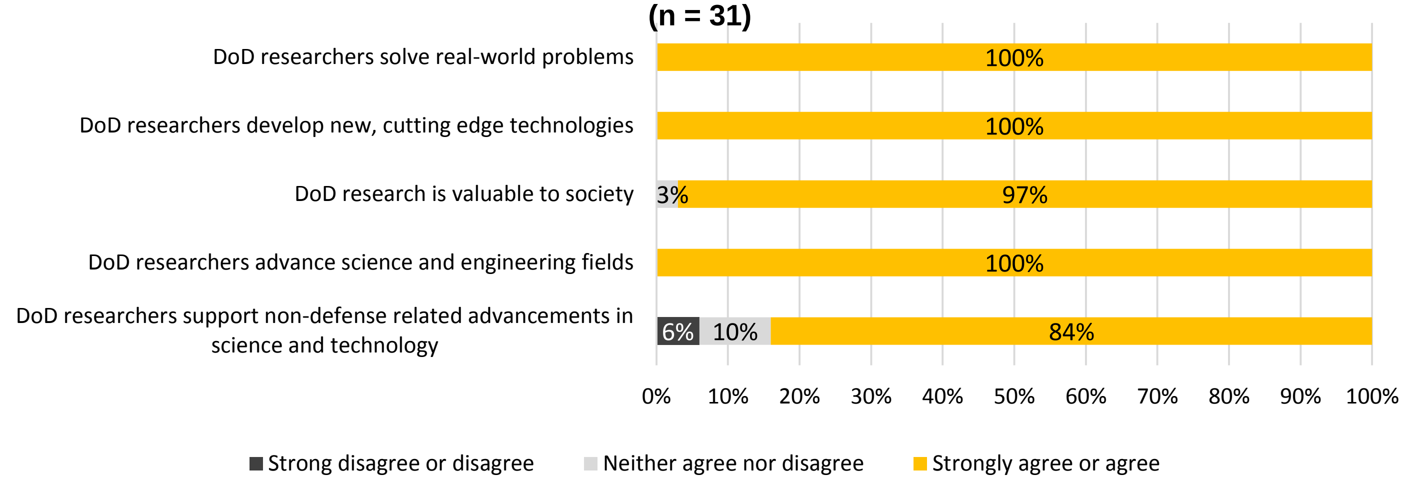
Attitudes toward Research

Students' attitudes about the importance of DoD research are an important prerequisite to their continued interest in the field and potential involvement in the future. In order to gauge students' attitudes in this area, the questionnaire also 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 (see Charts 37 and 38). A majority of Regional students agreed or strongly agreed with each statement, including that DoD researchers solve real-world problems (60%), DoD researchers develop new, cutting edge technologies (59%), and DoD research is valuable to society (59%).



Responses from National students were even more striking in that all or nearly all respondents expressed favorable opinions each of the statements. For example, 100% of National students strongly agreed that DoD researchers solve real-world problems, develop cutting-edge technologies, and advance science and engineering fields.

Chart 38: N-JSHS Student Opinions about DoD Researchers and Research (n = 31)



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 JSHS. As can be seen in Table 28, when asked to think back on how far they wanted to go in school before participating in JSHS, 16% of Regional students indicated graduating from high school, 26% finishing college, and 57% getting more education after college or an advanced degree. In contrast, after R-JSHS, only 5% reported wanting to finish their education after high school, 8% wanted to finish college, and 87% wanted to get more education after college or an advanced degree. Among National students, 91% had degree aspirations beyond college prior to N-JSHS. After participating in N-JSHS, all respondents intended to continue their education after college. The shift towards more education was statistically significant for both Regional[48] and National[49] students (R-JSHS: a very large effect[50] of $\varphi = 0.717$; N-JSHS: a medium effect of $\varphi = 0.375$).

---

[48] Chi-square test of independence, $\chi^2(82) = 42.171$, $p < 0.001$.

[49] Chi-square test of independence, $\chi^2(82) = 42.171$, $p = 0.034$.

[50] 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. With 1 degree of freedom, φ of value of 0.1 is considered a small effect, 0.3 a medium effect and 0.5 a large effect.

Table 28. Student Education Aspirations				
	R-JSHS Questionnaire Respondents (n = 82-83)		N-JSHS Questionnaire Respondents (n = 32)	
	Before JSHS	After JSHS	Before JSHS	After JSHS
Graduate from high school	16%	5%	0%	0%
Go to a trade or vocational school	0%	0%	0%	0%
Go to college for a little while	1%	0%	0%	0%
Finish college (get a Bachelor's degree)	26%	8%	9%	0%
Get more education after college	6%	8%	0%	6%
Get a master's degree	13%	22%	16%	9%
Get a Ph.D.	13%	25%	41%	44%
Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)	12%	10%	13%	6%
Get a combined M.D. / Ph.D.	9%	17%	22%	34%
Get another professional degree (law, business, etc.)	4%	5%	0%	0%

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 aspiration was before participating in JSHS and after JSHS (see Table 29). Among each group, the most common aspirations before JSHS were also most popular after JSHS. For example, among Regional students, 17% indicated aspiring to a career in medicine before JSHS, with another 12% interested in science, 10% in biological science, and 7% in engineering. After JSHS, 19% of students expressed interest in medicine, 11% in science, 11% in biological science, and 12% in engineering. Among National students the three most frequent careers selected before JSHS were also the most frequent responses after JSHS: medicine (38% before; 28% after), engineering (19% before; 16% after), and biological science (9% before; 19% after). Also notable was that fewer students in each group selected "undecided" for their response (R-JSHS: 19% before and 10% after; N-JSHS: 9% before and 0% after).

Table 29. Student Career Aspirations

	R-JSHS Questionnaire Respondents (n = 83)		N-JSHS Questionnaire Respondents (n = 32)	
	Before JSHS	After JSHS	Before JSHS	After JSHS
Medicine (e.g., doctor, dentist, veterinarian, etc.)	17%	19%	38%	28%
Science (no specific subject)	12%	11%	0%	3%
Biological science	10%	11%	9%	19%
Engineering	7%	12%	19%	16%
Business	4%	1%	3%	3%
Technology	4%	1%	0%	3%
Teaching, non-STEM	4%	2%	0%	0%
Social science (e.g., psychologist, sociologist)	4%	1%	0%	0%
Computer science	2%	7%	3%	6%
Agricultural science	2%	1%	0%	3%
Environmental science	2%	4%	0%	0%
Teaching, STEM	2%	4%	0%	0%
Art (e.g., writing, dancing, painting, etc.)	2%	1%	0%	0%
Health (e.g., nursing, pharmacy, technician, etc.)	1%	4%	0%	3%
Military, police, or security	1%	1%	0%	0%
Skilled trade (carpenter, electrician, plumber, etc.)	1%	2%	0%	0%
Physical science (e.g., physics, chemistry, astronomy, materials science)	0%	2%	6%	6%
Mathematics or statistics	0%	0%	6%	3%
Farming	0%	0%	3%	0%
Earth, atmospheric or oceanic science	0%	1%	0%	0%
Law	0%	0%	0%	0%
English/language arts	0%	0%	0%	0%
Undecided	19%	10%	9%	0%
Other†	5%	4%	3%	6%

† Before, R-JSHS other includes "Ag Teaching," "archaeology," "cinema/filmmaking," & "biotech industry-vaccine and drug production." After, R-JSHS other includes "Ag Teaching," "archaeology," & "cinema/filmmaking." Before, N-JSHS other includes "Computer Engineering." After, N-JSHS other includes "Physician researcher" and "Computer Engineering."

To examine whether the JSHS program increased student interest in STEM-related careers, each career option was coded as being STEM related or non-STEM related. Interestingly, National students were more likely than Regional student to have a STEM-related career aspiration prior to participating in JSHS (84% vs. 64%, respectively).[51] There was a large increase[52] in the proportion of Regional students aspiring to a STEM-related career (effect size, φ = 0.59). The change among National students was not statistically significant, which may be due to the relatively small sample or the high interest National students had in STEM careers prior to participating in JSHS. Still, National students were more likely to aspire to a STEM-related career after JSHS than were Regional students (97 vs. 80% of respondents).[53]

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 30, all National students and nearly all Regional students expect to use STEM somewhat in their career. Specifically, 68% of National students expect to use STEM 76-100% of the time in their work. Most of the other National students expect to use STEM 51-75% of the time, with only 3% expecting to use STEM less than 51% of the time. For the Regional respondents, 37% expect to use STEM 76-100% of the time in their work, 23% expect to use STEM 26-50% of the time, and 15% expect to use STEM less than 25% of the time or not at all.

Table 30. Students Expecting to use STEM in Their Work at Age 30

	R-JSHS Questionnaire Respondents (n = 82)	N-JSHS Questionnaire Respondents (n = 31)
Not at all	6%	0%
Up to 25% of the time	9%	0%
Up to 50% of the time	23%	3%
Up to 75% of the time	26%	29%
Up to 100% of the time	37%	68%

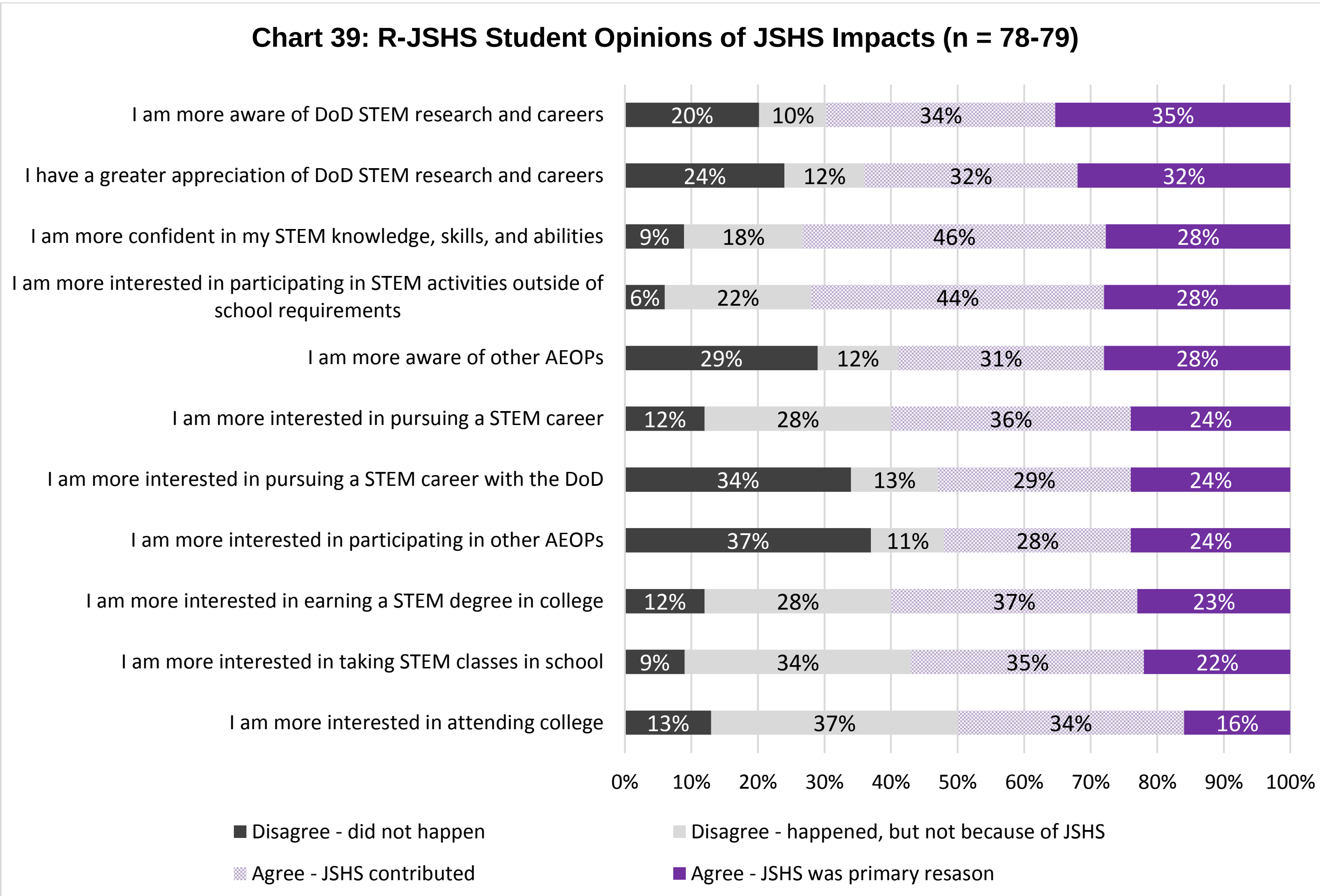
Overall Impact

Lastly, students were asked about impacts of participating in JSHS more broadly. From these data, it is clear that both Regional and National students thought the program had substantial impacts on them (see Charts 39 and 40). For each of the indicators, a majority of Regional students indicated that JSHS contributed to or was the primary reason for the impact. For example, 69% of respondents reported that they were more aware of DoD STEM research and careers because of JSHS, with 34% indicating that JSHS contributed to this impact and 35% indicating that JSHS was the primary reason. Similarly, 64% attributed JSHS with giving them a greater appreciation of DoD STEM research and careers, with half indicating JSHS was the primary reason for this impact. A majority of respondents also indicated that JSHS contributed to an increase in their awareness of other AEOPs (59%), interest in pursuing a STEM career with the DoD (53%), and interest in participating in other AEOPs (52%).

[51] Independent samples z-test, $z(1) = 2.089$, $p = 0.0367$.

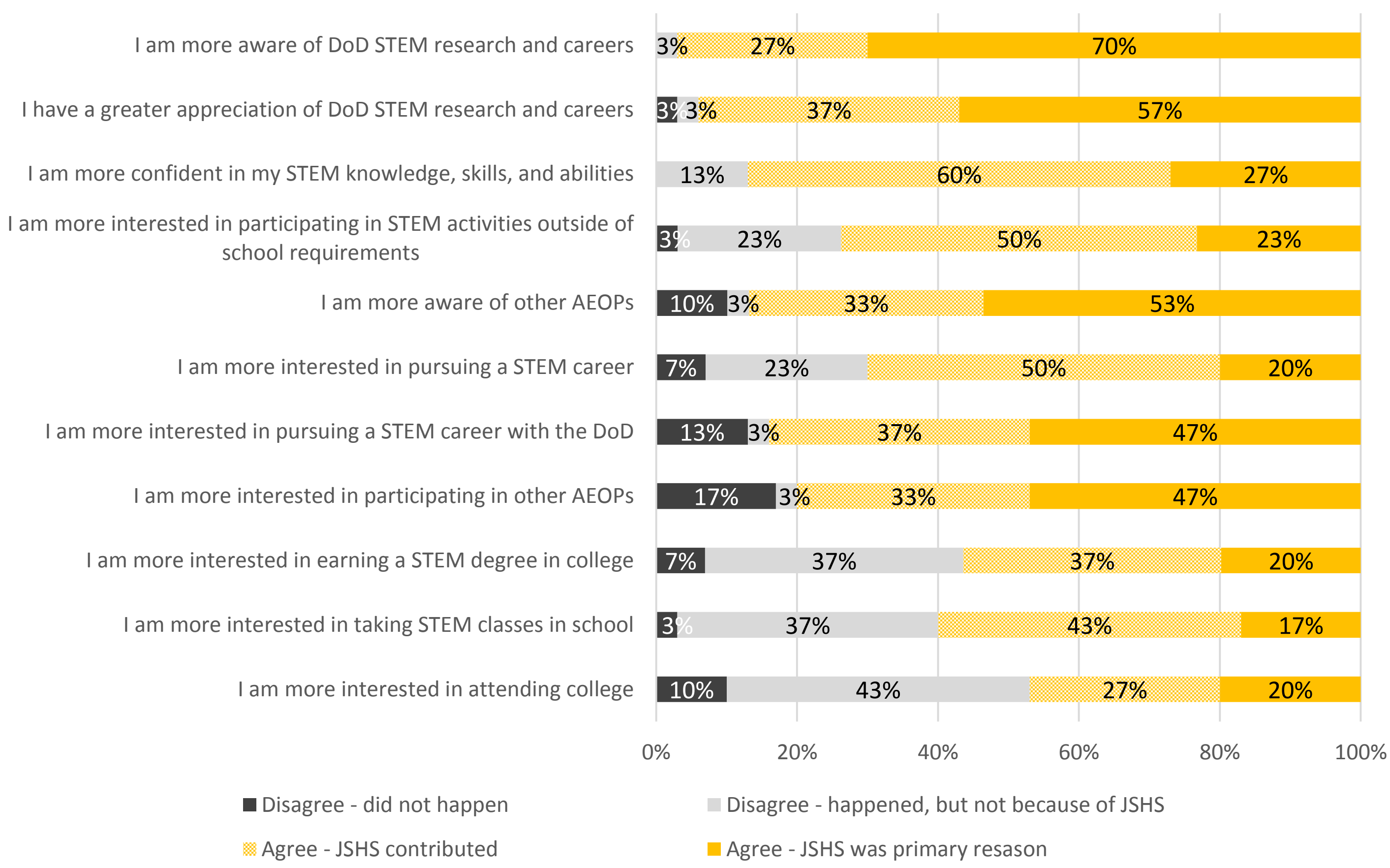
[52] McNemar test of dependent proportions, $\chi^2(1) = 18.561$, $p = 0.002$.

[53] Independent samples z-test, $z(1) = 2.271$, $p = 0.0231$.



Large proportions of responding National students also attributed impacts in these areas to JSHS. For example, nearly all reported that they were more aware of DoD STEM research and careers (97%) and have a greater appreciation of DoD STEM research and careers (94%) as a result of JSHS, with a majority for each indicating that JSHS was the primary reason for the impact. Large majorities also agreed that JSHS increased their awareness of other AEOPs (86%), interest in pursuing a STEM career with the DoD (84%), and interest in participating in other AEOPs (80%). That only 47% indicated that JSHS increased their interest in attending college is likely due to the high education aspirations students had prior to participating in the program.

Chart 40: N-JSHS Student Opinions of JSHS Impacts (n = 30)



These student questionnaire items were combined into a composite variable[54] to test for differences among subgroups of students. National students reported moderately higher impacts than Regional students (d = 0.471 standard deviations).[55] This finding is not surprising given that National students took part in activities at N-JSHS as well as their R-JSHS activities, giving them a longer and more intense JSHS experience. It may also be that success at the Regional level positively influenced their opinions about JSHS. Overall, minority students indicated greater impacts than non-minority students[56] (a large effect of d = 0.839 standard deviations) and FRL-eligible students reported much greater impacts (d = 0.916) than

[54] The Cronbach's alpha reliability for these 11 items was 0.949.

[55] Two-tailed independent samples t-test, $t(107) = 2.18$, $p = 0.032$.

[56] Two-tailed independent samples t-test, $t(98) = 3.44$, $p = 0.001$.

non-FRL-eligible students.[57] There was not a statistically significant difference in the composite scores between female and male students.

> *"It gave me confidence in public speaking. I learned so much from other's research and met amazing new people from all across the country. I learned the technical aspects of presenting research, writing technical papers and effectively communicating my research to the public."* – R-JSHS Student

An open-ended item on the questionnaire asked students to list the three most important ways they benefited from the program; 74 students provided at least one answer to the question. Student responses addressed a variety of themes. Regional students most often cited impacts on their understanding of STEM (65%), often describing how the program made them aware of careers in STEM (17%), their ability to communicate about STEM orally or in writing (13%), and their abilities to conduct STEM research (11%). Over half also cited the benefit of being able to meet new people (57%), including other students (28%) or STEM professionals (20%). About a third described impacts on affective outcomes: their interest in and motivation to pursue STEM (20%) or their confidence in their abilities to do STEM (11%). A quarter of those answering the question wrote about the experience they gained working in STEM as particularly valuable, with 17% specifically mentioning the experience doing research, and 11% the experience presenting their work.

Similar themes emerged in the National student responses, though in somewhat different proportions. As with Regional students, a large majority of National students responding to this question highlighted the opportunity to meet new people (83%), though they were more likely to describe the opportunity to network with STEM professionals rather than simply making new friends. About two-thirds described learning about STEM, most often careers in STEM fields (30%), college opportunities or scholarships (17%), and how to write about or present their work (17%). Sample responses to this question included:

> *I'm super excited for pursuing science in college. I learned a lot about some really interesting research. I now want to do my own research.* (R-JSHS Student)
>
> *It gave me confidence in public speaking. I learned so much from other's research and met amazing new people from all across the country. I learned the technical aspects of presenting research, writing technical papers and effectively communicating my research to the public.* (R-JSHS Student)

[57] Two-tailed independent samples t-test, $t(97) = 3.48$, $p = 0.001$. In addition, FRL-eligible students reported greater individual impact for all items except "I am more aware of DoD STEM research and careers."

Learned about cutting edge research. Learned to communicate with students as driven and as bright as myself. Networked greatly with STEM professionals. (N-JSHS Student)

Learning about job/internship opportunities. Inspiration from the keynote speakers. Going through the whole process of finding a mentor, doing a project, writing a research paper, and then preparing an oral presentation. (N-JSHS Student)

Similar comments arose in the focus groups and rapid interviews. As one said:

Having the ability to do research and then take it to stuff like this has been a really good opportunity—I am definitely going to college next year, into [STEM field] hopefully, hopefully will do research at some point in that. And this has given me background with experimentation and design, also in presentation and writing aspects. (JSHS Student)

Summary of Findings

The FY14 evaluation of JSHS 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 31.

Table 31. 2014 JSHS Evaluation Findings	
Participant Profiles	
JSHS is concerned with diversity and expanding the pool of student applicants but has had limited success in serving students of historically underrepresented and underserved populations.	• JSHS appears to have been successful in attracting participation of female students—a population that is historically underrepresented in engineering fields. Student questionnaire respondents from both the Regional and National competitions included more females (R-JSHS 69%; N-JSHS 58%) than males (R-JSHS 31%; N-JSHS 42%). Registration data indicates an even split between female and male JSHS students at the national level.
	• JSHS had limited success in attracting students from historically underserved minority race/ethnicity and low-income groups. Student questionnaire respondents included a small proportion of minority students identifying as Hispanic or Latino (R-JSHS 17%; N-JSHS 5%). A majority of respondents reported that they did not qualify for free or reduced-price lunch (R-JSHS 71%; N-JSHS 93%).

	• A large majority of student questionnaire respondents attended public schools (R-JSHS 87%; N-JSHS 86%). Although over a third of respondents attended schools in urban or rural settings, which tend to have higher numbers or proportions of underrepresented and underserved groups, most attended suburban schools. JSHS provided outreach to 137 schools (12% of high schools served) in 2014.
	• 937 students from 7 states participated in JSHS regional symposia at HBCU/MSIs.
JSHS engages an extensive and diverse group of adult participants as STEM mentors, STEM ambassadors, and volunteers.	• Approximately 1,100 teachers, 1,800 college/university faculty, 300 Army/DoD scientists/engineers, and 400 adult volunteers served as research mentors or STEM ambassadors in JSHS. Additional STEM professionals from a range of business sectors participated in career day activities.
Actionable Program Evaluation	
JSHS is strongly marketed to schools and teachers serving historically underserved groups.	• JSHS employed a multi-pronged effort to market and recruit students to participate in regional symposia. These efforts stemming from AAS and regional JSHS directors included personal contact with teachers and high school administrators, printed and electronic promotional materials distributed by direct mail and email, university websites, social media (Facebook), and targeted marketing at existing other STEM-related regional initiatives (e.g., university chapter of the National Society of Black Engineers).
	• Students most frequently learned about the regional JSHS program from teachers/professors (R-JSHS 88%; N-JSHS 72%). Other significant sources for N-JSHS students were the JSHS website (33%), a friend (28%), or another past participant of JSHS (28%).
Many JSHS students are motivated by an interest in STEM or the encouragement of a teacher or professor.	• R-JSHS students were most frequently motivated to participate in JSHS by teacher or professor encouragement (R-JSHS 50%), and N-JSHS students were most frequently motivated to participate in JSHS by their interest in STEM (N-JSHS 86%). Other highly motivating factors included: desire to learn in ways that are not possible in school (R-JSHS 43%; N-JSHS 64%); desire to expand laboratory or research skills (R-JSHS 38%; N-JSHS 55%); and desire to have fun (R-JSHS 25%; N-JSHS 55%).

JSHS engages students in meaningful STEM learning through hands-on activities.	• Almost all N-JSHS students (98%) and most R-JSHS students (53%) report learning about STEM topics on most days or every day of their JSHS experience. The overwhelming majority of N-JSHS students (84-93%), but fewer R-JSHS students (44-46%), report applying STEM knowledge to real-life situations, interacting with STEM professionals, and communicating with other students about STEM most or all days of their JSHS experience. The differences between N-JSHS and R-JSHS students in overall learning about STEM were statistically significant.
	• Many students had opportunities to engage in a variety of STEM practices during their JSHS experience. For example, students reported participating in hands-on activities (R-JSHS 36%; N-JSHS 69%), coming up with creative explanations/ solutions (R-JSHS 40%; N-JSHS 56%) and posting questions or problems to investigate (R-JSHS 41%; N-JSHS 56%) on most days or every day.
	• Both R-JSHS and N-JSHS students reported greater opportunities to learn about STEM in their JSHS experience than they typically have in school. However, R-JSHS students reported lower engagement in STEM practices in their JSHS experience than they typically have in school, and N-JSHS students reported similar engagement in STEM practices in both settings.
	• Most mentors reported using strategies to help make learning activities relevant to students, support the needs of diverse learners, develop collaboration and interpersonal skills, and engage students in "authentic" STEM activities.
JSHS promotes DoD STEM research and careers but can improve marketing of other AEOP opportunities.	• The vast majority of mentors had no past participation in or no awareness of an AEOP initiative beyond JSHS. 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.
	• JSHS sites offered a variety of activities for promoting STEM careers which vary by regional event. Activities may include interactive expert panels, off- and on-campus STEM expos, and field trips to Army, university, and other research labs and facilities.
The JSHS experience is greatly valued by students and mentors.	• All N-JSHS students indicated being very satisfied with their JSHS research experience, as did 80% of R-JSHS students who had a research experience. Further, the vast majority of N-JSHS students were satisfied with most elements of N-JSHS. Satisfaction with R-JSHS was more mixed.

	• The vast majority of responding mentors indicated having a positive experience with those program features they experienced. Further, many commented on the benefits the program provides students, including engaging with real-world STEM issues or research and meeting STEM professionals and students.
Outcomes Evaluation	
JSHS had positive impacts on students' perceptions of their STEM knowledge and competencies.	• A majority of R-JSHS students and the vast majority of N-JSHS students reported large or extreme gains on their knowledge of a STEM topic or field in depth; how professionals work on real problems in STEM; research conducted in a STEM topic or field; what everyday research work is like in STEM; and the research processes, ethics, and rules for conduct in STEM. These impacts were greater for N-JSHS students than R-JSHS students, but similar across gender, race/ethnicity, and FRL status.
	• Many students also reported impacts on their abilities to do STEM, including such things as applying knowledge, logic, and creativity to propose solutions that can be tested; displaying numeric data from an investigation in charts or graphs to identify patterns and relationships; making a model that represents the key features or functions of a solution to a problem; identifying the strengths and limitations of explanations in terms of how well they describe or predict observations; and using mathematics to analyze numeric data.
JSHS had positive impacts on students' perceptions of their 21st Century Skills.	• A majority of students reported large or extreme gains on their ability to make changes when things do not go as planned, persevere with a task, and set goals and reflect on performance. Overall, minority students and FRL-eligible students reported greater gains than their counterparts.
JSHS, especially N-JSHS, positively impacted students' confidence and identity in STEM, as well as their interest in future STEM engagement.	• Almost all N-JSHS students reported a large or extreme gain in feeling like part of a STEM community (94%); feeling responsible for a STEM project or activity (94%); confidence to do well in future STEM courses (93%); and readiness for more challenging STEM activities (90%). However, R-JSHS students were less likely to report gains of this magnitude in these areas (42%, 48%, 51%, and 49% on these items, respectively). Overall, minority students reported greater gains in STEM confidence and identity than non-minority students.

	• 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 JSHS, they were more likely to participate in a STEM club, student association, or professional organization; work on a STEM project or experiment in a university of professional setting; and mentor or teach other students about STEM. N-JSHS students were more likely to indicate impacts in these areas than R-JSHS students.
JSHS succeeded in raising students' education aspirations and their aspirations for a STEM career.	• After participating in JSHS, students indicated being more likely to go further in their schooling than they would have before JSHS, with the greatest changes being in the proportions of Regional students who expected to continue their education beyond a Bachelor's degree (57% before JSHS, 87% after) and National students who aspired to a combined M.D./Ph.D. (22% before and 34% 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. There was a large increase in the proportion of R-JSHS students interested in a STEM-related career. Many N-JSHS students indicated interest in a STEM-related career both before and after JSHS, and there was not a statistically significant difference across time points.
JSHS students are largely unaware of AEOP initiatives, but students show substantial interest in future AEOP opportunities.	• Students, particularly R-JSHS students, and mentors were largely unaware of other AEOP initiatives, but 59% of R-JSHS students and 86% of N-JSHS students indicated that JSHS made them more aware of other AEOPs, and most (R-JSHS 52%; N-JSHS 80%) credited JSHS with increasing their interest in participating in other programs.
JSHS raised student awareness and appreciation of DoD STEM research and careers, as well as their interest in pursuing a STEM career with the DoD.	• Almost all N-JSHS students and most R-JSHS students reported that they had a greater awareness (R-JSHS 69%; N-JSHS 97%) and appreciation (R-JSHS 64%; N-JSHS 94%) of DoD STEM research and careers. In addition, most (R-JSHS 53%; N-JSHS 84%) indicated that JSHS raised their interest in pursuing a STEM career with the DoD.

Recommendations

1. The AEOP has the goal of broadening the talent pool in STEM fields, with a subset of the programs (e.g., REAP, UNITE) specifically targeting underrepresented and underserved populations. Although not an explicit goal of

JSHS, the questionnaire data indicate that JSHS has limited success at attracting students from groups historically underrepresented and underserved in STEM on a national scale. In order to improve on this, the program should continue to collect information from specific regional symposia as well as other AEOPs that are successfully attracting underrepresented and underserved students to then disseminate to the larger JSHS community of regional directors. Additionally, JSHS may consider ways to build on 2014 efforts to strengthen its outreach to schools that serve large proportions of such students (e.g., urban schools, Title I schools), and perhaps seek advice from groups or individuals with expertise in engaging these populations of students such as the National Action Council for Minorities in Engineering or the Society for Advancement of Hispanics/Chicanos and Native Americans in Science. JSHS might also consider the possibility of engaging with target districts through the AEOP's strategic outreach initiative opportunities which provide limited financial support to assist in the ability of a target community to engage with the AEOPs. Additionally, collecting demographic information on students participating in the R-JSHS through the centralized registration tool in FY15 and beyond will enable a more accurate representation of the JSHS participation pool.

2. Given the goal of having students progress from JSHS into other AEOP programs, JSHS should work with regional symposia to increase students' exposure to AEOP. Only about 1 in 10 mentors recommended each of REAP, HSAP, SEAP, or SMART to students, and fewer discussed other AEOPs. 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 invited speakers, career events, or their mentors, the program may want to work with each R-JSHS 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 program 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. 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. Improved communication with the individual program sites about expectations for the evaluation may help. Given the large number of participants in the Regional competitions, it may be worth randomly sampling students to respond to the questionnaire, and rechanneling efforts into getting a high response rate from the sample. 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. The R-JSHS experience is the only JSHS experience for most students, but consistent differences between R-JSHS and N-JSHS student responses suggest that N-JSHS may be having a greater impact on students than R-JSHS. Some

of these differences are likely due to initial differences in interest and/or ability between students who are selected to go on to N-JSHS and those who are not. However, other differences may be related to differences in the availability/quality of mentor support or the availability/quality of activities at each symposium. JSHS should consider what guidance and support can be provided to regional directors, mentors, and other supporters of R-JSHS to encourage active engagement in STEM activities, useful feedback from judges, and feelings of success that support a positive STEM identity among students who are not selected for N-JSHS.

Appendices

Appendix A

FY14 JSHS Evaluation Plan

Questionnaires

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

1. AEOP Youth Questionnaire to be completed by student participants of the JSHS national event and JSHS regional events; and
2. AEOP Mentor Questionnaire to be completed by research mentors, competition advisors, chaperones, teachers, or others who supported students as they prepared for or participated in JSHS national and regional 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 JSHS conducted by VT includes site visit/onsite focus groups at the JSHS national event.

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 JSHS 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 strategic sampling of participants.

"Red carpet" presentations and tours can detract from our time with and learning from participants, so please avoid scheduling these kinds of activities. Assume we will spend ½ to 1 day at each JSHS event.

Please identify a quiet location where evaluators can meet with participants. Evaluators have undergone criminal background checks as a term of their employment and can be left unsupervised with participants.

Selecting Focus Group Participants:
We would appreciate event administrators' assistance in helping to assemble a diverse group of focus group participants who can provide information about a range of experiences possible in the JSHS. Ideally, this assistance is in the form of pre-event notifications of the focus groups, including scheduled dates, times, and locations.

Ideally, each student focus group will be inclusive of

- males and females (equal representation if possible),
- range of grade levels of students,
- range of race/ethnicities of students served by the program, and
- range of STEM interests (if known).

We prefer that students volunteer themselves after receiving the invitation to participate in the focus group, but will pursue students nominated by program staff or mentors. Participants may RSVP to evaluators privately or simply show up at the focus group location; however, sign-up sheets should not be used--if they are publically displayed, they breach participant confidentiality. No more than 6-8 participants in any focus group, PLEASE. Any more than 8 and we are unable to ask more than a few questions or dig deeply into participants' responses. If focus groups are any shorter than 45 minutes, then the focus group size should be limited to 4-6 participants.

We realize that there are a number of different adult participants of JSHS--regional directors, national judges, chaperones, and even parents. We would encourage any of these groups to participate in the adult focus group and have geared questions to be applicable across groups. In the event that there is an overwhelming response to the invitation, we will arrange for a second mentor focus group.

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 JSHS program and differences between students who participated only in R-JSHS and students who participated in both R-JSHS and N-JSHS. 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 JSHS Apprentice Questionnaire and Data Summaries

2014 Junior Science and Humanities Symposium: National JSHS 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?
- ❍ Yes
- ❍ No
- ❍ Choose not to report

Q8. Which best describes the location of your school?

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

Q9. What kind of school do you attend?
- ❍ Public school
- ❍ Private school
- ❍ Home school
- ❍ Online school
- ❍ Department of Defense school (DoDDS or DoDEA)

Q10. What is the highest competition level you personally achieved in your JSHS participation this year? (Select ONE)
- ❍ Regional Oral Presenter
- ❍ Regional Poster Presenter (competitive)
- ❍ Regional Poster Presenter (non-competitive)
- ❍ Non-presenting Regional Participant
- ❍ National Oral Presenter
- ❍ National Poster Presenter (competitive)
- ❍ National Poster Presenter (non-competitive)
- ❍ Non-presenting National Participant

Q11. In which JSHS competition category did you present your research? (Select ONE)
- ❍ I did not present my research
- ❍ Chemistry
- ❍ Computer Science & Mathematics
- ❍ Engineering & Technology
- ❍ Environmental Science
- ❍ Life Science
- ❍ Medicine, health, & behavioral science
- ❍ Physical Science
- ❍ Social Science

Q12. In which Regional JSHS event did you participate? (Select ONE)
- ❍ Alabama
- ❍ Alaska
- ❍ Arkansas
- ❍ California—Northern California & Western Nevada
- ❍ California—Southern California
- ❍ Connecticut
- ❍ DoD Dependent Schools-Europe
- ❍ New Jersey—North New Jersey
- ❍ New York—Long Island
- ❍ New York—Metro
- ❍ New York—Upstate
- ❍ North Carolina
- ❍ North Central—Minnesota, North Dakota, South Dakota
- ❍ New England—Northern New England

- DoD Dependent Schools-Pacific
- District of Columbia
- Florida
- Georgia
- Hawaii
- Illinois
- Indiana
- Intermountain—Colorado, Montana, Idaho, Nevada, Utah
- Iowa
- Kansas—Nebraska—Oklahoma
- Kentucky
- Maryland
- Michigan—Southeastern Michigan
- Mississippi
- Missouri
- New Jersey--Monmouth
- New England—Southern New England
- Ohio
- Oregon
- Pennsylvania
- Puerto Rico
- South Carolina
- Southwest
- Tennessee
- Texas
- Virginia
- Washington
- West Virginia
- Wisconsin-Western Wisconsin & Upper Michigan
- Wisconsin
- Wyoming—Eastern Colorado

Q13. How did you learn about JSHS? (Check all that apply)

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

Q14. How motivating were the following factors in your decision to participate in JSHS?

	Not at all motivating	Slightly motivating	Somewhat motivating	Very motivating	Extremely motivating
Teacher or professor encouragement	❍	❍	❍	❍	❍

An academic requirement or school grade	❍	❍	❍	❍	❍
Desire to learn something new or interesting	❍	❍	❍	❍	❍
The program mentor(s)	❍	❍	❍	❍	❍
Résumé or college application building	❍	❍	❍	❍	❍
Networking opportunities	❍	❍	❍	❍	❍
Interest in science, technology, engineering, or mathematics (STEM)	❍	❍	❍	❍	❍
Interest in STEM careers with the Army	❍	❍	❍	❍	❍
Having fun	❍	❍	❍	❍	❍
Earning money over the summer	❍	❍	❍	❍	❍
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)	❍	❍	❍	❍	❍

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
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	❍	❍	❍	❍	❍

Q16. How often did you do each of the following in JSHS 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	❍	❍	❍	❍	❍

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
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	❍	❍	❍	❍	❍

Q18. How often did you do each of the following in JSHS 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	❍	❍	❍	❍	❍

Q19. 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	❍	❍	❍	❍	❍

Q20. How often did you do each of the following in JSHS 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	❍	❍	❍	❍	❍

Q21. How USEFUL were each of the following JSHS supports provided at JSHS.org?

	Not at all	A little	Somewhat	Very much
National JSHS Groundrules for Student Presentations	❍	❍	❍	❍
Paper Submissions and Competition Deadlines	❍	❍	❍	❍
Sample Papers	❍	❍	❍	❍
Oral Presentation Tips	❍	❍	❍	❍
Selected Articles – Conducting Research	❍	❍	❍	❍

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

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

Q24. Rate how the following items impacted your awareness of Army Educational Outreach Programs (AEOPs) during JSHS:

	Not at all	A little	Somewhat	Very much
JSHS website	❍	❍	❍	❍
AEOP website	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍
Army STEM Career Magazine	❍	❍	❍	❍
My mentor(s)	❍	❍	❍	❍
Invited speakers or “career” events	❍	❍	❍	❍
Participation in JSHS	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat)	❍	❍	❍	❍

Q25. Rate how the following items impacted your awareness of Department of Defense (DoD) STEM careers during JSHS:

	Not at all	A little	Somewhat	Very much
JSHS website	❍	❍	❍	❍
AEOP website	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍
Army STEM Career Magazine	❍	❍	❍	❍
My mentor(s)	❍	❍	❍	❍
Invited speakers or “career” events	❍	❍	❍	❍
Participation in JSHS	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat)	❍	❍	❍	❍

Q26. The following activities were common to many Regional JSHS programs across the nation. How SATISFIED were you with each of the following REGIONAL JSHS program activities? If your Regional JSHS event did not have a given activity, select “Did Not Experience”?

	Did Not Experience	Poor	Fair	Good	Excellent
Student Oral Presentations	❍	❍	❍	❍	❍

Student Poster Presentations	❍	❍	❍	❍	❍
Judging Process	❍	❍	❍	❍	❍
Feedback from Judges	❍	❍	❍	❍	❍
Feedback from VIPs and Peers	❍	❍	❍	❍	❍
Invited Speaker Presentations	❍	❍	❍	❍	❍
Panel or Roundtable Discussions	❍	❍	❍	❍	❍
Career Exhibits	❍	❍	❍	❍	❍
Tours or Field Trips	❍	❍	❍	❍	❍
Team Building Activities	❍	❍	❍	❍	❍
Social Events	❍	❍	❍	❍	❍

Q27. The Following activities were included in the National JSHS program. How SATISFIED were you with each of the NATIONAL JSHS program activities? **Only presented to NATIONAL JSHS participants; Q10**

	Did Not Experience	Poor	Fair	Good	Excellent
Opening Ceremony	❍	❍	❍	❍	❍
General Session 1 Keynote Speaker: Leigh McCue, Ph.D.	❍	❍	❍	❍	❍
Student Research Sessions and Judging	❍	❍	❍	❍	❍
General Session 2 Keynote Speaker: Kenneth Kosik, Ph.D.	❍	❍	❍	❍	❍
Student Team Building	❍	❍	❍	❍	❍
DoD Exhibits at USA Science & Engineering Festival	❍	❍	❍	❍	❍
USA Science & Engineering Festival Scavenger Hunt	❍	❍	❍	❍	❍
Student Poster Session and Judging	❍	❍	❍	❍	❍
Student Poster Session VIP and Peer Review	❍	❍	❍	❍	❍
General Session 3 Keynote Speaker: Christopher Cassidy, Commander, USN	❍	❍	❍	❍	❍
Panel Discussion: Pathways to DoD STEM Careers	❍	❍	❍	❍	❍
Lunch with DoD Scientists and Engineers	❍	❍	❍	❍	❍
Free Time at National Mall or USA Science & Engineering Festival	❍	❍	❍	❍	❍

Awards Ceremony and Congratulatory Remarks	❍	❍	❍	❍	❍

Q28. Which of the following best describes your primary research mentor? ****Not presented to non-presenting regional JSHS participants; Q10****

- ❍ I did not have a research mentor
- ❍ Teacher
- ❍ Coach
- ❍ Parent
- ❍ Club or activity leader (School club, Boy/Girls Scouts, etc.)
- ❍ STEM researcher (private industry, university, or DoD/government employee, etc.)
- ❍ Other (specify) ______________________

Q29. Which of the following statements best reflects the input you had into your project initially? ****Not presented to non-presenting regional JSHS participants; Q10****

- ❍ I was assigned a project by my mentor
- ❍ I worked with my mentor to design a project
- ❍ I had a choice among various projects suggested by my mentor
- ❍ I worked with my mentor and members of a research team to design a project
- ❍ I designed the entire project on my own
- ❍ I did not have a project

Q30. Which of the following statements best reflects the availability of your mentor? ****Not presented to non-presenting regional JSHS participants; Q10****

- ❍ I did not have a mentor
- ❍ The mentor was never available
- ❍ The mentor was available less than half of the time
- ❍ The mentor was available about half of the time of my project
- ❍ The mentor was available more than half of the time
- ❍ The mentor was always available

Q31. Which of the following statements best reflects your working as part of a group or team? ****Not presented to non-presenting regional JSHS participants; Q10****

- ❍ I worked alone (or alone with my research mentor)
- ❍ I worked with others in a shared laboratory or other space, but we work on different projects
- ❍ I worked alone on my project and I met with others regularly for general reporting or discussion
- ❍ I worked alone on a project that was closely connected with projects of others in my group
- ❍ I work with a group who all worked on the same project

Q32. Rate each of the following: ****Not presented to non-presenting regional JSHS participants; Q10****

	Did Not Experience	Poor	Fair	Good	Excellent
My working relationship with my mentor	❍	❍	❍	❍	❍
My working relationship with the group or team	❍	❍	❍	❍	❍
The amount of time I spent doing meaningful research	❍	❍	❍	❍	❍
The amount of time I spent with my research mentor	❍	❍	❍	❍	❍
The research experience overall	❍	❍	❍	❍	❍

Q33. Which of the following statements apply to your research experience? (choose ALL that apply) **Not presented to non-presenting regional JSHS participants; Q10**

❑ I presented a talk or poster to other students or faculty
❑ I presented a talk or poster at a professional symposium or conference
❑ I attended a symposium or conference
❑ I wrote or co-wrote a paper that was/will be published in a research journal
❑ I wrote or co-wrote a technical paper or patent
❑ I will present a talk or poster to other students or faculty
❑ I will present a talk or poster at a professional symposium or conference
❑ I will attend a symposium or conference
❑ I will write or co-write a paper that was/will be published in a research journal
❑ I will write or co-write a technical paper or patent
❑ I won an award or scholarship based on my research

Q34. The list below describes 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 JSHS: **Not presented to non-presenting regional JSHS participants; Q10**

	No - my mentor did not use this strategy with me	Yes - my mentor 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	❍	❍

Q35. Which category best describes the focus of your JSHS experience?

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

Q36. AS A RESULT OF YOUR JSHS EXPERIENCE, how much did you GAIN in the following areas?

	No gain	A little gain	Some gain	Large gain	Extremely large 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	❍	❍	❍	❍	❍

Q37. AS A RESULT OF YOUR JSHS EXPERIENCE, how much did you GAIN in the following areas? **Only presented to respondents who selected "science" in Q35**

	No gains	A little gain	Some gain	Large gain	Extremely large gains
Asking questions based on observations of real-world phenomena	❍	❍	❍	❍	❍
Asking a question (about a phenomenon) that can be answered with one or more investigations	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	❍	❍	❍	❍	❍

Making a model to represent the key features and functions of an observed phenomenon	❍	❍	❍	❍	❍
Deciding what type of data to collect in order to answer a question	❍	❍	❍	❍	❍
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	❍	❍	❍	❍	❍
Testing how changing one variable affects another variable, in order to understand relationships between variables	❍	❍	❍	❍	❍
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	❍	❍	❍	❍	❍
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics to analyze numeric data	❍	❍	❍	❍	❍
Supporting a proposed explanation (for a phenomenon) with data from investigations	❍	❍	❍	❍	❍
Asking questions to understand the data and interpretations others use to support their explanations	❍	❍	❍	❍	❍
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	❍	❍	❍	❍	❍
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	❍	❍	❍	❍	❍
Communicating information about your investigations and explanations in different formats (e.g., orally, written, graphically, mathematically)	❍	❍	❍	❍	❍
Identifying the limitations of data collected in an investigation	❍	❍	❍	❍	❍
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	❍	❍	❍	❍	❍
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Using data or interpretations from other researchers or investigations to improve an explanation	❍	❍	❍	❍	❍
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	❍	❍	❍	❍	❍
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	❍	❍	❍	❍	❍
Integrating information from multiple sources to support your explanations of phenomena	❍	❍	❍	❍	❍

Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	❍	❍	❍	❍	❍

Q38. AS A RESULT OF YOUR JSHS EXPERIENCE, how much did you GAIN in the following areas? **Only presented to respondents who selected "technology," "engineering," or "mathematics" in Q35**

	No gains	A little gain	Some gain	Large gain	Extremely large gains
Identifying real-world problems based on social, technological, or environmental issues	❍	❍	❍	❍	❍
Defining a problem that can be solved by developing a new or improved object, process, or system	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	❍	❍	❍	❍	❍
Making a model that represents the key features or functions of a solution to a problem	❍	❍	❍	❍	❍
Deciding what type of data to collect in order to test if a solution functions as intended	❍	❍	❍	❍	❍
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	❍	❍	❍	❍	❍
Identifying the limitations of the data collected in an investigation	❍	❍	❍	❍	❍
Carrying out procedures for an investigation and recording data accurately	❍	❍	❍	❍	❍
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	❍	❍	❍	❍	❍
Using computer-based models to investigate cause and effect relationships of a simulated solution	❍	❍	❍	❍	❍
Considering alternative interpretations of data when deciding if a solution functions as intended	❍	❍	❍	❍	❍
Displaying numeric data in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics to analyze numeric data	❍	❍	❍	❍	❍
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	❍	❍	❍	❍	❍
Using data or interpretations from other researchers or investigations to improve a solution	❍	❍	❍	❍	❍
Asking questions to understand the data and interpretations others use to support their solutions	❍	❍	❍	❍	❍
Using data from investigations to defend an argument that conveys how a solution meets design criteria	❍	❍	❍	❍	❍

Deciding what additional data or information may be needed to find the best solution to a problem	❍	❍	❍	❍	❍
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	❍	❍	❍	❍	❍
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	❍	❍	❍	❍	❍
Integrating information from multiple sources to support your solution to a problem	❍	❍	❍	❍	❍
Communicating information about your design processes and/or solutions in different formats (e.g., orally, written, graphically, mathematically)	❍	❍	❍	❍	❍
Supporting a proposed solution (for a problem) with data from investigations	❍	❍	❍	❍	❍

Q39. AS A RESULT OF YOUR JSHS EXPERIENCE, how much did you GAIN in the following areas?

	No gains	A little gain	Some gain	Large gain	Extremely large gains
Learning to work independently	❍	❍	❍	❍	❍
Setting goals and reflecting on performance	❍	❍	❍	❍	❍
Persevering with a task	❍	❍	❍	❍	❍
Making changes when things do not go as planned	❍	❍	❍	❍	❍
Patience for the slow pace of research	❍	❍	❍	❍	❍
Working collaboratively with a team	❍	❍	❍	❍	❍
Communicating effectively with others	❍	❍	❍	❍	❍
Including others' perspectives when making decisions	❍	❍	❍	❍	❍
Sense of being part of a learning community	❍	❍	❍	❍	❍
Sense of contributing to a body of knowledge	❍	❍	❍	❍	❍
Building relationships with professionals in a field	❍	❍	❍	❍	❍
Connecting a topic or field and your personal values	❍	❍	❍	❍	❍

Q40. AS A RESULT OF YOUR JSHS EXPERIENCE, how much did you GAIN in the following areas?

	No gains	A little gain	Some gain	Large gain	Extremely large gains
Interest in a new STEM topic or field	❍	❍	❍	❍	❍
Clarifying a STEM career path	❍	❍	❍	❍	❍

Sense of accomplishing something in STEM	❍	❍	❍	❍	❍
Building academic or professional credentials in STEM	❍	❍	❍	❍	❍
Readiness 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	❍	❍	❍	❍	❍
Trying out new ideas or procedures on your own in a STEM project or activity	❍	❍	❍	❍	❍
Feeling responsible for a STEM project or activity	❍	❍	❍	❍	❍
Feeling like a STEM professional	❍	❍	❍	❍	❍
Feeling like part of a STEM community	❍	❍	❍	❍	❍

Q41. AS A RESULT OF YOUR JSHS 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 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	❍	❍	❍	❍	❍

Q42. How far did you want to go in school BEFORE participating in JSHS?

- ❍ 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
- ❍ Get a master's degree
- ❍ Get a Ph.D.
- ❍ Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)
- ❍ Get a combined M.D. / Ph.D.
- ❍ Get another professional degree (law, business, etc.)

Q43. How far do you want to go in school AFTER participating in JSHS?

- ❍ 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
- ❍ Get a master's degree
- ❍ Get a Ph.D.
- ❍ Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)
- ❍ Get a combined M.D. / Ph.D.
- ❍ Get another professional degree (law, business, etc.)

Q44. BEFORE JSHS, 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 JSHS)

- ❍ Undecided
- ❍ Science (no specific subject)
- ❍ Physical science (e.g., physics, chemistry, astronomy, materials science)
- ❍ Biological science
- ❍ Earth, atmospheric or oceanic science
- ❍ Agricultural science
- ❍ Teaching, non-STEM
- ❍ Medicine (e.g., doctor, dentist, veterinarian, etc.)
- ❍ Health (e.g., nursing, pharmacy, technician, etc.)
- ❍ Social science (e.g., psychologist, sociologist)
- ❍ Business
- ❍ Law

- ❍ Environmental science
- ❍ Computer science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics or statistics
- ❍ Teaching, STEM
- ❍ English/language arts
- ❍ Farming
- ❍ Military, police, or security
- ❍ Art (e.g., writing, dancing, painting, etc.)
- ❍ Skilled trade (carpenter, electrician, plumber, etc.)

Other ____________________

Q45. AFTER JSHS, 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 JSHS)

- ❍ Undecided
- ❍ Science (no specific subject)
- ❍ Physical science (e.g., 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 (e.g., doctor, dentist, veterinarian, etc.)
- ❍ Health (e.g., nursing, pharmacy, technician, etc.)
- ❍ Social science (e.g., psychologist, sociologist)
- ❍ Business
- ❍ Law
- ❍ English/language arts
- ❍ Farming
- ❍ Military, police, or security
- ❍ Art (e.g., writing, dancing, painting, etc.)
- ❍ Skilled trade (carpenter, electrician, plumber, etc.)

Other ____________________

Q46. 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
- ❍ up to 25% of the time
- ❍ up to 50% of the time
- ❍ up to 75% of the time
- ❍ up to 100% of the time

Q47. 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)	❍	❍	❍	❍	❍

Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	❍	❍	❍	❍	❍
Junior Science & Humanities Symposium	❍	❍	❍	❍	❍
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	❍	❍	❍	❍	❍

Q48. 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)	❍	❍	❍	❍
Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	❍	❍	❍	❍
Junior Science & Humanities Symposium	❍	❍	❍	❍
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	❍	❍	❍	❍

Q49. How many jobs/careers in science, technology, engineering, or math (STEM) did you learn about during JSHS?

❍ None
❍ 1
❍ 2
❍ 3
❍ 4
❍ 5 or more

Q50. How many Department of Defense (DoD) STEM jobs/careers did you learn about during JSHS?

❍ None
❍ 1
❍ 2
❍ 3
❍ 4
❍ 5 or more

Q51. 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	❍	❍	❍	❍	❍

Q52. Which of the following statements describe you after participating in JSHS?

	Disagree - This did not happen	Disagree - This happened but not because of the program	Agree - The program contributed	Agree - The program 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	❍	❍	❍	❍

Q53. What are the three most important ways that you have benefited from JSHS?

Benefit #1:

Benefit #2:

Benefit #3:

54. What are the three ways that JSHS should be improved for future participants?

Improvement #1:

Improvement #2:

Improvement #3:

Q55. Tell us about your overall satisfaction with your JSHS experience.

National 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. = , SD =)		
	Freq.	**%**
4th	0	0%
5th	0	0%
6th	0	0%
7th	0	0%
8th	0	0%
9th	0	0%
10th	2	5%
11th	9	21%
12th	13	30%
College freshman	19	44%
College sophomore	0	0%
College junior	0	0%
College senior	0	0%
Graduate program	0	0%
Other, (specify)	0	0%
Choose not to report	0	0%
Total	**43**	**100%**

What is your gender?		
	Freq.	**%**
Male	18	42%
Female	25	58%
Choose not to report	0	0%
Total	**43**	**100%**

What is your race or ethnicity?		
	Freq.	**%**
Hispanic or Latino	2	5%
Asian	19	44%

Black or African American	3	7%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	17	40%
Other race or ethnicity, (specify):	1	2%
Choose not to report	1	2%
Total	**43**	**100%**

Note. Other = "Asian/Latina"

Do you qualify for free or reduced lunches at school?		
	Freq.	**%**
Yes	3	7%
No	40	93%
Choose not to report	0	0%
Total	**43**	**100%**

Which best describes the location of your school?		
	Freq.	**%**
Frontier or tribal school	0	0%
Rural (country)	5	12%
Suburban	27	63%
Urban (city)	11	26%
Total	**43**	**100%**

What kind of school do you attend?		
	Freq.	**%**
Public school	37	86%
Private school	4	9%
Home school	0	0%
Online school	0	0%
Department of Defense school (DoDDS or DoDEA)	2	5%
Total	**43**	**100%**

What is the highest competition level you personally achieved in your JSHS participation this year? (Select ONE)		
	Freq.	%
Regional Oral Presenter	0	0%
Regional Poster Presenter (competitive)	0	0%
Regional Poster Presenter (non-competitive)	1	2%
Non-presenting Regional Participant	0	0%
National Oral Presenter	21	49%
National Poster Presenter	21	49%
Non-presenting National Participant	0	0%
Total	43	100%

In which JSHS competition category did you present your research? (Select ONE)		
	Freq.	%
I did not present my research	0	0%
Chemistry	5	12%
Computer Science & Mathematics	6	14%
Engineering & Technology	6	14%
Environmental Science	4	9%
Life Science	5	12%
Medicine, Health, & Behavioral Science	15	35%
Physical Science	2	5%
Social Science	0	0%
Total	43	100%

In which REGIONAL JSHS event did you participate? (Select ONE)						
	Freq.	%			Freq.	%
Alabama	0	0%		New Jersey—North New Jersey	1	2%
Alaska	1	2%		New York—Long Island	1	2%
Arkansas	1	2%		New York—Metro	2	5%
California—Northern California & Western Nevada	1	2%		New York—Upstate	2	5%

California—Southern California	0	0%		**North Carolina**	1	2%
Connecticut	2	5%		**North Central—Minnesota, North Dakota, South Dakota**	1	2%
DoD Dependent Schools-Europe	2	5%		**New England—Northern New England**	0	0%
DoD Dependent Schools-Pacific	0	0%		**New England—Southern New England**	0	0%
District of Columbia	0	0%		**Ohio**	0	0%
Florida	0	0%		**Oregon**	0	0%
Georgia	1	2%		**Pennsylvania**	0	0%
Hawaii	1	2%		**Puerto Rico**	0	0%
Illinois	2	5%		**South Carolina**	0	0%
Indiana	1	2%		**Southwest**	3	7%
Intermountain—Colorado, Montana, Idaho, Nevada, Utah	2	5%		**Tennessee**	3	7%
Iowa	2	5%		**Texas**	1	2%
Kansas—Nebraska—Oklahoma	2	5%		**Virginia**	1	2%
Kentucky	1	2%		**Washington**	1	2%
Maryland	1	2%		**West Virginia**	0	0%
Michigan—Southeastern Michigan	0	0%		**Wisconsin-Western Wisconsin & Upper Michigan**	0	0%
Mississippi	0	0%		**Wisconsin**	0	0%
Missouri	2	5%		**Wyoming—Eastern Colorado**	0	0%
New Jersey--Monmouth	3	7%				
				Total	**42**	**100%**

How did you learn about JSHS? (Check all that apply)						
	Freq.	**%**			**Freq.**	**%**
Army Educational Outreach Program (AEOP) website	1	2%		**Extended family member (e.g., grandparents, aunts, uncles, cousins)**	0	0%
JSHS website	14	33%		**Friend of the family**	2	5%
Facebook, Twitter, Pinterest, or other social media	2	5%		**Teacher or professor**	31	72%
School or university newsletter or email	9	21%		**Guidance counselor**	1	2%
News story or other media coverage	0	0%		**Mentor from JSHS**	2	5%
Another past participant of JSHS	12	28%		**Someone who works at an Army laboratory**	0	0%
Friend	12	28%		**Someone who works with the Department of Defense**	0	0%

Immediate family member (e.g., mother, father, siblings)	3	7%		**Other (specify):**	0	0%
				Total		**100%**

How motivating were the following factors in your decision to participate in JSHS?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Teacher or professor encouragement	3 (7%)	6 (14%)	9 (21%)	5 (12%)	19 (45%)	42	**3.74**	1.36
An academic requirement or school grade	21 (50%)	6 (14%)	6 (14%)	2 (5%)	7 (17%)	42	**2.24**	1.53
Desire to learn something new or interesting	1 (2%)	2 (5%)	6 (14%)	14 (33%)	19 (45%)	42	**4.14**	1.00
The program mentor(s)	3 (7%)	7 (17%)	12 (29%)	6 (14%)	14 (33%)	42	**3.50**	1.31
Résumé or college application building	3 (7%)	4 (10%)	12 (29%)	10 (24%)	13 (31%)	42	**3.62**	1.23
Networking opportunities	0 (0%)	5 (12%)	8 (19%)	11 (26%)	18 (43%)	42	**4.00**	1.06
Interest in science, technology, engineering, or mathematics (STEM)	0 (0%)	0 (0%)	2 (5%)	4 (10%)	36 (86%)	42	**4.81**	0.51
Interest in STEM careers with the Army	8 (19%)	7 (17%)	10 (24%)	6 (14%)	11 (26%)	42	**3.12**	1.47
Having fun	1 (2%)	2 (5%)	2 (5%)	14 (33%)	23 (55%)	42	**4.33**	0.95
Earning money over the summer	16 (38%)	4 (10%)	7 (17%)	5 (12%)	10 (24%)	42	**2.74**	1.64
Opportunity to do something with friends	10 (24%)	7 (17%)	6 (14%)	6 (14%)	13 (31%)	42	**3.12**	1.60
Opportunity to use advanced laboratory technology	5 (12%)	4 (10%)	9 (21%)	8 (19%)	16 (38%)	42	**3.62**	1.40
Desire to expand laboratory or research skills	2 (5%)	3 (7%)	4 (10%)	10 (24%)	23 (55%)	42	**4.17**	1.17
Learning in ways that are not possible in school	1 (2%)	1 (2%)	4 (10%)	9 (21%)	27 (64%)	42	**4.43**	0.94
Serving the community or country	2 (5%)	4 (10%)	9 (21%)	11 (26%)	16 (38%)	42	**3.83**	1.19
Parent encouragement	7 (17%)	11 (26%)	6 (14%)	7 (17%)	11 (26%)	42	**3.10**	1.48
Exploring a unique work environment	5 (12%)	1 (2%)	4 (10%)	15 (36%)	17 (40%)	42	**3.90**	1.30
Other (specify)	1 (13%)	0 (0%)	0 (0%)	0 (0%)	7 (88%)	8	**4.50**	1.41

Note. Other = "Desire to contribute to the growing scientific community". Response scale: **1** = "Not at all motivating," **2** = "Slightly motivating," **3** = "Somewhat motivating," **4** = "Very motivating," **5** = "Extremely motivating".

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 (3%)	2 (5%)	9 (23%)	16 (40%)	12 (30%)	40	**3.90**	0.98
Apply STEM knowledge to real life situations	3 (8%)	5 (13%)	7 (18%)	12 (30%)	13 (33%)	40	**3.68**	1.27
Learn about cutting-edge STEM research	6 (15%)	7 (18%)	9 (23%)	12 (30%)	6 (15%)	40	**3.13**	1.30

Learn about different STEM careers	3 (8%)	13 (33%)	12 (30%)	6 (15%)	6 (15%)	40	**2.98**	1.19
Interact with STEM professionals	8 (20%)	11 (28%)	13 (33%)	2 (5%)	6 (15%)	40	**2.68**	1.29

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 JSHS this year?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Learn about new science, technology, engineering, or mathematics (STEM) topics	0 (0%)	0 (0%)	1 (3%)	7 (18%)	32 (80%)	40	**4.78**	0.48
Apply STEM knowledge to real life situations	0 (0%)	1 (3%)	4 (10%)	10 (25%)	25 (63%)	40	**4.48**	0.78
Learn about cutting-edge STEM research	0 (0%)	1 (3%)	2 (5%)	8 (20%)	29 (73%)	40	**4.63**	0.70
Learn about different STEM careers	0 (0%)	0 (0%)	3 (8%)	8 (20%)	29 (73%)	40	**4.65**	0.62
Interact with STEM professionals	0 (0%)	0 (0%)	3 (8%)	7 (18%)	30 (75%)	40	**4.68**	0.62

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	4 (10%)	3 (8%)	16 (40%)	9 (23%)	8 (20%)	40	**3.35**	1.19
Participate in hands-on STEM activities	2 (5%)	3 (8%)	17 (43%)	9 (23%)	9 (23%)	40	**3.50**	1.09
Work as part of a team	3 (8%)	1 (3%)	10 (25%)	15 (38%)	11 (28%)	40	**3.75**	1.13
Communicate with other students about STEM	3 (8%)	5 (13%)	4 (10%)	17 (43%)	11 (28%)	40	**3.70**	1.22

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 JSHS this year?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Practice using laboratory or field techniques, procedures, and tools	7 (18%)	5 (13%)	8 (21%)	10 (26%)	9 (23%)	39	**3.23**	1.42
Participate in hands-on STEM activities	3 (8%)	1 (3%)	8 (21%)	11 (28%)	16 (41%)	39	**3.92**	1.20
Work as part of a team	2 (5%)	5 (13%)	7 (18%)	11 (28%)	14 (36%)	39	**3.77**	1.22
Communicate with other students about STEM	0 (0%)	0 (0%)	6 (15%)	4 (10%)	29 (74%)	39	**4.59**	0.75

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	2 (5%)	0 (0%)	14 (37%)	12 (32%)	10 (26%)	38	**3.74**	1.03
Design an investigation	2 (5%)	6 (16%)	14 (37%)	13 (34%)	3 (8%)	38	**3.24**	1.00
Carry out an investigation	1 (3%)	4 (11%)	16 (42%)	13 (34%)	4 (11%)	38	**3.39**	0.92
Analyze and interpret data or information	1 (3%)	0 (0%)	12 (32%)	18 (47%)	7 (18%)	38	**3.79**	0.84
Draw conclusions from an investigation	1 (3%)	4 (11%)	9 (24%)	18 (47%)	6 (16%)	38	**3.63**	0.97
Come up with creative explanations or solutions	4 (11%)	2 (5%)	14 (37%)	11 (29%)	7 (18%)	38	**3.39**	1.17
Build (or simulate) something	5 (13%)	3 (8%)	14 (37%)	10 (26%)	6 (16%)	38	**3.24**	1.22

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 JSHS this year?								
	1	2	3	4	5	n	Avg.	SD
Pose questions or problems to investigate	0 (0%)	7 (18%)	10 (26%)	9 (24%)	12 (32%)	38	**3.68**	1.12
Design an investigation	4 (11%)	9 (24%)	5 (13%)	12 (32%)	8 (21%)	38	**3.29**	1.33
Carry out an investigation	6 (16%)	8 (21%)	8 (21%)	9 (24%)	7 (18%)	38	**3.08**	1.36
Analyze and interpret data or information	5 (14%)	6 (16%)	5 (14%)	13 (35%)	8 (22%)	37	**3.35**	1.36
Draw conclusions from an investigation	5 (13%)	6 (16%)	4 (11%)	16 (42%)	7 (18%)	38	**3.37**	1.32
Come up with creative explanations or solutions	1 (3%)	7 (18%)	6 (16%)	12 (32%)	12 (32%)	38	**3.71**	1.18
Build (or simulate) something	1 (3%)	10 (26%)	6 (16%)	11 (29%)	10 (26%)	38	**3.50**	1.22

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

How USEFUL were each of the following JSHS resources provided at JSHS.org?								
	0	1	2	3	4	n	Avg.	SD
National JSHS Groundrules for Student Presentations	3 (9%)	0 (0%)	7 (21%)	12 (35%)	12 (35%)	34	**3.16**	0.78
Paper Submissions and Competition Deadlines	1 (3%)	1 (3%)	6 (18%)	11 (32%)	15 (44%)	34	**3.21**	0.86
Sample Papers	10 (29%)	2 (6%)	5 (15%)	7 (21%)	10 (29%)	34	**3.04**	1.00
Oral Presentation Tips	6 (18%)	2 (6%)	7 (21%)	7 (21%)	12 (35%)	34	**3.04**	1.00
Selected Articles - Conducting Research	11 (32%)	5 (15%)	5 (15%)	8 (24%)	5 (15%)	34	**2.57**	1.08

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

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

	0	1	2	3	4	n	Avg.	SD
JSHS website	2 (6%)	3 (9%)	9 (27%)	10 (30%)	9 (27%)	33	**2.81**	0.98
AEOP website	15 (45%)	3 (9%)	6 (18%)	4 (12%)	5 (15%)	33	**2.61**	1.09
AEOP social media	14 (42%)	3 (9%)	7 (21%)	6 (18%)	3 (9%)	33	**2.47**	0.96
AEOP brochure	6 (18%)	3 (9%)	8 (24%)	8 (24%)	8 (24%)	33	**2.78**	1.01
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat)	9 (28%)	6 (19%)	4 (13%)	7 (22%)	6 (19%)	32	**2.57**	1.16
Army STEM Career Magazine	18 (55%)	5 (15%)	3 (9%)	3 (9%)	4 (12%)	33	**2.40**	1.24
My mentor(s)	8 (24%)	4 (12%)	8 (24%)	5 (15%)	8 (24%)	33	**2.68**	1.11
Invited speakers or "career" events	1 (3%)	1 (3%)	1 (3%)	11 (33%)	19 (58%)	33	**3.50**	0.72
Participation in JSHS	0 (0%)	2 (6%)	0 (0%)	5 (15%)	26 (79%)	33	**3.67**	0.78

Note. Response scale: **0** = "Did Not Experience" (excluded from analysis), **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 JSHS:

	0	1	2	3	4	n	Avg.	SD
JSHS website	4 (12%)	6 (18%)	4 (12%)	12 (36%)	7 (21%)	33	**2.69**	1.07
AEOP website	16 (48%)	1 (3%)	8 (24%)	2 (6%)	6 (18%)	33	**2.76**	1.03
AEOP social media	17 (52%)	2 (6%)	6 (18%)	3 (9%)	5 (15%)	33	**2.69**	1.08
AEOP brochure	6 (18%)	3 (9%)	8 (24%)	8 (24%)	8 (24%)	33	**2.78**	1.01
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat)	10 (30%)	7 (21%)	5 (15%)	4 (12%)	7 (21%)	33	**2.48**	1.24
Army STEM Career Magazine	18 (55%)	2 (6%)	6 (18%)	2 (6%)	5 (15%)	33	**2.67**	1.11
My mentor(s)	7 (22%)	3 (9%)	8 (25%)	4 (13%)	10 (31%)	32	**2.84**	1.11
Invited speakers or "career" events	1 (3%)	0 (0%)	2 (6%)	3 (9%)	26 (81%)	32	**3.77**	0.56
Participation in JSHS	0 (0%)	0 (0%)	0 (0%)	2 (6%)	30 (94%)	32	**3.94**	0.25

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

The following activities were common to many Regional JSHS programs across the nation. How SATISFIED were you with each of the following REGIONAL JSHS program activities? If your Regional JSHS event did not have a given activity, select "Did Not Experience"

	0	1	2	3	4	n	Avg.	SD
Student Oral Presentations	1 (3%)	0 (0%)	1 (3%)	6 (18%)	26 (76%)	32	**3.94**	0.25
Student Poster Presentations	17 (52%)	2 (6%)	0 (0%)	5 (15%)	9 (27%)	34	**3.76**	0.50
Judging Process	0 (0%)	0 (0%)	5 (15%)	11 (32%)	18 (53%)	33	**3.31**	1.01
Feedback from Judges	1 (3%)	7 (21%)	5 (15%)	7 (21%)	14 (41%)	34	**3.38**	0.74

Feedback from VIPs and Peers	4 (12%)	6 (18%)	11 (32%)	4 (12%)	9 (26%)	34	**2.85**	1.20
Invited Speaker Presentations	6 (18%)	2 (6%)	4 (12%)	10 (29%)	12 (35%)	34	**2.53**	1.14
Panel or Roundtable Discussions	18 (53%)	1 (3%)	2 (6%)	7 (21%)	6 (18%)	34	**3.14**	0.93
Career Exhibits	21 (62%)	1 (3%)	1 (3%)	6 (18%)	5 (15%)	34	**3.13**	0.89
Tours or Field Trips	11 (32%)	2 (6%)	2 (6%)	10 (29%)	9 (26%)	34	**3.15**	0.90
Team Building Activities	17 (50%)	2 (6%)	3 (9%)	4 (12%)	8 (24%)	34	**3.13**	0.92
Social Events	10 (29%)	1 (3%)	3 (9%)	8 (24%)	12 (35%)	34	**3.06**	1.09

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

The following activities were included in the National JSHS program. How SATISFIED were you with each of the NATIONAL JSHS program activities?

	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
Opening Ceremony	0 (0%)	0 (0%)	2 (6%)	14 (41%)	18 (53%)	34	**3.47**	0.61
General Session 1 Keynote Speaker: Leigh McCue, Ph.D.	0 (0%)	0 (0%)	4 (12%)	10 (29%)	20 (59%)	34	**3.47**	0.71
Student (Oral) Research Sessions and Judging	1 (3%)	0 (0%)	3 (9%)	10 (29%)	20 (59%)	34	**3.52**	0.67
General Session 2 Keynote Speaker: Kenneth Kosik, Ph.D.	0 (0%)	0 (0%)	1 (3%)	13 (38%)	20 (59%)	34	**3.56**	0.56
Student Team Building Activity	0 (0%)	3 (9%)	8 (24%)	7 (21%)	16 (47%)	34	**3.06**	1.04
DoD Exhibits at USA Science & Engineering Festival	4 (12%)	0 (0%)	0 (0%)	13 (38%)	17 (50%)	34	**3.57**	0.50
USA Science & Engineering Festival Scavenger Hunt	17 (50%)	7 (21%)	4 (12%)	1 (3%)	5 (15%)	34	**2.24**	1.30
Student Poster Session and Judging	5 (15%)	2 (6%)	3 (9%)	9 (27%)	14 (42%)	33	**3.25**	0.93
Student Poster Session VIP and Peer Review	8 (24%)	2 (6%)	2 (6%)	10 (30%)	11 (33%)	33	**3.20**	0.91
General Session 3 Keynote Speaker: Christopher Cassidy, Commander, USN	1 (3%)	0 (0%)	1 (3%)	5 (15%)	27 (79%)	34	**3.79**	0.48
General Session 4 Keynote Speaker: John Pellegrino, Ph.D.	1 (3%)	0 (0%)	3 (9%)	8 (24%)	22 (65%)	34	**3.58**	0.66
Panel Discussion: Pathways to DoD STEM Careers	1 (3%)	3 (9%)	6 (18%)	10 (30%)	13 (39%)	33	**3.03**	1.00
Lunch with DoD Scientists and Engineers	2 (6%)	3 (9%)	7 (21%)	5 (15%)	17 (50%)	34	**3.13**	1.07
Free Time at National Mall or USA Science & Engineering Festival	1 (3%)	0 (0%)	1 (3%)	5 (15%)	27 (79%)	34	**3.79**	0.48
Awards Ceremony and Congratulatory Remarks	1 (3%)	0 (0%)	3 (9%)	8 (24%)	22 (65%)	34	**3.58**	0.66

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

Which of the following best describes your primary research mentor?

	Freq.	%
I did not have a research mentor	3	9%
Teacher	14	41%
Coach	0	0%
Parent	1	3%
Club or activity leader (School club, Boy/Girls Scouts)	1	3%
STEM researcher (university, industry, or DoD/government employee)	14	41%
Other (specify)	1	3%
Total	34	100%

Note. Other = "Scientific professional, post-doctoral fellow"

Which of the following statements best reflects the input you had into your project initially?		
	Freq.	%
I did not have a project	0	0%
I was assigned a project by my mentor	0	0%
I worked with my mentor to design a project	8	24%
I had a choice among various projects suggested by my mentor	4	12%
I worked with my mentor and members of a research team to design a project	4	12%
I designed the entire project on my own	18	53%
Total	34	100%

Which of the following statements best reflects the availability of your mentor?		
	Freq.	%
I did not have a mentor	4	12%
The mentor was never available	1	3%
The mentor was available less than half of the time	5	15%
The mentor was available about half of the time of my project	5	15%
The mentor was available more than half of the time	5	15%
The mentor was always available	14	41%
Total	34	100%

Which of the following statements best reflects your working as part of a group or team?		
	Freq.	**%**
I did not have a project	0	0%
I worked alone (or alone with my research mentor)	20	59%
I worked with others in a shared laboratory or other space, but we worked on different projects	5	15%
I worked alone on my project, and I met with others regularly for general reporting or discussion	5	15%
I worked alone on a project that was closely connected with projects of others in my group	1	3%
I worked with a group who all worked on the same project	3	9%
Total	**34**	**100%**

How SATISFIED were you with each of the following?								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
My working relationship with my mentor	4 (12%)	2 (6%)	0 (0%)	6 (18%)	22 (65%)	34	**3.60**	0.81
My working relationship with the group or team	22 (65%)	0 (0%)	1 (3%)	2 (6%)	9 (26%)	34	**3.67**	0.65
The amount of time I spent doing meaningful research	0 (0%)	0 (0%)	2 (6%)	5 (15%)	27 (79%)	34	**3.74**	0.57
The amount of time I spent with my research mentor	6 (18%)	2 (6%)	2 (6%)	9 (26%)	15 (44%)	34	**3.32**	0.90
The research experience overall	0 (0%)	0 (0%)	0 (0%)	4 (12%)	30 (88%)	34	**3.88**	0.33

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

Which of the following statements apply to your research experience? (choose all that apply)						
	Freq.	**%**			**Freq.**	**%**
I presented a talk or poster to other students or faculty	31	72%		I will present a talk or poster to other students or faculty	14	33%
I presented a talk or poster at a professional symposium or conference	27	63%		I will present a talk or poster at a professional symposium or conference	12	28%
I attended a symposium or conference	29	67%		I will attend a symposium or conference	17	40%
I wrote or co-wrote a paper that was/will be published in a research journal	10	23%		I will write or co-write a paper that was/will be published in a research journal	7	16%
I wrote or co-wrote a technical paper or patent	8	19%		I will write or co-write a technical paper or patent	5	12%
				I won an award or scholarship based on my research	28	65%

				Total	43	100%

The list below describes 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 for JSHS:	Yes - my mentor used this strategy with me		No - my mentor did not use this strategy with me	
	Freq.	%	Freq.	%
Helped me become aware of the roles STEM play in my everyday life	13	42%	18	58%
Helped me understand how STEM can help me improve my community	19	61%	12	39%
Used teaching/mentoring activities that addressed my learning style	22	71%	9	29%
Provided me with extra support when I needed it	26	84%	5	16%
Encouraged me to exchange ideas with others whose backgrounds or viewpoints are different from mine	22	71%	9	29%
Allowed me to work on a collaborative project as a member of a team	19	61%	12	39%
Helped me practice a variety of STEM skills with supervision	18	58%	13	42%
Gave me constructive feedback to improve my STEM knowledge, skills, or abilities	25	81%	6	19%
Gave me guidance about educational pathways that would prepare me for a STEM career	15	50%	15	50%
Recommended Army Educational Outreach Programs that match my interests	5	17%	25	83%
Discussed STEM career opportunities with DoD or other government agencies	6	20%	24	80%

Which category best describes the focus of your JSHS experience?		
	Freq.	%
Science	18	53%
Technology	6	18%
Engineering	7	21%
Mathematics	3	9%
Total	34	100%

AS A RESULT OF YOUR JSHS 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	0 (0%)	1 (3%)	3 (9%)	11 (32%)	19 (56%)	34	**4.41**	0.78
Knowledge of research conducted in a STEM topic or field	1 (3%)	0 (0%)	4 (12%)	10 (29%)	19 (56%)	34	**4.35**	0.92
Knowledge of research processes, ethics, and rules for conduct in STEM	1 (3%)	0 (0%)	10 (29%)	7 (21%)	16 (47%)	34	**4.09**	1.03
Knowledge of how professionals work on real problems in STEM	0 (0%)	0 (0%)	4 (12%)	12 (35%)	18 (53%)	34	**4.41**	0.70
Knowledge of what everyday research work is like in STEM	1 (3%)	1 (3%)	4 (12%)	10 (29%)	18 (53%)	34	**4.26**	0.99

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

AS A RESULT OF YOUR JSHS EXPERIENCE, how much did you GAIN in the following areas?								
	1	2	3	4	5	n	Avg.	SD
Asking questions based on observations of real-world phenomena	0 (0%)	1 (6%)	5 (29%)	4 (24%)	7 (41%)	17	**4.00**	1.00
Asking a question (about a phenomenon) that can be answered with one or more investigations	0 (0%)	0 (0%)	6 (35%)	4 (24%)	7 (41%)	17	**4.06**	0.90
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	0 (0%)	0 (0%)	6 (35%)	4 (24%)	7 (41%)	17	**4.06**	0.90
Making a model to represent the key features and functions of an observed phenomenon	0 (0%)	3 (19%)	3 (19%)	5 (31%)	5 (31%)	16	**3.75**	1.13
Deciding what type of data to collect in order to answer a question	0 (0%)	1 (6%)	5 (31%)	3 (19%)	7 (44%)	16	**4.00**	1.03
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	0 (0%)	1 (6%)	3 (19%)	4 (25%)	8 (50%)	16	**4.19**	0.98
Identifying the limitations of data collected in an investigation	0 (0%)	0 (0%)	6 (35%)	4 (24%)	7 (41%)	17	**4.06**	0.90
Carrying out procedures for an investigation and recording data accurately	0 (0%)	1 (6%)	4 (24%)	3 (18%)	9 (53%)	17	**4.18**	1.01
Testing how changing one variable affects another variable, in order to understand relationships between variables	2 (12%)	1 (6%)	6 (35%)	1 (6%)	7 (41%)	17	**3.59**	1.42
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	3 (18%)	1 (6%)	4 (24%)	2 (12%)	7 (41%)	17	**3.53**	1.55
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	1 (6%)	2 (12%)	4 (24%)	1 (6%)	9 (53%)	17	**3.88**	1.36

Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	0 (0%)	1 (6%)	4 (24%)	4 (24%)	8 (47%)	17	**4.12**	0.99
Using mathematics to analyze numeric data	0 (0%)	1 (6%)	4 (24%)	6 (35%)	6 (35%)	17	**4.00**	0.94
Supporting a proposed explanation (for a phenomenon) with data from investigations	0 (0%)	0 (0%)	7 (41%)	3 (18%)	7 (41%)	17	**4.00**	0.94
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	0 (0%)	1 (6%)	3 (18%)	6 (35%)	7 (41%)	17	**4.12**	0.93
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	0 (0%)	0 (0%)	3 (18%)	6 (35%)	8 (47%)	17	**4.29**	0.77
Using data or interpretations from other researchers or investigations to improve an explanation	0 (0%)	0 (0%)	6 (35%)	5 (29%)	6 (35%)	17	**4.00**	0.87
Asking questions to understand the data and interpretations others use to support their explanations	0 (0%)	0 (0%)	5 (29%)	5 (29%)	7 (41%)	17	**4.12**	0.86
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	0 (0%)	0 (0%)	4 (24%)	5 (29%)	8 (47%)	17	**4.24**	0.83
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	0 (0%)	0 (0%)	4 (24%)	5 (29%)	8 (47%)	17	**4.24**	0.83
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	0 (0%)	1 (6%)	5 (29%)	3 (18%)	8 (47%)	17	**4.06**	1.03
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	0 (0%)	0 (0%)	7 (41%)	4 (24%)	6 (35%)	17	**3.94**	0.90
Integrating information from multiple sources to support your explanations of phenomena	0 (0%)	0 (0%)	4 (24%)	6 (35%)	7 (41%)	17	**4.18**	0.81
Communicating information about your investigations and explanations in different formats (e.g., orally, written, graphically, mathematically)	0 (0%)	1 (6%)	3 (18%)	3 (18%)	10 (59%)	17	**4.29**	0.99

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

AS A RESULT OF YOUR JSHS EXPERIENCE, how much did you GAIN in the following areas?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Identifying real-world problems based on social, technological, or environmental issues	0 (0%)	0 (0%)	2 (13%)	7 (47%)	6 (40%)	15	**4.27**	0.70

Defining a problem that can be solved by developing a new or improved object, process, or system	0 (0%)	0 (0%)	1 (7%)	6 (40%)	8 (53%)	15	**4.47**	0.64
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	0 (0%)	0 (0%)	1 (7%)	5 (33%)	9 (60%)	15	**4.53**	0.64
Making a model that represents the key features or functions of a solution to a problem	1 (7%)	0 (0%)	5 (33%)	3 (20%)	6 (40%)	15	**3.87**	1.19
Deciding what type of data to collect in order to test if a solution functions as intended	1 (7%)	0 (0%)	4 (27%)	4 (27%)	6 (40%)	15	**3.93**	1.16
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	1 (7%)	1 (7%)	3 (20%)	4 (27%)	6 (40%)	15	**3.87**	1.25
Identifying the limitations of the data collected in an investigation	1 (7%)	2 (13%)	3 (20%)	3 (20%)	6 (40%)	15	**3.73**	1.33
Carrying out procedures for an investigation and recording data accurately	1 (7%)	2 (13%)	4 (27%)	2 (13%)	6 (40%)	15	**3.67**	1.35
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	2 (13%)	2 (13%)	2 (13%)	2 (13%)	7 (47%)	15	**3.67**	1.54
Using computer-based models to investigate cause and effect relationships of a simulated solution	0 (0%)	0 (0%)	3 (20%)	6 (40%)	6 (40%)	15	**4.20**	0.77
Considering alternative interpretations of data when deciding if a solution functions as intended	1 (7%)	2 (13%)	3 (20%)	4 (27%)	5 (33%)	15	**3.67**	1.29
Displaying numeric data in charts or graphs to identify patterns and relationships	2 (13%)	1 (7%)	2 (13%)	6 (40%)	4 (27%)	15	**3.60**	1.35
Using mathematics to analyze numeric data	0 (0%)	1 (7%)	4 (27%)	5 (33%)	5 (33%)	15	**3.93**	0.96
Supporting a proposed solution (for a problem) with data from investigations	2 (13%)	1 (7%)	2 (13%)	5 (33%)	5 (33%)	15	**3.67**	1.40
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	2 (13%)	0 (0%)	2 (13%)	3 (20%)	8 (53%)	15	**4.00**	1.41
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	0 (0%)	2 (13%)	3 (20%)	4 (27%)	6 (40%)	15	**3.93**	1.10
Using data or interpretations from other researchers or investigations to improve a solution	2 (13%)	1 (7%)	2 (13%)	3 (20%)	7 (47%)	15	**3.80**	1.47
Asking questions to understand the data and interpretations others use to support their solutions	0 (0%)	1 (7%)	3 (20%)	5 (33%)	6 (40%)	15	**4.07**	0.96
Using data from investigations to defend an argument that conveys how a solution meets design criteria	1 (7%)	1 (7%)	4 (27%)	2 (13%)	7 (47%)	15	**3.87**	1.30

Deciding what additional data or information may be needed to find the best solution to a problem	1 (7%)	1 (7%)	4 (27%)	4 (27%)	5 (33%)	15	**3.73**	1.22
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	2 (13%)	3 (20%)	1 (7%)	2 (13%)	7 (47%)	15	**3.60**	1.59
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	1 (7%)	1 (7%)	3 (20%)	3 (20%)	7 (47%)	15	**3.93**	1.28
Integrating information from multiple sources to support your solution to a problem	1 (7%)	0 (0%)	3 (20%)	4 (27%)	7 (47%)	15	**4.07**	1.16
Communicating information about your design processes and/or solutions in different formats (e.g., orally, written, graphically, mathematically)	1 (7%)	0 (0%)	2 (13%)	2 (13%)	10 (67%)	15	**4.33**	1.18

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

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

	1	2	3	4	5	n	Avg.	SD
Learning to work independently	2 (6%)	4 (12%)	3 (9%)	9 (27%)	15 (45%)	33	**3.94**	1.27
Setting goals and reflecting on performance	1 (3%)	2 (6%)	4 (12%)	12 (36%)	14 (42%)	33	**4.09**	1.04
Persevering with a task	1 (3%)	3 (9%)	4 (12%)	7 (21%)	18 (55%)	33	**4.15**	1.15
Making changes when things do not go as planned	0 (0%)	5 (15%)	5 (15%)	7 (21%)	16 (48%)	33	**4.03**	1.13
Patience for the slow pace of research	1 (3%)	3 (9%)	6 (18%)	6 (18%)	17 (52%)	33	**4.06**	1.17
Working collaboratively with a team	10 (30%)	3 (9%)	3 (9%)	7 (21%)	10 (30%)	33	**3.12**	1.67
Communicating effectively with others	1 (3%)	4 (12%)	7 (21%)	7 (21%)	14 (42%)	33	**3.88**	1.19
Including others' perspectives when making decisions	1 (3%)	6 (18%)	6 (18%)	9 (27%)	11 (33%)	33	**3.70**	1.21
Sense of being part of a learning community	2 (6%)	4 (12%)	10 (30%)	5 (15%)	12 (36%)	33	**3.64**	1.27
Sense of contributing to a body of knowledge	0 (0%)	3 (9%)	7 (21%)	11 (33%)	12 (36%)	33	**3.97**	0.98
Building relationships with professionals in a field	1 (3%)	3 (9%)	5 (15%)	8 (24%)	16 (48%)	33	**4.06**	1.14
Connecting a topic or field and your personal values	1 (3%)	1 (3%)	5 (15%)	8 (24%)	18 (55%)	33	**4.24**	1.03

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

AS A RESULT OF YOUR JSHS 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	0 (0%)	1 (3%)	5 (16%)	10 (32%)	15 (48%)	31	**4.26**	0.86
Clarifying a STEM career path	2 (6%)	0 (0%)	4 (13%)	11 (35%)	14 (45%)	31	**4.13**	1.09
Sense of accomplishing something in STEM	1 (3%)	0 (0%)	3 (10%)	12 (39%)	15 (48%)	31	**4.29**	0.90

Building academic or professional credentials in STEM	1 (3%)	1 (3%)	5 (16%)	9 (29%)	15 (48%)	31	**4.16**	1.04
Readiness for more challenging STEM activities	0 (0%)	1 (3%)	2 (6%)	10 (32%)	18 (58%)	31	**4.45**	0.77
Confidence to do well in future STEM courses	0 (0%)	0 (0%)	2 (6%)	10 (32%)	19 (61%)	31	**4.55**	0.62
Confidence to contribute to STEM	0 (0%)	0 (0%)	4 (13%)	9 (29%)	18 (58%)	31	**4.45**	0.72
Thinking creatively about a STEM project or activity	0 (0%)	0 (0%)	4 (13%)	12 (39%)	15 (48%)	31	**4.35**	0.71
Trying out new ideas or procedures on my own in a STEM project or activity	0 (0%)	1 (3%)	3 (10%)	13 (42%)	14 (45%)	31	**4.29**	0.78
Feeling responsible for a STEM project or activity	0 (0%)	0 (0%)	2 (6%)	16 (52%)	13 (42%)	31	**4.35**	0.61
Feeling like a STEM professional	0 (0%)	0 (0%)	7 (23%)	13 (42%)	11 (35%)	31	**4.13**	0.76
Feeling like part of a STEM community	0 (0%)	0 (0%)	2 (6%)	12 (39%)	17 (55%)	31	**4.48**	0.63

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

AS A RESULT OF YOUR JSHS 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	0 (0%)	0 (0%)	19 (59%)	6 (19%)	7 (22%)	32	**3.63**	0.83
Watch or read non-fiction STEM	0 (0%)	0 (0%)	14 (44%)	10 (31%)	8 (25%)	32	**3.81**	0.82
Look up STEM information at a library or on the internet	0 (0%)	0 (0%)	9 (28%)	13 (41%)	10 (31%)	32	**4.03**	0.78
Tinker with a mechanical or electrical device	0 (0%)	2 (6%)	15 (47%)	8 (25%)	7 (22%)	32	**3.63**	0.91
Work on solving mathematical or scientific puzzles	0 (0%)	1 (3%)	14 (44%)	12 (38%)	5 (16%)	32	**3.66**	0.79
Design a computer program or website	0 (0%)	1 (3%)	12 (38%)	9 (28%)	10 (31%)	32	**3.88**	0.91
Observe things in nature (plant growth, animal behavior, stars or planets, etc.)	1 (3%)	0 (0%)	14 (44%)	7 (22%)	10 (31%)	32	**3.78**	1.01
Talk with friends or family about STEM	0 (0%)	0 (0%)	5 (16%)	12 (38%)	15 (47%)	32	**4.31**	0.74
Mentor or teach other students about STEM	0 (0%)	1 (3%)	3 (9%)	11 (34%)	17 (53%)	32	**4.38**	0.79
Help with a community service project that relates to STEM	0 (0%)	0 (0%)	5 (16%)	13 (41%)	14 (44%)	32	**4.28**	0.73
Participate in a STEM club, student association, or professional organization	0 (0%)	0 (0%)	5 (16%)	13 (41%)	14 (44%)	32	**4.28**	0.73
Participate in STEM camp, fair, or competition	0 (0%)	0 (0%)	6 (19%)	9 (28%)	17 (53%)	32	**4.34**	0.79
Take an elective (not required) STEM class	0 (0%)	0 (0%)	6 (19%)	10 (31%)	16 (50%)	32	**4.31**	0.78
Work on a STEM project or experiment in a university or professional setting	0 (0%)	0 (0%)	5 (16%)	9 (28%)	18 (56%)	32	**4.41**	0.76
Receive an award or special recognition for STEM accomplishments	0 (0%)	0 (0%)	4 (13%)	12 (38%)	16 (50%)	32	**4.38**	0.71

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 JSHS?		
	Freq.	**%**
Graduate from high school	0	0%
Go to a trade or vocational school	0	0%
Go to college for a little while	0	0%
Finish college (get a Bachelor's degree)	3	9%
Get more education after college	0	0%
Get a master's degree	5	16%
Get a Ph.D.	13	41%
Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)	4	13%
Get a combined M.D. / Ph.D.	7	22%
Get another professional degree (law, business, etc.)	0	0%
Total	**32**	**100%**

How far did you want to go in school AFTER participating in JSHS?		
	Freq.	**%**
Graduate from high school	0	0%
Go to a trade or vocational school	0	0%
Go to college for a little while	0	0%
Finish college (get a Bachelor's degree)	0	0%
Get more education after college	2	6%
Get a master's degree	3	9%
Get a Ph.D.	14	44%
Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)	2	6%
Get a combined M.D. / Ph.D.	11	34%
Get another professional degree (law, business, etc.)	0	0%
Total	**32**	**100%**

BEFORE JSHS, 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 JSHS)						
	Freq.	**%**			**Freq.**	**%**
Undecided	3	9%		**Teaching, non-STEM**	0	0%
Science (no specific subject)	0	0%		**Medicine (e.g., doctor, dentist, veterinarian, etc.)**	12	38%
Physical science (e.g., physics, chemistry, astronomy, materials science)	2	6%		**Health (e.g., nursing, pharmacy, technician, etc.)**	0	0%
Biological science	3	9%		**Social science (e.g., psychologist, sociologist)**	0	0%
Earth, atmospheric or oceanic science	0	0%		**Business**	1	3%
Agricultural science	0	0%		**Law**	0	0%
Environmental science	0	0%		**English/language arts**	0	0%
Computer science	1	3%		**Farming**	1	3%
Technology	0	0%		**Military, police, or security**	0	0%
Engineering	6	19%		**Art (e.g., writing, dancing, painting, etc.)**	0	0%
Mathematics or statistics	2	6%		**Skilled trade (carpenter, electrician, plumber, etc.)**	0	0%
Teaching, STEM	0	0%		**Other**	1	3%
				Total	**32**	**100%**

Note. Other = “Computer Engineering”

AFTER JSHS, 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 JSHS)						
	Freq.	**%**			**Freq.**	**%**
Undecided	0	0%		**Teaching, non-STEM**	0	0%
Science (no specific subject)	1	3%		**Medicine (e.g., doctor, dentist, veterinarian, etc.)**	9	28%
Physical science (e.g., physics, chemistry, astronomy, materials science)	2	6%		**Health (e.g., nursing, pharmacy, technician, etc.)**	1	3%
Biological science	6	19%		**Social science (e.g., psychologist, sociologist)**	0	0%
Earth, atmospheric or oceanic science	0	0%		**Business**	1	3%
Agricultural science	1	3%		**Law**	0	0%
Environmental science	0	0%		**English/language arts**	0	0%
Computer science	2	6%		**Farming**	0	0%
Technology	1	3%		**Military, police, or security**	0	0%
Engineering	5	16%		**Art (e.g., writing, dancing, painting, etc.)**	0	0%

Mathematics or statistics	1	3%		Skilled trade (carpenter, electrician, plumber, etc.)	0	0%
Teaching, STEM	0	0%		Other	2	6%
				Total	**32**	**100%**

Note. Other = "Physician researcher," & "Computer Engineering"

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	0	0%
up to 25% of the time	0	0%
up to 50% of the time	1	3%
up to 75% of the time	9	29%
up to 100% of the time	21	68%
Total	**31**	**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 (90%)	3 (10%)	0 (0%)	0 (0%)	0 (0%)	31	**1.00**	0.00
eCybermission	26 (84%)	4 (13%)	1 (3%)	0 (0%)	0 (0%)	31	**1.20**	0.45
Junior Solar Sprint (JSS)	28 (90%)	3 (10%)	0 (0%)	0 (0%)	0 (0%)	31	**1.00**	0.00
Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	23 (74%)	5 (16%)	2 (6%)	0 (0%)	1 (3%)	31	**1.63**	1.06
Junior Science & Humanities Symposium	0 (0%)	1 (3%)	18 (58%)	5 (16%)	7 (23%)	31	**2.58**	0.89
Gains in the Education of Mathematics and Science (GEMS)	24 (77%)	6 (19%)	0 (0%)	1 (3%)	0 (0%)	31	**1.29**	0.76
GEMS Near Peers	25 (83%)	5 (17%)	0 (0%)	0 (0%)	0 (0%)	30	**1.00**	0.00
UNITE	24 (80%)	3 (10%)	0 (0%)	0 (0%)	3 (10%)	30	**2.50**	1.64
Science & Engineering Apprenticeship Program (SEAP)	19 (61%)	10 (32%)	0 (0%)	0 (0%)	2 (6%)	31	**1.50**	1.17
Research & Engineering Apprenticeship Program (REAP)	20 (65%)	9 (29%)	0 (0%)	0 (0%)	2 (6%)	31	**1.55**	1.21
High School Apprenticeship Program (HSAP)	23 (79%)	5 (17%)	0 (0%)	0 (0%)	1 (3%)	29	**1.50**	1.22
College Qualified Leaders (CQL)	26 (84%)	5 (16%)	0 (0%)	0 (0%)	0 (0%)	31	**1.00**	0.00

Undergraduate Research Apprenticeship Program (URAP)	23 (74%)	6 (19%)	0 (0%)	0 (0%)	2 (6%)	31	**1.75**	1.39
Science Mathematics, and Research for Transformation (SMART) College Scholarship	14 (45%)	13 (42%)	0 (0%)	2 (6%)	2 (6%)	31	**1.59**	1.12
National Defense Science & Engineering Graduate (NDSEG) Fellowship	24 (77%)	5 (16%)	0 (0%)	1 (3%)	1 (3%)	31	**1.71**	1.25

Note. Response scale: **0** = "Never heard of it," (excluded from analysis), **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	13 (43%)	9 (30%)	5 (17%)	3 (10%)	30	**1.93**	1.01
eCYBERMISSION	11 (37%)	11 (37%)	4 (13%)	4 (13%)	30	**2.03**	1.03
Junior Solar Sprint (JSS)	13 (43%)	9 (30%)	4 (13%)	4 (13%)	30	**1.97**	1.07
Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	11 (37%)	9 (30%)	5 (17%)	5 (17%)	30	**2.13**	1.11
Junior Science & Humanities Symposium	2 (7%)	2 (7%)	2 (7%)	24 (80%)	30	**3.60**	0.89
Gains in the Education of Mathematics and Science (GEMS)	9 (30%)	11 (37%)	3 (10%)	7 (23%)	30	**2.27**	1.14
GEMS Near Peers	12 (40%)	8 (27%)	5 (17%)	5 (17%)	30	**2.10**	1.12
UNITE	13 (45%)	8 (28%)	5 (17%)	3 (10%)	29	**1.93**	1.03
Science & Engineering Apprenticeship Program (SEAP)	7 (23%)	8 (27%)	4 (13%)	11 (37%)	30	**2.63**	1.22
Research & Engineering Apprenticeship Program (REAP)	7 (23%)	9 (30%)	3 (10%)	11 (37%)	30	**2.60**	1.22
High School Apprenticeship Program (HSAP)	7 (24%)	9 (31%)	4 (14%)	9 (31%)	29	**2.52**	1.18
College Qualified Leaders (CQL)	8 (28%)	8 (28%)	6 (21%)	7 (24%)	29	**2.41**	1.15
Undergraduate Research Apprenticeship Program (URAP)	5 (17%)	9 (30%)	4 (13%)	12 (40%)	30	**2.77**	1.17
Science Mathematics, and Research for Transformation (SMART) College Scholarship	2 (7%)	5 (17%)	5 (17%)	18 (60%)	30	**3.30**	0.99
National Defense Science & Engineering Graduate (NDSEG) Fellowship	7 (23%)	8 (27%)	4 (13%)	11 (37%)	30	**2.63**	1.22

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 JSHS?

	Freq.	%
None	0	0%
1	0	0%
2	0	0%

3	5	16%
4	2	6%
5 or more	24	77%
Total	**31**	**100%**

How many Department of Defense (DoD) STEM jobs/careers did you learn about during JSHS?		
	Freq.	**%**
None	0	0%
1	0	0%
2	2	6%
3	4	13%
4	2	6%
5 or more	23	74%
Total		**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	0 (0%)	0 (0%)	0 (0%)	14 (45%)	17 (55%)	31	**4.55**	0.51
DoD researchers develop new, cutting edge technologies	0 (0%)	0 (0%)	0 (0%)	13 (42%)	18 (58%)	31	**4.58**	0.50
DoD researchers support non-defense related advancements in science and technology	0 (0%)	2 (6%)	3 (10%)	12 (39%)	14 (45%)	31	**4.23**	0.88
DoD researchers solve real-world problems	0 (0%)	0 (0%)	0 (0%)	8 (26%)	23 (74%)	31	**4.74**	0.44
DoD research is valuable to society	0 (0%)	0 (0%)	1 (3%)	8 (26%)	22 (71%)	31	**4.68**	0.54

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 JSHS?							
	1	**2**	**3**	**4**	**n**	**Avg.**	**SD**
I am more confident in my STEM knowledge, skills, and abilities	0 (0%)	4 (13%)	18 (60%)	8 (27%)	30	**3.13**	0.63
I am more interested in participating in STEM activities outside of school requirements	1 (3%)	7 (23%)	15 (50%)	7 (23%)	30	**2.93**	0.78
I am more aware of other AEOPs	3 (10%)	1 (3%)	10 (33%)	16 (53%)	30	**3.30**	0.95
I am more interested in participating in other AEOPs	5 (17%)	1 (3%)	10 (33%)	14 (47%)	30	**3.10**	1.09

I am more interested in taking STEM classes in school	1 (3%)	11 (37%)	13 (43%)	5 (17%)	30	**2.73**	0.78
I am more interested in attending college	3 (10%)	13 (43%)	8 (27%)	6 (20%)	30	**2.57**	0.94
I am more interested in earning a STEM degree in college	2 (7%)	11 (37%)	11 (37%)	6 (20%)	30	**2.70**	0.88
I am more interested in pursuing a STEM career	2 (7%)	7 (23%)	15 (50%)	6 (20%)	30	**2.83**	0.83
I am more aware of DoD STEM research and careers	0 (0%)	1 (3%)	8 (27%)	21 (70%)	30	**3.67**	0.55
I have a greater appreciation of DoD STEM research and careers	1 (3%)	1 (3%)	11 (37%)	17 (57%)	30	**3.47**	0.73
I am more interested in pursuing a STEM career with the DoD	4 (13%)	1 (3%)	11 (37%)	14 (47%)	30	**3.17**	1.02

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

Regional 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? (Avg. = , SD =)		
	Freq.	%
4th	0	0%
5th	0	0%
6th	0	0%
7th	0	0%
8th	0	0%
9th	1	1%
10th	6	6%
11th	22	21%
12th	53	51%
College freshman	21	20%
College sophomore	0	0%
College junior	0	0%
College senior	0	0%
Graduate program	0	0%
Other (specify)	0	0%
Choose not to report	0	0%
Total	103	100%

What is your gender?		
	Freq.	%
Male	31	29%
Female	73	69%
Choose not to report	2	2%
Total	106	100%

What is your race or ethnicity?		
	Freq.	%
Hispanic or Latino	18	17%
Asian	18	17%

Black or African American	1	1%
Native American or Alaska Native	0	0%
Native Hawaiian or Other Pacific Islander	0	0%
White	59	56%
Other race or ethnicity (specify):	5	5%
Choose not to report	5	5%
Total	**106**	**100%**

Note. Other = "Persian" (n = 2), "Lebanese," "Mixed," and "Afghan."

Do you qualify for free or reduced lunches at school?		
	Freq.	**%**
Yes	20	19%
No	75	71%
Choose not to report	11	10%
Total	**106**	**100%**

Which best describes the location of your school?		
	Freq.	**%**
Frontier or reservation	1	1%
Rural (country)	18	17%
Suburban	66	62%
Urban (city)	21	20%
Total	**106**	**100%**

What kind of school do you attend?		
	Freq.	**%**
Public school	92	87%
Private school	9	8%
Home school	0	0%
Online school	0	0%
Department of Defense school (DoDDS or DoDEA)	5	5%
Total	**106**	**100%**

What is the highest competition level you personally achieved in your JSHS participation this year? (Select ONE)		
	Freq.	**%**
Regional Oral Presenter	34	33%
Regional Poster Presenter (competitive)	18	17%
Regional Poster Presenter (non-competitive)	5	5%
Non-presenting Regional Participant	47	45%
Total	**104**	**100%**

In which JSHS competition category did you present your research? (Select ONE)		
	Freq.	**%**
I did not present my research	39	38%
Chemistry	8	8%
Computer Science & Mathematics	2	2%
Engineering & Technology	9	9%
Environmental Science	15	15%
Life Science	11	11%
Medicine, Health, & Behavioral Science	12	12%
Physical Science	3	3%
Social Science	4	4%
Total	**103**	**100%**

In which REGIONAL JSHS event did you participate? (Select ONE)						
	Freq.	**%**			**Freq.**	**%**
Alabama	0	0%		**New Jersey—North New Jersey**	10	10%
Alaska	7	7%		**New York—Long Island**	3	3%
Arkansas	1	1%		**New York—Metro**	3	3%
California—Northern California & Western Nevada	35	34%		**New York—Upstate**	2	2%
California—Southern California	0	0%		**North Carolina**	2	2%
Connecticut	9	9%		**North Central—Minnesota, North Dakota, South Dakota**	0	0%
DoD Dependent Schools-Europe	4	4%		**New England—Northern New England**	0	0%
DoD Dependent Schools-Pacific	0	0%		**New England—Southern New England**	0	0%

District of Columbia	0	0%		**Ohio**	0	0%
Florida	0	0%		**Oregon**	0	0%
Georgia	2	2%		**Pennsylvania**	1	1%
Hawaii	0	0%		**Puerto Rico**	5	5%
Illinois	8	8%		**South Carolina**	2	2%
Indiana	0	0%		**Southwest**	1	1%
Intermountain—Colorado, Montana, Idaho, Nevada, Utah	0	0%		**Tennessee**	0	0%
Iowa	3	3%		**Texas**	0	0%
Kansas—Nebraska—Oklahoma	0	0%		**Virginia**	3	3%
Kentucky	0	0%		**Washington**	0	0%
Maryland	0	0%		**West Virginia**	0	0%
Michigan—Southeastern Michigan	0	0%		**Wisconsin-Western Wisconsin & Upper Michigan**	1	1%
Mississippi	0	0%		**Wisconsin**	0	0%
Missouri	0	0%		**Wyoming—Eastern Colorado**	0	0%
New Jersey--Monmouth	0	0%				
				Total	**102**	**100%**

How did you learn about JSHS? (Check all that apply)						
	Freq.	**%**			**Freq.**	**%**
Army Educational Outreach Program (AEOP) website	1	1%		**Extended family member (e.g., grandparents, aunts, uncles, cousins)**	0	0%
JSHS website	8	8%		**Friend of the family**	0	0%
Facebook, Twitter, Pinterest, or other social media	0	0%		**Teacher or professor**	93	88%
School or university newsletter or email	14	13%		**Guidance counselor**	1	1%
News story or other media coverage	0	0%		**Mentor from JSHS**	4	4%
Another past participant of JSHS	12	11%		**Someone who works at an Army laboratory**	0	0%
Friend	8	8%		**Someone who works with the Department of Defense**	1	1%
Immediate family member (e.g., mother, father, siblings)	6	6%		**Other (specify):**	4	4%
				Total	**106**	**100%**

Note. Other = “Regional JSHS web site,” “Teacher” (n = 2), “Regional Director”.

How motivating were the following factors in your decision to participate in JSHS?	1	2	3	4	5	n	Avg.	SD
Teacher or professor encouragement	4 (4%)	3 (3%)	12 (12%)	32 (31%)	52 (50%)	103	**4.21**	1.03
An academic requirement or school grade	37 (36%)	12 (12%)	18 (17%)	14 (14%)	22 (21%)	103	**2.73**	1.58
Desire to learn something new or interesting	8 (8%)	5 (5%)	21 (20%)	35 (34%)	34 (33%)	103	**3.80**	1.18
The program mentor(s)	23 (22%)	10 (10%)	27 (26%)	21 (20%)	22 (21%)	103	**3.09**	1.44
Résumé or college application building	10 (10%)	15 (15%)	24 (23%)	22 (21%)	32 (31%)	103	**3.50**	1.33
Networking opportunities	24 (24%)	12 (12%)	25 (25%)	16 (16%)	25 (25%)	102	**3.06**	1.49
Interest in science, technology, engineering, or mathematics (STEM)	7 (7%)	2 (2%)	18 (17%)	26 (25%)	50 (49%)	103	**4.07**	1.17
Interest in STEM careers with the Army	47 (46%)	15 (15%)	26 (25%)	7 (7%)	8 (8%)	103	**2.17**	1.29
Having fun	10 (10%)	12 (12%)	26 (25%)	29 (28%)	25 (25%)	102	**3.46**	1.26
Earning money over the summer	51 (50%)	10 (10%)	20 (20%)	11 (11%)	10 (10%)	102	**2.21**	1.41
Opportunity to do something with friends	25 (24%)	22 (21%)	22 (21%)	13 (13%)	21 (20%)	103	**2.83**	1.46
Opportunity to use advanced laboratory technology	27 (26%)	12 (12%)	22 (21%)	13 (13%)	29 (28%)	103	**3.05**	1.56
Desire to expand laboratory or research skills	10 (10%)	9 (9%)	19 (18%)	26 (25%)	39 (38%)	103	**3.73**	1.32
Learning in ways that are not possible in school	7 (7%)	7 (7%)	24 (23%)	21 (20%)	44 (43%)	103	**3.85**	1.24
Serving the community or country	21 (20%)	14 (14%)	25 (24%)	21 (20%)	22 (21%)	103	**3.09**	1.42
Parent encouragement	24 (24%)	16 (16%)	23 (23%)	15 (15%)	24 (24%)	102	**2.99**	1.49
Exploring a unique work environment	15 (15%)	7 (7%)	24 (24%)	21 (21%)	34 (34%)	101	**3.51**	1.40
Other (specify)	12 (48%)	0 (0%)	5 (20%)	0 (0%)	8 (32%)	25	**2.68**	1.80

Note. Response scale: **1** = "Not at all motivating," **2** = "Slightly motivating," **3** = "Somewhat motivating," **4** = "Very motivating," **5** = "Extremely motivating". Other = "The new people I have met while in the research,"

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	9 (9%)	12 (12%)	24 (24%)	25 (25%)	31 (31%)	101	**3.56**	1.28
Apply STEM knowledge to real life situations	11 (11%)	16 (16%)	27 (27%)	29 (29%)	17 (17%)	100	**3.25**	1.23
Learn about cutting-edge STEM research	14 (14%)	18 (18%)	42 (42%)	20 (20%)	5 (5%)	99	**2.84**	1.07
Learn about different STEM careers	17 (17%)	22 (22%)	39 (39%)	16 (16%)	5 (5%)	99	**2.70**	1.09
Interact with STEM professionals	38 (38%)	18 (18%)	31 (31%)	9 (9%)	5 (5%)	101	**2.26**	1.20

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 JSHS this year?

	1	2	3	4	5	n	Avg.	SD
Learn about new science, technology, engineering, or mathematics (STEM) topics	13 (13%)	8 (8%)	24 (25%)	15 (15%)	37 (38%)	97	**3.57**	1.41
Apply STEM knowledge to real life situations	16 (16%)	10 (10%)	27 (28%)	23 (24%)	21 (22%)	97	**3.24**	1.35
Learn about cutting-edge STEM research	16 (16%)	10 (10%)	29 (30%)	16 (16%)	26 (27%)	97	**3.27**	1.40
Learn about different STEM careers	18 (19%)	13 (14%)	25 (26%)	15 (16%)	25 (26%)	96	**3.17**	1.44
Interact with STEM professionals	17 (18%)	11 (11%)	26 (27%)	14 (14%)	29 (30%)	97	**3.28**	1.45

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	11 (11%)	10 (10%)	27 (27%)	44 (44%)	9 (9%)	101	**3.30**	1.12
Participate in hands-on STEM activities	11 (11%)	16 (16%)	30 (30%)	34 (34%)	9 (9%)	100	**3.14**	1.14
Work as part of a team	9 (9%)	10 (10%)	32 (32%)	38 (38%)	12 (12%)	101	**3.34**	1.10
Communicate with other students about STEM	13 (13%)	16 (16%)	31 (31%)	23 (23%)	18 (18%)	101	**3.17**	1.27

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 JSHS this year?

	1	2	3	4	5	n	Avg.	SD
Practice using laboratory or field techniques, procedures, and tools	28 (29%)	8 (8%)	26 (27%)	19 (20%)	16 (16%)	97	**2.87**	1.45
Participate in hands-on STEM activities	26 (27%)	11 (11%)	25 (26%)	16 (16%)	19 (20%)	97	**2.91**	1.47
Work as part of a team	19 (20%)	22 (23%)	23 (24%)	15 (15%)	18 (19%)	97	**2.91**	1.39
Communicate with other students about STEM	15 (15%)	13 (13%)	26 (27%)	14 (14%)	29 (30%)	97	**3.30**	1.42

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	6 (6%)	12 (12%)	29 (30%)	39 (40%)	12 (12%)	98	**3.40**	1.05
Design an investigation	11 (11%)	12 (12%)	52 (53%)	19 (19%)	4 (4%)	98	**2.93**	0.97
Carry out an investigation	9 (9%)	7 (7%)	48 (49%)	29 (30%)	4 (4%)	97	**3.12**	0.95
Analyze and interpret data or information	7 (7%)	6 (6%)	35 (36%)	39 (40%)	10 (10%)	97	**3.40**	1.01
Draw conclusions from an investigation	9 (9%)	5 (5%)	37 (38%)	38 (39%)	9 (9%)	98	**3.34**	1.03

Come up with creative explanations or solutions	10 (10%)	9 (9%)	38 (39%)	30 (31%)	11 (11%)	98	**3.23**	1.10
Build (or simulate) something	13 (13%)	17 (17%)	48 (49%)	15 (15%)	5 (5%)	98	**2.82**	1.02

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 JSHS this year?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Pose questions or problems to investigate	18 (19%)	17 (18%)	20 (22%)	23 (25%)	15 (16%)	93	**3.00**	1.37
Design an investigation	21 (23%)	20 (22%)	25 (27%)	19 (20%)	8 (9%)	93	**2.71**	1.26
Carry out an investigation	22 (24%)	17 (18%)	27 (29%)	16 (17%)	10 (11%)	92	**2.73**	1.30
Analyze and interpret data or information	15 (16%)	20 (22%)	22 (24%)	23 (25%)	13 (14%)	93	**2.99**	1.30
Draw conclusions from an investigation	18 (19%)	19 (20%)	22 (24%)	21 (23%)	13 (14%)	93	**2.91**	1.33
Come up with creative explanations or solutions	16 (17%)	17 (18%)	23 (25%)	20 (22%)	17 (18%)	93	**3.05**	1.35
Build (or simulate) something	18 (20%)	26 (28%)	25 (27%)	16 (17%)	7 (8%)	92	**2.65**	1.20

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

How USEFUL were each of the following JSHS resources provided at JSHS.org?								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
National JSHS Groundrules for Student Presentations	36 (38%)	1 (1%)	12 (13%)	13 (14%)	32 (34%)	94	**3.31**	0.86
Paper Submissions and Competition Deadlines	31 (33%)	0 (0%)	11 (12%)	17 (18%)	35 (37%)	94	**3.38**	0.77
Sample Papers	39 (41%)	3 (3%)	24 (26%)	8 (9%)	20 (21%)	94	**2.82**	1.00
Oral Presentation Tips	41 (44%)	4 (4%)	15 (16%)	12 (13%)	22 (23%)	94	**2.98**	1.01
Selected Articles - Conducting Research	45 (48%)	2 (2%)	16 (17%)	11 (12%)	20 (21%)	94	**3.00**	0.96

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

Rate how the following items impacted your awareness of Army Educational Outreach Programs (AEOPs) during JSHS:								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
JSHS website	44 (47%)	8 (9%)	14 (15%)	9 (10%)	18 (19%)	93	**2.76**	1.13
AEOP website	64 (69%)	8 (9%)	14 (15%)	5 (5%)	2 (2%)	93	**2.03**	0.87
AEOP social media	66 (71%)	11 (12%)	12 (13%)	2 (2%)	2 (2%)	93	**1.81**	0.88
AEOP brochure	56 (60%)	7 (8%)	12 (13%)	7 (8%)	11 (12%)	93	**2.59**	1.12
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat)	64 (69%)	8 (9%)	11 (12%)	6 (6%)	4 (4%)	93	**2.21**	1.01
Army STEM Career Magazine	64 (70%)	10 (11%)	12 (13%)	3 (3%)	3 (3%)	92	**1.96**	0.96

My mentor(s)	46 (49%)	12 (13%)	14 (15%)	8 (9%)	13 (14%)	93	**2.47**	1.16
Invited speakers or "career" events	39 (42%)	10 (11%)	16 (17%)	12 (13%)	16 (17%)	93	**2.63**	1.10
Participation in JSHS	31 (33%)	7 (8%)	17 (18%)	8 (9%)	30 (32%)	93	**2.98**	1.11

Note. Response scale: **0** = "Did Not Experience" (excluded from analysis), **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 JSHS:

	0	1	2	3	4	n	Avg.	SD
JSHS website	40 (44%)	11 (12%)	15 (16%)	7 (8%)	18 (20%)	91	**2.63**	1.18
AEOP website	61 (68%)	8 (9%)	11 (12%)	6 (7%)	4 (4%)	90	**2.21**	1.01
AEOP social media	64 (70%)	8 (9%)	11 (12%)	5 (5%)	4 (4%)	92	**2.18**	1.02
AEOP brochure	55 (60%)	7 (8%)	11 (12%)	7 (8%)	12 (13%)	92	**2.65**	1.14
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat)	64 (70%)	9 (10%)	11 (12%)	3 (3%)	5 (5%)	92	**2.14**	1.08
Army STEM Career Magazine	63 (68%)	9 (10%)	12 (13%)	4 (4%)	4 (4%)	92	**2.10**	1.01
My mentor(s)	42 (46%)	13 (14%)	18 (20%)	9 (10%)	9 (10%)	91	**2.29**	1.06
Invited speakers or "career" events	35 (38%)	8 (9%)	16 (17%)	17 (18%)	16 (17%)	92	**2.72**	1.03
Participation in JSHS	32 (35%)	6 (7%)	16 (17%)	9 (10%)	29 (32%)	92	**3.02**	1.08

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

The following activities were common to many Regional JSHS programs across the nation. How SATISFIED were you with each of the following REGIONAL JSHS program activities? If your Regional JSHS event did not have a given activity, select "Did Not Experience"

	0	1	2	3	4	n	Avg.	SD
Student Oral Presentations	15 (16%)	1 (1%)	7 (8%)	17 (19%)	51 (56%)	91	**3.55**	0.72
Student Poster Presentations	34 (37%)	2 (2%)	10 (11%)	19 (21%)	26 (29%)	91	**3.21**	0.86
Judging Process	18 (20%)	3 (3%)	15 (16%)	25 (27%)	30 (33%)	91	**3.12**	0.88
Feedback from Judges	22 (24%)	10 (11%)	21 (23%)	15 (16%)	23 (25%)	91	**2.74**	1.08
Feedback from VIPs and Peers	29 (32%)	11 (12%)	20 (22%)	13 (14%)	18 (20%)	91	**2.61**	1.09
Invited Speaker Presentations	28 (31%)	4 (4%)	8 (9%)	16 (18%)	33 (37%)	89	**3.28**	0.93
Panel or Roundtable Discussions	48 (53%)	1 (1%)	7 (8%)	16 (18%)	18 (20%)	90	**3.21**	0.81
Career Exhibits	57 (63%)	1 (1%)	12 (13%)	7 (8%)	14 (15%)	91	**3.00**	0.95
Tours or Field Trips	36 (40%)	3 (3%)	4 (4%)	23 (25%)	25 (27%)	91	**3.27**	0.83
Team Building Activities	54 (59%)	4 (4%)	7 (8%)	12 (13%)	14 (15%)	91	**2.97**	1.01
Social Events	37 (41%)	5 (5%)	11 (12%)	19 (21%)	19 (21%)	91	**2.96**	0.97

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

Which of the following best describes your primary research mentor?		
	Freq.	**%**
I did not have a research mentor	16	17%
Teacher	58	62%
Coach	0	0%
Parent	3	3%
Club or activity leader (School club, Boy/Girls Scouts)	0	0%
STEM researcher (university, industry, or DoD/government employee)	16	17%
Other (specify)	1	1%
Total	**94**	**100%**

Note. Other = "Doctor".

Which of the following statements best reflects the input you had into your project initially?		
	Freq.	**%**
I did not have a project	19	20%
I was assigned a project by my mentor	5	5%
I worked with my mentor to design a project	21	23%
I had a choice among various projects suggested by my mentor	7	8%
I worked with my mentor and members of a research team to design a project	9	10%
I designed the entire project on my own	32	34%
Total	**93**	**100%**

Which of the following statements best reflects the availability of your mentor?		
	Freq.	**%**
I did not have a mentor	21	22%
The mentor was never available	2	2%
The mentor was available less than half of the time	10	11%
The mentor was available about half of the time of my project	4	4%
The mentor was available more than half of the time	13	14%
The mentor was always available	44	47%
Total	**94**	**100%**

Which of the following statements best reflects your working as part of a group or team?		
	Freq.	**%**
I did not have a project	20	21%
I worked alone (or alone with my research mentor)	49	52%
I worked with others in a shared laboratory or other space, but we worked on different projects	14	15%
I worked alone on my project, and I met with others regularly for general reporting or discussion	3	3%
I worked alone on a project that was closely connected with projects of others in my group	2	2%
I worked with a group who all worked on the same project	6	6%
Total	**94**	**100%**

How SATISFIED were you with each of the following?								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
My working relationship with my mentor	25 (27%)	2 (2%)	8 (9%)	5 (5%)	54 (57%)	94	**3.61**	0.81
My working relationship with the group or team	65 (69%)	2 (2%)	5 (5%)	5 (5%)	17 (18%)	94	**3.28**	1.00
The amount of time I spent doing meaningful research	18 (19%)	2 (2%)	13 (14%)	20 (22%)	40 (43%)	93	**3.31**	0.85
The amount of time I spent with my research mentor	25 (27%)	4 (4%)	16 (17%)	17 (18%)	32 (34%)	94	**3.12**	0.96
The research experience overall	17 (18%)	3 (3%)	8 (9%)	13 (14%)	52 (56%)	93	**3.50**	0.84

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

Which of the following statements apply to your research experience? (choose all that apply)						
	Freq.	**%**			**Freq.**	**%**
I presented a talk or poster to other students or faculty	58	55%		I will present a talk or poster to other students or faculty	9	8%
I presented a talk or poster at a professional symposium or conference	35	33%		I will present a talk or poster at a professional symposium or conference	8	8%
I attended a symposium or conference	49	46%		I will attend a symposium or conference	13	12%
I wrote or co-wrote a paper that was/will be published in a research journal	8	8%		I will write or co-write a paper that was/will be published in a research journal	1	1%
I wrote or co-wrote a technical paper or patent	5	5%		I will write or co-write a technical paper or patent	4	4%
				I won an award or scholarship based on my research	32	30%

					Total	106	100%

The list below describes 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 for JSHS:				
	Yes - my mentor used this strategy with me		No - my mentor did not use this strategy with me	
	Freq.	%	Freq.	%
Helped me become aware of the roles STEM play in my everyday life	45	62%	28	38%
Helped me understand how STEM can help me improve my community	43	60%	29	40%
Used teaching/mentoring activities that addressed my learning style	47	64%	26	36%
Provided me with extra support when I needed it	58	79%	15	21%
Encouraged me to exchange ideas with others whose backgrounds or viewpoints are different from mine	50	69%	22	31%
Allowed me to work on a collaborative project as a member of a team	29	40%	43	60%
Helped me practice a variety of STEM skills with supervision	49	69%	22	31%
Gave me constructive feedback to improve my STEM knowledge, skills, or abilities	56	78%	16	22%
Gave me guidance about educational pathways that would prepare me for a STEM career	42	59%	29	41%
Recommended Army Educational Outreach Programs that match my interests	14	20%	57	80%
Discussed STEM career opportunities with DoD or other government agencies	17	24%	54	76%

Which category best describes the focus of your JSHS experience?		
	Freq.	%
Science	74	80%
Technology	5	5%
Engineering	12	13%
Mathematics	1	1%
Total	92	100%

AS A RESULT OF YOUR JSHS 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	9 (10%)	3 (3%)	31 (34%)	26 (29%)	21 (23%)	90	**3.52**	1.18
Knowledge of research conducted in a STEM topic or field	9 (10%)	4 (4%)	25 (28%)	30 (33%)	22 (24%)	90	**3.58**	1.20
Knowledge of research processes, ethics, and rules for conduct in STEM	11 (12%)	7 (8%)	27 (30%)	25 (28%)	20 (22%)	90	**3.40**	1.26
Knowledge of how professionals work on real problems in STEM	10 (11%)	8 (9%)	26 (29%)	21 (23%)	25 (28%)	90	**3.48**	1.29
Knowledge of what everyday research work is like in STEM	11 (12%)	8 (9%)	22 (25%)	25 (28%)	23 (26%)	89	**3.46**	1.31

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

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

	1	2	3	4	5	n	Avg.	SD
Asking questions based on observations of real-world phenomena	8 (11%)	5 (7%)	23 (32%)	15 (21%)	20 (28%)	71	**3.48**	1.29
Asking a question (about a phenomenon) that can be answered with one or more investigations	5 (7%)	9 (13%)	18 (25%)	21 (30%)	18 (25%)	71	**3.54**	1.21
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	6 (8%)	5 (7%)	16 (23%)	21 (30%)	23 (32%)	71	**3.70**	1.24
Making a model to represent the key features and functions of an observed phenomenon	13 (18%)	6 (8%)	17 (24%)	16 (23%)	19 (27%)	71	**3.31**	1.43
Deciding what type of data to collect in order to answer a question	6 (9%)	7 (10%)	20 (29%)	16 (23%)	21 (30%)	70	**3.56**	1.26
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	8 (11%)	6 (8%)	23 (32%)	13 (18%)	21 (30%)	71	**3.46**	1.31
Identifying the limitations of data collected in an investigation	10 (14%)	7 (10%)	20 (29%)	15 (21%)	18 (26%)	70	**3.34**	1.35
Carrying out procedures for an investigation and recording data accurately	9 (13%)	5 (7%)	21 (30%)	10 (14%)	24 (35%)	69	**3.51**	1.38
Testing how changing one variable affects another variable, in order to understand relationships between variables	12 (17%)	5 (7%)	18 (26%)	14 (20%)	21 (30%)	70	**3.39**	1.43
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	16 (23%)	10 (14%)	18 (26%)	10 (14%)	16 (23%)	70	**3.00**	1.46
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	11 (16%)	6 (9%)	22 (31%)	13 (19%)	18 (26%)	70	**3.30**	1.37
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	10 (14%)	4 (6%)	18 (26%)	19 (28%)	18 (26%)	69	**3.45**	1.33

Using mathematics to analyze numeric data	11 (15%)	11 (15%)	14 (20%)	19 (27%)	16 (23%)	71	**3.25**	1.38
Supporting a proposed explanation (for a phenomenon) with data from investigations	12 (17%)	6 (8%)	20 (28%)	12 (17%)	21 (30%)	71	**3.34**	1.42
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	11 (15%)	5 (7%)	22 (31%)	11 (15%)	22 (31%)	71	**3.39**	1.40
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	7 (10%)	8 (11%)	19 (27%)	16 (23%)	21 (30%)	71	**3.51**	1.30
Using data or interpretations from other researchers or investigations to improve an explanation	11 (15%)	5 (7%)	24 (34%)	10 (14%)	21 (30%)	71	**3.35**	1.38
Asking questions to understand the data and interpretations others use to support their explanations	11 (15%)	4 (6%)	21 (30%)	12 (17%)	23 (32%)	71	**3.45**	1.40
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	9 (13%)	5 (7%)	21 (30%)	15 (21%)	21 (30%)	71	**3.48**	1.33
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	8 (11%)	7 (10%)	21 (30%)	15 (21%)	20 (28%)	71	**3.45**	1.31
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	10 (14%)	7 (10%)	17 (24%)	17 (24%)	20 (28%)	71	**3.42**	1.37
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	9 (13%)	9 (13%)	16 (23%)	18 (25%)	19 (27%)	71	**3.41**	1.35
Integrating information from multiple sources to support your explanations of phenomena	7 (10%)	8 (11%)	22 (31%)	12 (17%)	21 (30%)	70	**3.46**	1.30
Communicating information about your investigations and explanations in different formats (e.g., orally, written, graphically, mathematically)	10 (14%)	5 (7%)	21 (30%)	13 (18%)	22 (31%)	71	**3.45**	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 JSHS EXPERIENCE, how much did you GAIN in the following areas?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Identifying real-world problems based on social, technological, or environmental issues	0 (0%)	3 (20%)	7 (47%)	2 (13%)	3 (20%)	15	**3.33**	1.05
Defining a problem that can be solved by developing a new or improved object, process, or system	0 (0%)	1 (7%)	9 (60%)	2 (13%)	3 (20%)	15	**3.47**	0.92

Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	0 (0%)	2 (13%)	8 (53%)	2 (13%)	3 (20%)	15	**3.40**	0.99
Making a model that represents the key features or functions of a solution to a problem	0 (0%)	1 (7%)	8 (53%)	3 (20%)	3 (20%)	15	**3.53**	0.92
Deciding what type of data to collect in order to test if a solution functions as intended	0 (0%)	2 (13%)	8 (53%)	2 (13%)	3 (20%)	15	**3.40**	0.99
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	0 (0%)	2 (13%)	8 (53%)	2 (13%)	3 (20%)	15	**3.40**	0.99
Identifying the limitations of the data collected in an investigation	0 (0%)	3 (20%)	8 (53%)	0 (0%)	4 (27%)	15	**3.33**	1.11
Carrying out procedures for an investigation and recording data accurately	0 (0%)	3 (21%)	8 (57%)	0 (0%)	3 (21%)	14	**3.21**	1.05
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	0 (0%)	2 (13%)	9 (60%)	1 (7%)	3 (20%)	15	**3.33**	0.98
Using computer-based models to investigate cause and effect relationships of a simulated solution	1 (7%)	2 (13%)	9 (60%)	1 (7%)	2 (13%)	15	**3.07**	1.03
Considering alternative interpretations of data when deciding if a solution functions as intended	0 (0%)	4 (27%)	7 (47%)	1 (7%)	3 (20%)	15	**3.20**	1.08
Displaying numeric data in charts or graphs to identify patterns and relationships	1 (7%)	3 (20%)	7 (47%)	2 (13%)	2 (13%)	15	**3.07**	1.10
Using mathematics to analyze numeric data	1 (7%)	3 (20%)	8 (53%)	1 (7%)	2 (13%)	15	**3.00**	1.07
Supporting a proposed solution (for a problem) with data from investigations	0 (0%)	4 (27%)	7 (47%)	0 (0%)	4 (27%)	15	**3.27**	1.16
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	1 (7%)	3 (20%)	6 (40%)	1 (7%)	4 (27%)	15	**3.27**	1.28
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	0 (0%)	2 (14%)	8 (57%)	0 (0%)	4 (29%)	14	**3.43**	1.09
Using data or interpretations from other researchers or investigations to improve a solution	0 (0%)	2 (13%)	7 (47%)	3 (20%)	3 (20%)	15	**3.47**	0.99
Asking questions to understand the data and interpretations others use to support their solutions	0 (0%)	5 (33%)	6 (40%)	1 (7%)	3 (20%)	15	**3.13**	1.13
Using data from investigations to defend an argument that conveys how a solution meets design criteria	0 (0%)	5 (33%)	7 (47%)	0 (0%)	3 (20%)	15	**3.07**	1.10
Deciding what additional data or information may be needed to find the best solution to a problem	0 (0%)	3 (20%)	7 (47%)	2 (13%)	3 (20%)	15	**3.33**	1.05
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	0 (0%)	3 (21%)	8 (57%)	0 (0%)	3 (21%)	14	**3.21**	1.05

	1	2	3	4	5	n	Avg.	SD
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	0 (0%)	4 (27%)	6 (40%)	1 (7%)	4 (27%)	15	**3.33**	1.18
Integrating information from multiple sources to support your solution to a problem	0 (0%)	3 (20%)	6 (40%)	3 (20%)	3 (20%)	15	**3.40**	1.06
Communicating information about your design processes and/or solutions in different formats (e.g., orally, written, graphically, mathematically)	1 (7%)	2 (13%)	7 (47%)	1 (7%)	4 (27%)	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 YOUR JSHS EXPERIENCE, how much did you GAIN in the following areas?								
	1	**2**	**3**	**4**	**5**	**n**	**Avg.**	**SD**
Learning to work independently	8 (10%)	3 (4%)	26 (31%)	22 (27%)	24 (29%)	83	**3.61**	1.22
Setting goals and reflecting on performance	8 (10%)	3 (4%)	21 (25%)	27 (33%)	24 (29%)	83	**3.67**	1.21
Persevering with a task	8 (10%)	2 (2%)	21 (25%)	23 (28%)	29 (35%)	83	**3.76**	1.24
Making changes when things do not go as planned	7 (8%)	4 (5%)	16 (19%)	25 (30%)	31 (37%)	83	**3.83**	1.23
Patience for the slow pace of research	10 (12%)	6 (7%)	21 (25%)	20 (24%)	26 (31%)	83	**3.55**	1.33
Working collaboratively with a team	29 (35%)	5 (6%)	21 (26%)	12 (15%)	15 (18%)	82	**2.74**	1.52
Communicating effectively with others	12 (15%)	4 (5%)	22 (28%)	17 (21%)	25 (31%)	80	**3.49**	1.38
Including others' perspectives when making decisions	15 (18%)	6 (7%)	19 (23%)	22 (27%)	21 (25%)	83	**3.34**	1.41
Sense of being part of a learning community	10 (12%)	8 (10%)	22 (27%)	18 (22%)	25 (30%)	83	**3.48**	1.34
Sense of contributing to a body of knowledge	9 (11%)	8 (10%)	22 (27%)	20 (24%)	24 (29%)	83	**3.51**	1.30
Building relationships with professionals in a field	12 (14%)	9 (11%)	20 (24%)	18 (22%)	24 (29%)	83	**3.40**	1.39
Connecting a topic or field and your personal values	12 (14%)	6 (7%)	18 (22%)	15 (18%)	32 (39%)	83	**3.59**	1.43

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

AS A RESULT OF YOUR JSHS 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	8 (10%)	11 (14%)	26 (32%)	6 (7%)	30 (37%)	81	**3.48**	1.37
Clarifying a STEM career path	9 (11%)	11 (14%)	28 (35%)	10 (12%)	23 (28%)	81	**3.33**	1.32
Sense of accomplishing something in STEM	6 (7%)	13 (16%)	26 (32%)	10 (12%)	26 (32%)	81	**3.46**	1.29
Building academic or professional credentials in STEM	10 (12%)	8 (10%)	28 (35%)	13 (16%)	22 (27%)	81	**3.36**	1.32
Readiness for more challenging STEM activities	6 (7%)	9 (11%)	27 (33%)	15 (19%)	24 (30%)	81	**3.52**	1.24
Confidence to do well in future STEM courses	6 (7%)	9 (11%)	25 (31%)	15 (19%)	26 (32%)	81	**3.57**	1.25

Confidence to contribute to STEM	5 (6%)	10 (12%)	29 (36%)	9 (11%)	28 (35%)	81	**3.56**	1.25
Thinking creatively about a STEM project or activity	6 (7%)	8 (10%)	25 (31%)	17 (21%)	25 (31%)	81	**3.58**	1.23
Trying out new ideas or procedures on my own in a STEM project or activity	6 (7%)	6 (7%)	28 (35%)	16 (20%)	25 (31%)	81	**3.59**	1.21
Feeling responsible for a STEM project or activity	8 (10%)	7 (9%)	27 (33%)	13 (16%)	26 (32%)	81	**3.52**	1.30
Feeling like a STEM professional	11 (14%)	15 (19%)	26 (32%)	8 (10%)	21 (26%)	81	**3.16**	1.36
Feeling like part of a STEM community	9 (11%)	11 (14%)	27 (33%)	6 (7%)	28 (35%)	81	**3.41**	1.38

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

AS A RESULT OF YOUR JSHS 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%)	0 (0%)	52 (63%)	12 (14%)	16 (19%)	83	**3.46**	0.93
Watch or read non-fiction STEM	5 (6%)	0 (0%)	44 (53%)	23 (28%)	11 (13%)	83	**3.42**	0.94
Look up STEM information at a library or on the internet	4 (5%)	1 (1%)	38 (46%)	26 (31%)	14 (17%)	83	**3.54**	0.95
Tinker with a mechanical or electrical device	5 (6%)	0 (0%)	45 (55%)	19 (23%)	13 (16%)	82	**3.43**	0.97
Work on solving mathematical or scientific puzzles	4 (5%)	2 (2%)	39 (47%)	20 (24%)	18 (22%)	83	**3.55**	1.02
Design a computer program or website	6 (7%)	1 (1%)	57 (69%)	11 (13%)	8 (10%)	83	**3.17**	0.89
Observe things in nature (plant growth, animal behavior, stars or planets, etc.)	3 (4%)	1 (1%)	34 (41%)	21 (25%)	24 (29%)	83	**3.75**	1.01
Talk with friends or family about STEM	3 (4%)	2 (2%)	32 (39%)	20 (24%)	25 (30%)	82	**3.76**	1.04
Mentor or teach other students about STEM	3 (4%)	2 (2%)	36 (43%)	19 (23%)	23 (28%)	83	**3.69**	1.02
Help with a community service project that relates to STEM	3 (4%)	2 (2%)	35 (42%)	16 (19%)	27 (33%)	83	**3.75**	1.06
Participate in a STEM club, student association, or professional organization	4 (5%)	2 (2%)	30 (36%)	25 (30%)	22 (27%)	83	**3.71**	1.04
Participate in STEM camp, fair, or competition	4 (5%)	3 (4%)	31 (37%)	21 (25%)	24 (29%)	83	**3.70**	1.08
Take an elective (not required) STEM class	5 (6%)	1 (1%)	32 (39%)	21 (25%)	24 (29%)	83	**3.70**	1.09
Work on a STEM project or experiment in a university or professional setting	5 (6%)	1 (1%)	32 (39%)	20 (24%)	25 (30%)	83	**3.71**	1.10
Receive an award or special recognition for STEM accomplishments	4 (5%)	2 (2%)	33 (40%)	21 (25%)	23 (28%)	83	**3.69**	1.06

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 JSHS?

	Freq.	%
Graduate from high school	13	16%
Go to a trade or vocational school	0	0%
Go to college for a little while	1	1%
Finish college (get a Bachelor's degree)	21	26%
Get more education after college	5	6%
Get a master's degree	11	13%
Get a Ph.D.	11	13%
Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)	10	12%
Get a combined M.D. / Ph.D.	7	9%
Get another professional degree (law, business, etc.)	3	4%
Total	**82**	**100%**

How far did you want to go in school AFTER participating in JSHS?

	Freq.	%
Graduate from high school	4	5%
Go to a trade or vocational school	0	0%
Go to college for a little while	0	0%
Finish college (get a Bachelor's degree)	7	8%
Get more education after college	7	8%
Get a master's degree	18	22%
Get a Ph.D.	21	25%
Get a medical-related degree (M.D.), veterinary degree (D.V.M), or dental degree (D.D.S)	8	10%
Get a combined M.D. / Ph.D.	14	17%
Get another professional degree (law, business, etc.)	4	5%
Total	**83**	**100%**

BEFORE JSHS, 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 JSHS)

	Freq.	%			Freq.	%
Undecided	16	19%		**Teaching, non-STEM**	3	4%
Science (no specific subject)	10	12%		**Medicine (e.g., doctor, dentist, veterinarian, etc.)**	14	17%

Physical science (e.g., physics, chemistry, astronomy, materials science)	0	0%		Health (e.g., nursing, pharmacy, technician, etc.)	1	1%
Biological science	8	10%		Social science (e.g., psychologist, sociologist)	3	4%
Earth, atmospheric or oceanic science	0	0%		Business	3	4%
Agricultural science	2	2%		Law	0	0%
Environmental science	2	2%		English/language arts	0	0%
Computer science	2	2%		Farming	0	0%
Technology	3	4%		Military, police, or security	1	1%
Engineering	6	7%		Art (e.g., writing, dancing, painting, etc.)	2	2%
Mathematics or statistics	0	0%		Skilled trade (carpenter, electrician, plumber, etc.)	1	1%
Teaching, STEM	2	2%		Other	4	5%
				Total	**83**	**100%**

Note. Other = “Ag Teaching,” “archaeology,” “cinema/filmmaking,” & “biotech industry-vaccine and drug production.”

AFTER JSHS, 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 JSHS)

	Freq.	%			Freq.	%
Undecided	8	10%		Teaching, non-STEM	2	2%
Science (no specific subject)	9	11%		Medicine (e.g., doctor, dentist, veterinarian, etc.)	16	19%
Physical science (e.g., physics, chemistry, astronomy, materials science)	2	2%		Health (e.g., nursing, pharmacy, technician, etc.)	3	4%
Biological science	9	11%		Social science (e.g., psychologist, sociologist)	1	1%
Earth, atmospheric or oceanic science	1	1%		Business	1	1%
Agricultural science	1	1%		Law	0	0%
Environmental science	3	4%		English/language arts	0	0%
Computer science	6	7%		Farming	0	0%
Technology	1	1%		Military, police, or security	1	1%
Engineering	10	12%		Art (e.g., writing, dancing, painting, etc.)	1	1%
Mathematics or statistics	0	0%		Skilled trade (carpenter, electrician, plumber, etc.)	2	2%
Teaching, STEM	3	4%		Other	3	4%
				Total	**83**	**100%**

Note. Other = “Ag Teaching,” “archaeology,” & “cinema/filmmaking.”

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	5	6%
up to 25% of the time	7	9%
up to 50% of the time	19	23%
up to 75% of the time	21	26%
up to 100% of the time	30	37%
Total	**82**	**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	69 (86%)	7 (9%)	4 (5%)	0 (0%)	0 (0%)	80	**1.36**	0.50
eCybermission	65 (81%)	10 (13%)	4 (5%)	1 (1%)	0 (0%)	80	**1.40**	0.63
Junior Solar Sprint (JSS)	66 (84%)	8 (10%)	3 (4%)	2 (3%)	0 (0%)	79	**1.54**	0.78
Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	65 (82%)	8 (10%)	5 (6%)	0 (0%)	1 (1%)	79	**1.57**	0.85
Junior Science & Humanities Symposium	23 (29%)	4 (5%)	37 (46%)	6 (8%)	10 (13%)	80	**2.39**	0.86
Gains in the Education of Mathematics and Science (GEMS)	65 (82%)	7 (9%)	7 (9%)	0 (0%)	0 (0%)	79	**1.50**	0.52
GEMS Near Peers	64 (82%)	10 (13%)	4 (5%)	0 (0%)	0 (0%)	78	**1.29**	0.47
UNITE	66 (84%)	9 (11%)	4 (5%)	0 (0%)	0 (0%)	79	**1.31**	0.48
Science & Engineering Apprenticeship Program (SEAP)	61 (77%)	11 (14%)	4 (5%)	0 (0%)	3 (4%)	79	**1.72**	1.13
Research & Engineering Apprenticeship Program (REAP)	60 (76%)	12 (15%)	5 (6%)	0 (0%)	2 (3%)	79	**1.58**	0.96
High School Apprenticeship Program (HSAP)	60 (76%)	14 (18%)	5 (6%)	0 (0%)	0 (0%)	79	**1.26**	0.45
College Qualified Leaders (CQL)	66 (85%)	8 (10%)	4 (5%)	0 (0%)	0 (0%)	78	**1.33**	0.49
Undergraduate Research Apprenticeship Program (URAP)	61 (77%)	13 (16%)	5 (6%)	0 (0%)	0 (0%)	79	**1.28**	0.46
Science Mathematics, and Research for Transformation (SMART) College Scholarship	57 (72%)	16 (20%)	5 (6%)	0 (0%)	1 (1%)	79	**1.36**	0.73
National Defense Science & Engineering Graduate (NDSEG) Fellowship	63 (80%)	11 (14%)	4 (5%)	1 (1%)	0 (0%)	79	**1.38**	0.62

Note. Response scale: **0** = “Never heard of it,” (excluded from analysis), **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	39 (49%)	21 (27%)	13 (16%)	6 (8%)	79	**1.82**	0.97
eCYBERMISSION	41 (53%)	19 (24%)	11 (14%)	7 (9%)	78	**1.79**	1.00
Junior Solar Sprint (JSS)	36 (46%)	20 (25%)	15 (19%)	8 (10%)	79	**1.94**	1.03
Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	37 (47%)	21 (27%)	13 (17%)	7 (9%)	78	**1.87**	1.00
Junior Science & Humanities Symposium	20 (25%)	12 (15%)	15 (19%)	33 (41%)	80	**2.76**	1.23
Gains in the Education of Mathematics and Science (GEMS)	35 (45%)	17 (22%)	14 (18%)	11 (14%)	77	**2.01**	1.11
GEMS Near Peers	36 (46%)	24 (30%)	11 (14%)	8 (10%)	79	**1.89**	1.00
UNITE	37 (47%)	24 (30%)	11 (14%)	7 (9%)	79	**1.85**	0.98
Science & Engineering Apprenticeship Program (SEAP)	29 (37%)	20 (26%)	16 (21%)	13 (17%)	78	**2.17**	1.11
Research & Engineering Apprenticeship Program (REAP)	34 (43%)	19 (24%)	14 (18%)	12 (15%)	79	**2.05**	1.11
High School Apprenticeship Program (HSAP)	30 (38%)	19 (24%)	17 (22%)	13 (16%)	79	**2.16**	1.11
College Qualified Leaders (CQL)	33 (42%)	18 (23%)	15 (19%)	13 (16%)	79	**2.10**	1.13
Undergraduate Research Apprenticeship Program (URAP)	28 (35%)	17 (21%)	21 (26%)	14 (18%)	80	**2.26**	1.12
Science Mathematics, and Research for Transformation (SMART) College Scholarship	26 (33%)	16 (20%)	22 (28%)	16 (20%)	80	**2.35**	1.14
National Defense Science & Engineering Graduate (NDSEG) Fellowship	36 (46%)	18 (23%)	11 (14%)	14 (18%)	79	**2.04**	1.15

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 JSHS?		
	Freq.	**%**
None	13	16%
1	3	4%
2	5	6%
3	14	17%
4	10	12%
5 or more	38	46%
Total	**83**	**100%**

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

	Freq.	%
None	33	40%
1	8	10%
2	6	7%
3	11	13%
4	4	5%
5 or more	21	25%
Total	**83**	**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	6 (8%)	0 (0%)	29 (36%)	21 (26%)	24 (30%)	80	**3.71**	1.13
DoD researchers develop new, cutting edge technologies	6 (8%)	1 (1%)	26 (33%)	21 (26%)	26 (33%)	80	**3.75**	1.15
DoD researchers support non-defense related advancements in science and technology	6 (8%)	0 (0%)	32 (40%)	19 (24%)	23 (29%)	80	**3.66**	1.12
DoD researchers solve real-world problems	6 (8%)	1 (1%)	25 (31%)	24 (30%)	24 (30%)	80	**3.74**	1.13
DoD research is valuable to society	5 (6%)	1 (1%)	27 (34%)	18 (23%)	29 (36%)	80	**3.81**	1.14

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 JSHS?							
	1	**2**	**3**	**4**	**n**	**Avg.**	**SD**
I am more confident in my STEM knowledge, skills, and abilities	7 (9%)	14 (18%)	36 (46%)	22 (28%)	79	**2.92**	0.90
I am more interested in participating in STEM activities outside of school requirements	5 (6%)	17 (22%)	35 (44%)	22 (28%)	79	**2.94**	0.87
I am more aware of other AEOPs	23 (29%)	9 (12%)	24 (31%)	22 (28%)	78	**2.58**	1.19
I am more interested in participating in other AEOPs	29 (37%)	9 (11%)	22 (28%)	19 (24%)	79	**2.39**	1.21
I am more interested in taking STEM classes in school	7 (9%)	27 (34%)	28 (35%)	17 (22%)	79	**2.70**	0.91
I am more interested in attending college	10 (13%)	29 (37%)	27 (34%)	13 (16%)	79	**2.54**	0.92
I am more interested in earning a STEM degree in college	9 (12%)	22 (28%)	29 (37%)	18 (23%)	78	**2.72**	0.95
I am more interested in pursuing a STEM career	9 (12%)	22 (28%)	28 (36%)	19 (24%)	78	**2.73**	0.96
I am more aware of DoD STEM research and careers	16 (20%)	8 (10%)	27 (34%)	28 (35%)	79	**2.85**	1.12
I have a greater appreciation of DoD STEM research and careers	19 (24%)	9 (12%)	25 (32%)	25 (32%)	78	**2.72**	1.16
I am more interested in pursuing a STEM career with the DoD	27 (34%)	10 (13%)	23 (29%)	19 (24%)	79	**2.43**	1.19

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

Appendix C

FY14 JSHS Mentor Questionnaire and Data Summaries

2014 Junior Science and Humanities Symposium: JSHS 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:

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)

- ❍ Parent
- ❍ 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
- ❍ University
- ❍ Private 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
- ❑ 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 did you teach while participating in JSHS?

- ❍ 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?

- ❑ Physical science (e.g., physics, chemistry, astronomy, materials science)
- ❑ Biological science
- ❑ Earth, atmospheric, or oceanic science
- ❑ Agricultural science
- ❑ Environmental science
- ❑ Computer science
- ❑ Technology
- ❑ Engineering
- ❑ Mathematics or statistics
- ❑ Medicine, Health, or Behavioral Science
- ❑ Social science (e.g., psychology, sociology, anthropology)
- ❑ 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 (e.g., physics, chemistry, astronomy, materials science, etc.)
- ❍ Biological science
- ❍ Earth, atmospheric, or oceanic science
- ❍ Agricultural science

- ❍ Environmental science
- ❍ Computer science
- ❍ Technology
- ❍ Engineering
- ❍ Mathematics or statistics
- ❍ Other (specify) ____________________
- ❍ Medicine (e.g., doctor, dentist, veterinarian, etc.)
- ❍ Health (e.g., nursing, pharmacy, technician, etc.)
- ❍ Social science (e.g., psychologist, sociologist, etc.)

Q14 In which Regional JSHS event did you participate? (Select ONE)

- ❍ Alabama
- ❍ Alaska
- ❍ Arkansas
- ❍ California—Northern California & Western Nevada
- ❍ California—Southern California
- ❍ Connecticut
- ❍ DoD Dependent Schools-Europe
- ❍ DoD Dependent Schools-Pacific
- ❍ District of Columbia
- ❍ Florida
- ❍ Georgia
- ❍ Hawaii
- ❍ Illinois
- ❍ Indiana
- ❍ Intermountain—Colorado, Montana, Idaho, Nevada, Utah
- ❍ Iowa
- ❍ Kansas—Nebraska—Oklahoma
- ❍ Kentucky
- ❍ Maryland
- ❍ Michigan—Southeastern Michigan
- ❍ Mississippi
- ❍ Missouri
- ❍ New Jersey--Monmouth
- ❍ New Jersey—North New Jersey
- ❍ New York—Long Island
- ❍ New York—Metro
- ❍ New York—Upstate
- ❍ North Carolina
- ❍ North Central—Minnesota, North Dakota, South Dakota
- ❍ New England—Northern New England
- ❍ New England—Southern New England
- ❍ Ohio
- ❍ Oregon
- ❍ Pennsylvania
- ❍ Puerto Rico
- ❍ South Carolina
- ❍ Southwest
- ❍ Tennessee
- ❍ Texas
- ❍ Virginia
- ❍ Washington
- ❍ West Virginia
- ❍ Wisconsin-Western Wisconsin & Upper Michigan
- ❍ Wisconsin
- ❍ Wyoming—Eastern Colorado

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

- ❍ Research Mentor
- ❍ Competition advisor
- ❍ Other (specify) ____________________

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

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

- ❑ Army Educational Outreach Program (AEOP) website
- ❑ JSHS website
- ❑ Facebook, Twitter, Pinterest, or other social media
- ❑ State or national educator conference
- ❑ School, university, or professional organization newsletter or email
- ❑ A news story or other media coverage
- ❑ Past JSHS participant
- ❑ A student
- ❑ A colleague
- ❑ A supervisor or superior
- ❑ JSHS event or site host/director
- ❑ Workplace communications
- ❑ Someone who works at an Army laboratory
- ❑ Someone who works with the Department of Defense
- ❑ Other (specify): ____________________
- ❑ STEM conference

Q18 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 heard of it	Once	Twice	Three or more times	Never
Camp Invention	❍	❍	❍	❍	❍
eCYBERMISSION	❍	❍	❍	❍	❍
Junior Solar Sprint (JSS)	❍	❍	❍	❍	❍
Engineering Encounters Bridge Design Contest (formerly West Point Bridge Design Contest) (EEBDC)	❍	❍	❍	❍	❍
Junior Science & Humanities Symposium	❍	❍	❍	❍	❍
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 USEFUL were each of the following JSHS supports provided at JSHS.org?

	Not at all	A little	Somewhat	Very much
National JSHS Groundrules for Student Presentations	❍	❍	❍	❍
Paper Submissions and Competition Deadlines	❍	❍	❍	❍
Sample Papers	❍	❍	❍	❍
Oral Presentation Tips	❍	❍	❍	❍
Selected Articles – Conducting Research	❍	❍	❍	❍

Q20 Which JSHS supports were MOST USEFUL to you? Why?

Q21 What JSHS supports could be improved? How?

Q22 The following activities were common to many Regional JSHS across the nation. How SATISFIED were you with each of the following REGIONAL JSHS program activities? If your Regional JSHS event did not have a given activity, or if you did not attend Regional JSHS please select "Did Not Experience"?

	Did Not Experience	Not at all	A little	Somewhat	Very much
Student Oral Presentations	❍	❍	❍	❍	❍
Student Poster Presentations	❍	❍	❍	❍	❍
Judging Process	❍	❍	❍	❍	❍
Feedback from Judges	❍	❍	❍	❍	❍
Feedback from VIPs and Peers	❍	❍	❍	❍	❍
Invited Speaker Presentations	❍	❍	❍	❍	❍
Panel or Roundtable Discussions	❍	❍	❍	❍	❍
Career Exhibits	❍	❍	❍	❍	❍
Tours or Field Trips	❍	❍	❍	❍	❍

Team Building Activities	❍	❍	❍	❍	❍
Social Events	❍	❍	❍	❍	❍

Q23 The Following activities were included in the National JSHS program. How SATISFIED were you with each of the NATIONAL JSHS program activities? If you did not attend National JSHS with your student(s) please answer "Did Not Experience" for all items.

	Did Not Experience	Not at all	A little	Somewhat	Very much
Opening Ceremony	❍	❍	❍	❍	❍
General Session 1 Keynote Speaker: Leigh McCue, Ph.D.	❍	❍	❍	❍	❍
Student Research Sessions and Judging	❍	❍	❍	❍	❍
General Session 2 Keynote Speaker: Kenneth Kosik, Ph.D.	❍	❍	❍	❍	❍
Student Team Building	❍	❍	❍	❍	❍
DoD Exhibits at USA Science & Engineering Festival	❍	❍	❍	❍	❍
USA Science & Engineering Festival Scavenger Hunt	❍	❍	❍	❍	❍
Student Poster Session and Judging	❍	❍	❍	❍	❍
Student Poster Session VIP and Peer Review	❍	❍	❍	❍	❍
General Session 3 Keynote Speaker: Christopher Cassidy, Commander, USN	❍	❍	❍	❍	❍
Panel Discussion: Pathways to DoD STEM Careers	❍	❍	❍	❍	❍
Lunch with DoD Scientists and Engineers	❍	❍	❍	❍	❍
Free Time at National Mall or USA Science & Engineering Festival	❍	❍	❍	❍	❍
Awards Ceremony and Congratulatory Remarks	❍	❍	❍	❍	❍

Q24 The list below describes 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 JSHS.

	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 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 JSHS.

	Yes - I used this strategy	No - I did not use this strategy
Other, (specify):	❍	❍
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	❍	❍

Q26 The list below describes 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 JSHS.

	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 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 JSHS.

	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 (e.g., team projects, team meetings, journal clubs)	❍	❍
Other, (specify):	❍	❍

Q28 The list below describes 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 JSHS.

	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 (e.g., private industry, academia)	❍	❍
Discussing non-technical aspects of a STEM career (e.g., 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' resume, 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 JSHS?

	Did not experience	Not at all useful	A little useful	Somewhat useful	Very useful
JSHS website	❍	❍	❍	❍	❍
AEOP website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍	❍
Army STEM Career Magazine	❍	❍	❍	❍	❍
Program manager or site coordinators	❍	❍	❍	❍	❍
Invited speakers or "career" events	❍	❍	❍	❍	❍
Participation in JSHS	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab coats)	❍	❍	❍	❍	❍

Q30 Which of the following AEOPs did YOU EXPLICITY DISCUSS with your student(s) during JSHS? (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)	❍	❍

Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	❍	❍
Junior Science & Humanities Symposium	❍	❍
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 did not discuss AEOP with my students	❍	❍
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 JSHS.

	Did not experience	Not at all useful	A little useful	Somewhat useful	Very useful
JSHS website	❍	❍	❍	❍	❍
AEOP website	❍	❍	❍	❍	❍
AEOP social media	❍	❍	❍	❍	❍
AEOP brochure	❍	❍	❍	❍	❍
Army STEM Career Magazine	❍	❍	❍	❍	❍
Program manager or site coordinator	❍	❍	❍	❍	❍
Invited speakers or “career” events	❍	❍	❍	❍	❍
Participation in JSHS	❍	❍	❍	❍	❍
AEOP instructional supplies (Rite in the Rain notebook, Lab coats)	❍	❍	❍	❍	❍

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 JSHS?

	Not at all	At least once	A few times	Most days	Every day	Not applicable
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 JSHS?

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

Q35 AS A RESULT OF YOUR JSHS EXPERIENCE, how much did students GAIN in the following areas?

	No gains	A little gain	Some gain	Large gain	Extremely large gains
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 JSHS EXPERIENCE, how much did your student(s) GAIN in the following areas? **Only presented to those who chose "science" in Q34**

	No gains	A little gain	Some gain	Large gain	Extremely large gains
Asking questions based on observations of real-world phenomena	❍	❍	❍	❍	❍
Asking a question (about a phenomenon) that can be answered with one or more investigations	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	❍	❍	❍	❍	❍
Making a model to represent the key features and functions of an observed phenomenon	❍	❍	❍	❍	❍
Deciding what type of data to collect in order to answer a question	❍	❍	❍	❍	❍
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	❍	❍	❍	❍	❍
Testing how changing one variable affects another variable, in order to understand relationships between variables	❍	❍	❍	❍	❍
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	❍	❍	❍	❍	❍
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics to analyze numeric data	❍	❍	❍	❍	❍

Supporting a proposed explanation (for a phenomenon) with data from investigations	❍	❍	❍	❍	❍
Asking questions to understand the data and interpretations others use to support their explanations	❍	❍	❍	❍	❍
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	❍	❍	❍	❍	❍
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	❍	❍	❍	❍	❍
Communicating information about your investigations and explanations in different formats (e.g., orally, written, graphically, mathematically)	❍	❍	❍	❍	❍
Identifying the limitations of data collected in an investigation	❍	❍	❍	❍	❍
Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	❍	❍	❍	❍	❍
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Using data or interpretations from other researchers or investigations to improve an explanation	❍	❍	❍	❍	❍
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	❍	❍	❍	❍	❍
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	❍	❍	❍	❍	❍
Integrating information from multiple sources to support your explanations of phenomena	❍	❍	❍	❍	❍
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	❍	❍	❍	❍	❍

Q37 AS A RESULT OF THE JSHS EXPERIENCE, how much did your student(s) GAIN in the following areas? **Only presented to those who chose "technology", "engineering", or "mathematics" in Q34**

	No gains	A little gain	Some gain	Large gain	Extremely large gains
Identifying real-world problems based on social, technological, or environmental issues	❍	❍	❍	❍	❍
Defining a problem that can be solved by developing a new or improved object, process, or system	❍	❍	❍	❍	❍
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	❍	❍	❍	❍	❍

Making a model that represents the key features or functions of a solution to a problem	❍	❍	❍	❍	❍
Deciding what type of data to collect in order to test if a solution functions as intended	❍	❍	❍	❍	❍
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	❍	❍	❍	❍	❍
Identifying the limitations of the data collected in an investigation	❍	❍	❍	❍	❍
Carrying out procedures for an investigation and recording data accurately	❍	❍	❍	❍	❍
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	❍	❍	❍	❍	❍
Using computer-based models to investigate cause and effect relationships of a simulated solution	❍	❍	❍	❍	❍
Considering alternative interpretations of data when deciding if a solution functions as intended	❍	❍	❍	❍	❍
Displaying numeric data in charts or graphs to identify patterns and relationships	❍	❍	❍	❍	❍
Using mathematics to analyze numeric data	❍	❍	❍	❍	❍
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	❍	❍	❍	❍	❍
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	❍	❍	❍	❍	❍
Using data or interpretations from other researchers or investigations to improve a solution	❍	❍	❍	❍	❍
Asking questions to understand the data and interpretations others use to support their solutions	❍	❍	❍	❍	❍
Using data from investigations to defend an argument that conveys how a solution meets design criteria	❍	❍	❍	❍	❍
Deciding what additional data or information may be needed to find the best solution to a problem	❍	❍	❍	❍	❍
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	❍	❍	❍	❍	❍
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	❍	❍	❍	❍	❍
Integrating information from multiple sources to support your solution to a problem	❍	❍	❍	❍	❍
Communicating information about your design processes and/or solutions in different formats (e.g., orally, written, graphically, mathematically)	❍	❍	❍	❍	❍
Supporting a proposed solution (for a problem) with data from investigations	❍	❍	❍	❍	❍

Q38 AS A RESULT OF THE JSHS EXPERIENCE, how much did your student(s) GAIN (on average) in the following areas?

	No gains	A little gain	Some gain	Large gain	Extremely large gains
Learning to work independently	❍	❍	❍	❍	❍
Setting goals and reflecting on performance	❍	❍	❍	❍	❍
Persevering with a task	❍	❍	❍	❍	❍
Making changes when things do not go as planned	❍	❍	❍	❍	❍
Patience for the slow pace of research	❍	❍	❍	❍	❍
Working collaboratively with a team	❍	❍	❍	❍	❍
Communicating effectively with others	❍	❍	❍	❍	❍
Including others' perspectives when making decisions	❍	❍	❍	❍	❍
Sense of being part of a learning community	❍	❍	❍	❍	❍
Sense of contributing to a body of knowledge	❍	❍	❍	❍	❍
Building relationships with professionals in a field	❍	❍	❍	❍	❍
Connecting a topic or field and your personal values	❍	❍	❍	❍	❍

Q39 Which of the following statements describe YOUR STUDENT(S) after participating in the JSHS program?

	Disagree - This did not happen	Disagree - This happened but not because of Program	Agree - Program contributed	Agree - Program 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	❍	❍	❍	❍

Q40 What are the three most important strengths of JSHS?

Strength #1

Strength #2

Strength #3

Q41 What are the three ways JSHS should be improved for future participants?

Improvement #1

Improvement #2

Improvement #3

Q42 Tell us about your overall satisfaction with your JSHS experience.

JSHS Mentor Data Summary

What is your gender?		
	Freq.	**%**
Male	38	43%
Female	49	56%
Choose not to report	1	1%
Total	**88**	**100%**

What is your race or ethnicity?		
	Freq.	**%**
Hispanic or Latino	5	6%
Asian	5	6%
Black or African American	1	1%
Native American or Alaska Native	1	1%
Native Hawaiian or Other Pacific Islander	0	0%
White	68	77%
Other race or ethnicity, (specify):	3	3%
Choose not to report	5	6%
Total	**88**	**100%**

Note. Other = "German," "American," & "Human".

Which of the following BEST describes your current occupation? (select ONE)		
	Freq.	**%**
Teacher	65	74%
Other school staff	1	1%
University educator	10	11%
Scientist, Engineer, or Mathematician in-training (undergraduate or graduate student)	3	3%
Scientist, Engineer, or Mathematics professional (current or retired)	4	5%
Other, (specify):	5	6%
Total	**88**	**100%**

Note. Other = "mentor & research director," "Physician-Scientist," "volunteer/adm asst/codirector VAJSHS," "science supervisor," "University Lab Technician (staff)".

Which of the following BEST describes your organization? (select ONE)		
	Freq.	**%**
No organization	0	0%
School or district (K-12)	66	75%
State educational agency	0	0%
Institution of higher education (vocational school, junior college, college, or university)	16	18%
Industry	1	1%
Department of Defense or other government agency	1	1%
Non-profit	2	2%
Other (specify):	2	2%
Total	**88**	**100%**

Note. Other = "catholic school 9 – 12," "HS and HS Research Institute".

What grade level(s) do you teach? (select ALL that apply)		
	Freq.	**%**
Upper elementary	1	2%
Middle school	2	3%
High school	64	98%
Total	**65**	**100%**

Which best describes the location of your school?		
	Freq.	**%**
Frontier or tribal school	0	0%
Rural (country)	12	18%
Suburban	42	65%
Urban (city)	11	17%
Total	**65**	**100%**

At what kind of school did you teach while participating in JSHS?		
	Freq.	**%**
Public school	54	83%

Private school	9	14%
Home school	0	0%
Online school	0	0%
Department of Defense school (DoDDS or DoDEA)	54	3%
Total	**65**	**100%**

Do you work at a "Title-I" school?		
	Freq.	**%**
Yes	15	23%
No	38	58%
I am not sure	12	18%
Total	**65**	**100%**

Which of the following subjects do you teach? (check all that apply)						
	Freq.	**%**			**Freq.**	**%**
Physical science (physics, chemistry, astronomy, materials science)	33	51%		**Technology**	4	6%
Biological science	40	62%		**Engineering**	3	5%
Earth, atmospheric, or oceanic science	10	15%		**Mathematics or statistics**	5	8%
Agricultural science	0	0%		**Medicine, Health, or Behavioral Science**	7	11%
Environmental science	11	17%		**Social science (psychology, sociology, anthropology)**	2	3%
Computer science	0	0%		**Other, (specify):**	19	29%
				Total		**100%**

Note. Other = "Research or Science Research" (n = 13), "Honors Research" (n = 2), "Research Methods" (n = 2), "Independent Research," "Mentor of out of school research class".

Which of the following best describes your primary area of research?						
	Freq.	**%**			**Freq.**	**%**
Physical science (physics, chemistry, astronomy, materials science)	1	14%		**Technology**	0	0%
Biological science	2	29%		**Engineering**	1	14%
Earth, atmospheric, or oceanic science	0	0%		**Mathematics or statistics**	0	0%
Agricultural science	1	14%		**Medicine, Health, or Behavioral Science**	1	14%

Environmental science	0	0%		**Social science (psychology, sociology, anthropology)**	1	14%
Computer science	0	0%		**Other, (specify):**	0	0%
				Total	**7**	**100%**

In which REGIONAL JSHS event did you/your student(s) participate? (Select ONE)						
	Freq.	**%**			**Freq.**	**%**
Alabama	1	1%		**New Jersey—North New Jersey**	14	16%
Alaska	7	8%		**New York—Long Island**	8	9%
Arkansas	1	1%		**New York—Metro**	8	9%
California—Northern California & Western Nevada	6	7%		**New York—Upstate**	1	1%
California—Southern California	1	1%		**North Carolina**	0	0%
Connecticut	0	0%		**North Central—Minnesota, North Dakota, South Dakota**	0	0%
DoD Dependent Schools-Europe	3	3%		**New England—Northern New England**	0	0%
DoD Dependent Schools-Pacific	0	0%		**New England—Southern New England**	0	0%
District of Columbia	1	1%		**Ohio**	0	0%
Florida	2	2%		**Oregon**	0	0%
Georgia	2	2%		**Pennsylvania**	3	3%
Hawaii	2	2%		**Puerto Rico**	4	5%
Illinois	2	2%		**South Carolina**	2	2%
Indiana	2	2%		**Southwest**	1	1%
Intermountain—Colorado, Montana, Idaho, Nevada, Utah	1	1%		**Tennessee**	4	5%
Iowa	1	1%		**Texas**	1	1%
Kansas—Nebraska—Oklahoma	1	1%		**Virginia**	3	3%
Kentucky	1	1%		**Washington**	2	2%
Maryland	0	0%		**West Virginia**	0	0%
Michigan—Southeastern Michigan	0	0%		**Wisconsin-Western Wisconsin & Upper Michigan**	1	1%
Mississippi	0	0%		**Wisconsin**	0	0%
Missouri	0	0%		**Wyoming—Eastern Colorado**	0	0%
New Jersey--Monmouth	0	0%				
				Total	**86**	**100%**

Which of the following BEST describes your role during JSHS?		
	Freq.	**%**
Research Mentor	51	59%
Competition advisor	16	19%
Other, (specify):	19	22%
Total	**86**	**100%**

Note. Other = "teacher" (n = 10), "chaperone" (n = 6), "co-director" (n = 2), & "student advisor".

How many JSHS students did you work with this year? (Avg. = 5.86 students, SD = 7.89)		
# of Students	**Freq.**	**%**
0	3	4%
1	18	21%
2	13	15%
3	11	13%
4	8	10%
5	9	11%
6 – 10	10	12%
11 – 15	3	4%
16 – 20	4	5%
21 or more	5	6%
Total	**84**	**100%**

How did you learn about JSHS? (Check all that apply)						
	Freq.	**%**			**Freq.**	**%**
Army Educational Outreach Program (AEOP) website	2	2%		**A student**	17	19%
JSHS website	14	16%		**A colleague**	24	27%
Facebook, Twitter, Pinterest, or other social media	0	0%		**A supervisor or superior**	7	8%
State or national educator conference	0	0%		**JSHS event or site host/director**	11	13%
STEM conference	1	1%		**Workplace communications**	2	2%
School, university, or professional organization newsletter or email	13	15%		**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	1%
Past JSHS participant	28	32%		Other (specify):	6	7%
				Total	**88**	**100%**

Note. Other = "previous participation" (n = 3), "spouse," "Training by [university] of Science Research in the High School," "[state] Academy of Science website".

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	65 (86%)	10 (13%)	1 (1%)	0 (0%)	0 (0%)	76	**1.09**	0.30
eCybermission	48 (62%)	26 (34%)	2 (3%)	1 (1%)	0 (0%)	77	**1.14**	0.44
Junior Solar Sprint (JSS)	60 (81%)	14 (19%)	0 (0%)	0 (0%)	0 (0%)	74	**1.00**	0.00
Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	56 (75%)	13 (17%)	3 (4%)	1 (1%)	2 (3%)	75	**1.58**	1.02
Junior Science & Humanities Symposium	7 (8%)	1 (1%)	18 (21%)	9 (10%)	51 (59%)	86	**3.39**	0.88
Gains in the Education of Mathematics and Science (GEMS)	51 (67%)	23 (30%)	0 (0%)	1 (1%)	1 (1%)	76	**1.20**	0.71
GEMS Near Peers	60 (80%)	15 (20%)	0 (0%)	0 (0%)	0 (0%)	75	**1.00**	0.00
UNITE	60 (79%)	15 (20%)	0 (0%)	0 (0%)	1 (1%)	76	**1.19**	0.75
Science & Engineering Apprenticeship Program (SEAP)	55 (72%)	18 (24%)	2 (3%)	0 (0%)	1 (1%)	76	**1.24**	0.70
Research & Engineering Apprenticeship Program (REAP)	56 (74%)	19 (25%)	0 (0%)	0 (0%)	1 (1%)	76	**1.15**	0.67
High School Apprenticeship Program (HSAP)	58 (76%)	16 (21%)	1 (1%)	1 (1%)	0 (0%)	76	**1.17**	0.51
College Qualified Leaders (CQL)	61 (81%)	14 (19%)	0 (0%)	0 (0%)	0 (0%)	75	**1.00**	0.00
Undergraduate Research Apprenticeship Program (URAP)	56 (74%)	19 (25%)	0 (0%)	1 (1%)	0 (0%)	76	**1.10**	0.45
Science Mathematics, and Research for Transformation (SMART) College Scholarship	55 (72%)	17 (22%)	2 (3%)	1 (1%)	1 (1%)	76	**1.33**	0.80
National Defense Science & Engineering Graduate (NDSEG) Fellowship	60 (79%)	15 (20%)	0 (0%)	0 (0%)	1 (1%)	76	**1.19**	0.75

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

How USEFUL were each of the following JSHS resources provided at JSHS.org?								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**

National JSHS Groundrules for Student Presentations	18 (21%)	1 (1%)	11 (13%)	20 (24%)	35 (41%)	85	**3.33**	0.81
Paper Submissions and Competition Deadlines	15 (18%)	0 (0%)	8 (9%)	17 (20%)	45 (53%)	85	**3.53**	0.70
Sample Papers	27 (32%)	7 (8%)	14 (17%)	18 (21%)	18 (21%)	84	**2.82**	1.02
Oral Presentation Tips	23 (27%)	5 (6%)	11 (13%)	22 (26%)	23 (27%)	84	**3.03**	0.95
Selected Articles - Conducting Research	35 (42%)	5 (6%)	11 (13%)	16 (19%)	16 (19%)	83	**2.90**	0.99

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

The following activities were common to many Regional JSHS programs across the nation. How SATISFIED were you with each of the following REGIONAL JSHS program activities? If your Regional JSHS event did not have a given activity, select "Did Not Experience"

	0	1	2	3	4	n	Avg.	SD
Student Oral Presentations	12 (14%)	1 (1%)	3 (4%)	15 (18%)	52 (63%)	83	**3.66**	0.63
Student Poster Presentations	45 (55%)	3 (4%)	3 (4%)	10 (12%)	21 (26%)	82	**3.32**	0.94
Judging Process	15 (18%)	8 (10%)	9 (11%)	19 (23%)	31 (38%)	82	**3.09**	1.04
Feedback from Judges	27 (33%)	11 (13%)	10 (12%)	13 (16%)	22 (27%)	83	**2.82**	1.16
Feedback from VIPs and Peers	43 (52%)	5 (6%)	6 (7%)	17 (20%)	12 (14%)	83	**2.90**	0.98
Invited Speaker Presentations	36 (43%)	2 (2%)	6 (7%)	11 (13%)	28 (34%)	83	**3.38**	0.87
Panel or Roundtable Discussions	58 (70%)	1 (1%)	2 (2%)	7 (8%)	15 (18%)	83	**3.44**	0.82
Career Exhibits	59 (71%)	1 (1%)	4 (5%)	9 (11%)	10 (12%)	83	**3.17**	0.87
Tours or Field Trips	55 (67%)	1 (1%)	3 (4%)	2 (2%)	21 (26%)	82	**3.59**	0.84
Team Building Activities	63 (76%)	2 (2%)	1 (1%)	4 (5%)	13 (16%)	83	**3.40**	0.99
Social Events	40 (48%)	1 (1%)	5 (6%)	15 (18%)	22 (27%)	83	**3.35**	0.78

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

The following activities were included in the National JSHS program. How SATISFIED were you with each of the NATIONAL JSHS program activities?

	0	1	2	3	4	n	Avg.	SD
Opening Ceremony	67 (81%)	0 (0%)	0 (0%)	5 (6%)	11 (13%)	83	**3.69**	0.48
General Session 1 Keynote Speaker: Leigh McCue, Ph.D.	66 (80%)	0 (0%)	0 (0%)	5 (6%)	12 (14%)	83	**3.71**	0.47
Student (Oral) Research Sessions and Judging	66 (80%)	0 (0%)	0 (0%)	3 (4%)	14 (17%)	83	**3.82**	0.39
General Session 2 Keynote Speaker: Kenneth Kosik, Ph.D.	65 (79%)	0 (0%)	1 (1%)	4 (5%)	12 (15%)	82	**3.65**	0.61
Student Team Building Activity	69 (83%)	1 (1%)	1 (1%)	5 (6%)	7 (8%)	83	**3.29**	0.91
DoD Exhibits at USA Science & Engineering Festival	68 (83%)	0 (0%)	3 (4%)	5 (6%)	6 (7%)	82	**3.21**	0.80

USA Science & Engineering Festival Scavenger Hunt	75 (90%)	5 (6%)	0 (0%)	1 (1%)	2 (2%)	83	**2.00**	1.41
Student Poster Session and Judging	68 (82%)	0 (0%)	0 (0%)	10 (12%)	5 (6%)	83	**3.33**	0.49
Student Poster Session VIP and Peer Review	71 (88%)	0 (0%)	0 (0%)	6 (7%)	4 (5%)	81	**3.40**	0.52
General Session 3 Keynote Speaker: Christopher Cassidy, Commander, USN	65 (80%)	0 (0%)	0 (0%)	2 (2%)	14 (17%)	81	**3.88**	0.34
General Session 4 Keynote Speaker: John Pellegrino, Ph.D.	66 (80%)	1 (1%)	1 (1%)	3 (4%)	11 (13%)	82	**3.50**	0.89
Panel Discussion: Pathways to DoD STEM Careers	69 (83%)	0 (0%)	5 (6%)	2 (2%)	7 (8%)	83	**3.14**	0.95
Lunch with DoD Scientists and Engineers	70 (84%)	0 (0%)	5 (6%)	3 (4%)	5 (6%)	83	**3.00**	0.91
Free Time at National Mall or USA Science & Engineering Festival	66 (80%)	0 (0%)	2 (2%)	5 (6%)	9 (11%)	82	**3.44**	0.73
Awards Ceremony and Congratulatory Remarks	66 (80%)	0 (0%)	0 (0%)	3 (4%)	14 (17%)	83	**3.82**	0.39

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

The list below describes 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 JSHS.

	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	67	86%	11	14%
Giving students real-life problems to investigate or solve	60	77%	18	23%
Asking students to relate outside events or activities to topics covered in the program	52	67%	26	33%
Selecting readings or activities that relate to students' backgrounds	51	66%	26	34%
Encouraging students to suggest new readings, activities, or projects	62	79%	16	21%
Making explicit provisions for students who wish to carry out independent studies	65	86%	11	14%
Helping students become aware of the roles STEM plays in their everyday lives	56	73%	21	27%
Helping students understand how STEM can help them improve their communities	54	70%	23	30%
Other, (specify):	2	17%	10	83%

Note. Other = "using hands-on activities and engineering prototypes," "students select their topics & readings not me; students find their own mentors," "putting students in control, encouraging them to find relevant problems to solve, encouraging and helping students find solutions for their communities," "some programming practice," & "sharing my own research with my students".

The list below describes 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 JSHS.

	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	50	63%	29	37%
Interacting with all students in the same way regardless of their gender or race and ethnicity	72	90%	8	10%
Using gender neutral language	65	81%	15	19%
Using diverse teaching/mentoring activities to address a broad spectrum of students	67	85%	12	15%
Integrating ideas from the literature on pedagogical activities for women and underrepresented students	50	63%	29	37%
Providing extra readings, activities, or other support for students who lack essential background knowledge or skills	63	80%	16	20%
Directing students to other individuals or programs if I can only provide limited support	67	85%	12	15%
Other, (specify):	6	43%	8	57%

Note. Other = "teaching documentation and technical writing," "This is a research program. Very little traditional teaching goes on, it is totally student-driven. All students read well or do not get in," "Giving students opportunities to make decisions while giving them support," "My students were all trained in various molecular and cell biology techniques in a special summer program administered by my school," "Finding financial support for students with limited means," "I always use gender-neutral language, but it's less important than being non-biased overall".

The list below describes 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 JSHS.

	Yes – I used this strategy		No – I did not use this strategy	
	Freq.	%	Freq.	%
Having students tell others about their backgrounds and interests	47	59%	33	41%
Having students explain difficult ideas to others	67	85%	12	15%
Having students exchange ideas with others whose backgrounds or viewpoints are different from their own	59	75%	20	25%
Having students participate in giving and receiving feedback	74	93%	6	8%
Having students work on collaborative activities or projects as a member of a team	66	83%	14	18%
Having students listen to the ideas of others with an open mind	72	91%	7	9%
Having students pay attention to the feelings of all team members	56	72%	22	28%
Having students develop ways to resolve conflict and reach agreement among the team	57	71%	23	29%
Other, (specify):	2	25%	6	75%

Note. "presenting to general public, peer groups, etc.," "Giving students opportunities to interact with others who share STEM interests".

The list below describes 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 JSHS.				
	Yes – I used this strategy		No – I did not use this strategy	
	Freq.	%	Freq.	%
Teaching (or assigning readings) about specific STEM subject matter	57	73%	21	27%
Having students access and critically review technical texts or media to support their work	65	83%	13	17%
Demonstrating the use of laboratory or field techniques, procedures, and tools students are expected to use	68	87%	10	13%
Helping students practice STEM skills with supervision	68	88%	9	12%
Giving constructive feedback to improve students' STEM competencies	69	90%	8	10%
Allowing students to work independently as appropriate for their self-management abilities and STEM competencies	72	94%	5	6%
Encouraging students to seek support from other team members	69	88%	9	12%
Encouraging opportunities in which students could learn from others (e.g., team projects, team meetings, journal clubs)	65	83%	13	17%
Other, (specify):	5	56%	4	44%

Note. "this is a totally student driven program," "All projects are independent. No team projects in my curriculum," "Making students aware of STEM activities or competitions," "Encouraging opportunities in which students could learn from others WHEN appropriate".

The list below describes 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 JSHS.				
	Yes – I used this strategy		No – I did not use this strategy	
	Freq.	%	Freq.	%
Asking about students' educational and career interests	64	84%	12	16%
Recommending extracurricular programs that align with students' educational goals	55	72%	21	28%
Recommending Army Educational Outreach Programs that align with students' educational goals	14	18%	62	82%
Providing guidance about educational pathways that would prepare students for a STEM career	58	77%	17	23%
Sharing personal experiences, attitudes, and values pertaining to STEM	64	88%	9	12%
Discussing STEM career opportunities with the DoD or other government agencies	23	30%	53	70%

Discussing STEM career opportunities outside of the DoD or other government agencies (e.g., private industry, academia)	48	64%	27	36%
Discussing non-technical aspects of a STEM career (e.g., economic, political, ethical, and/or social issues)	45	60%	30	40%
Highlighting under-representation of women and racial and ethnic minority populations in STEM and/or their contributions in STEM	37	49%	39	51%
Recommending student and professional organizations in STEM	41	55%	33	45%
Helping students build effective STEM networks	43	57%	32	43%
Critically reviewing students' resume, application, or interview preparations	56	74%	20	26%
Other, (specify):	3	43%	4	57%

Note. "Exposing students to many STEM career pathways," & "Providing guidance about educational pathways that would prepare students for a STEM career, or a career in the humanities if that is their inclination".

How USEFUL were each of the following in your efforts to expose student(s) to Army Educational Outreach Programs (AEOPs) during JSHS?								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
JSHS website	25 (33%)	2 (3%)	7 (9%)	14 (18%)	28 (37%)	76	**3.33**	0.86
AEOP website	70 (93%)	1 (1%)	0 (0%)	3 (4%)	1 (1%)	75	**2.80**	1.10
AEOP social media	73 (97%)	1 (1%)	0 (0%)	1 (1%)	0 (0%)	75	**2.00**	1.41
AEOP brochure	64 (85%)	0 (0%)	4 (5%)	3 (4%)	4 (5%)	75	**3.00**	0.89
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat)	69 (92%)	1 (1%)	1 (1%)	3 (4%)	1 (1%)	75	**2.67**	1.03
My mentor(s)	55 (72%)	0 (0%)	5 (7%)	7 (9%)	9 (12%)	76	**3.19**	0.81
Invited speakers or "career" events	50 (66%)	1 (1%)	3 (4%)	8 (11%)	14 (18%)	76	**3.35**	0.85
Participation in JSHS	20 (26%)	1 (1%)	6 (8%)	8 (10%)	42 (55%)	77	**3.60**	0.75

Note. Response scale: **0** = "Did Not Experience" (excluded from analysis), **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 JSHS?				
	Yes - I discussed this program with my student(s)		**No - I did not discuss this program with my student(s)**	
	Freq.	**%**	**Freq.**	**%**
Camp Invention	3	4%	69	96%
eCYBERMISSION	5	7%	67	93%
Junior Solar Sprint (JSS)	2	3%	69	97%
Engineering Encounters Bridge Design Contest (EEBDC)-formerly West Point Bridge Design Contest	5	7%	66	93%

Junior Science & Humanities Symposium	56	75%	19	25%
Gains in the Education of Mathematics and Science (GEMS)	4	6%	68	94%
GEMS Near Peers	2	3%	70	97%
UNITE	2	3%	69	97%
Science & Engineering Apprenticeship Program (SEAP)	7	10%	65	90%
Research & Engineering Apprenticeship Program (REAP)	8	11%	64	89%
High School Apprenticeship Program (HSAP)	8	11%	64	89%
College Qualified Leaders (CQL)	2	3%	69	97%
Undergraduate Research Apprenticeship Program (URAP)	5	7%	67	93%
Science Mathematics, and Research for Transformation (SMART) College Scholarship	7	10%	65	90%
National Defense Science & Engineering Graduate (NDSEG) Fellowship	3	4%	67	96%
I discussed AEOP with my student(s) but did not discuss any specific program	6	9%	64	91%
I did not discuss AEOP with my students	11	17%	55	83%

How USEFUL were each of the following in your efforts to expose your student(s) to Department of Defense (DoD) STEM careers during JSHS?								
	0	**1**	**2**	**3**	**4**	**n**	**Avg.**	**SD**
JSHS website	31 (41%)	2 (3%)	10 (13%)	12 (16%)	20 (27%)	75	**3.14**	0.93
AEOP website	69 (93%)	0 (0%)	0 (0%)	2 (3%)	3 (4%)	74	**3.60**	0.55
AEOP social media	72 (97%)	0 (0%)	0 (0%)	2 (3%)	0 (0%)	74	**3.00**	0.00
AEOP brochure	64 (88%)	1 (1%)	0 (0%)	1 (1%)	7 (10%)	73	**3.56**	1.01
AEOP instructional supplies (Rite in the Rain notebook, Lab Coat)	69 (93%)	2 (3%)	0 (0%)	1 (1%)	2 (3%)	74	**2.60**	1.52
My mentor(s)	57 (77%)	2 (3%)	6 (8%)	4 (5%)	5 (7%)	74	**2.71**	1.05
Invited speakers or "career" events	54 (72%)	2 (3%)	0 (0%)	11 (15%)	8 (11%)	75	**3.19**	0.87
Participation in JSHS	24 (32%)	2 (3%)	7 (9%)	9 (12%)	33 (44%)	75	**3.43**	0.88

Note. Response scale: **0** = "Did Not Experience" (excluded from analysis), **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%)	11 (15%)	26 (35%)	38 (51%)	75	**4.36**	0.73

DoD researchers develop new, cutting edge technologies	0 (0%)	0 (0%)	9 (12%)	24 (32%)	41 (55%)	74	**4.43**	0.70
DoD researchers support non-defense related advancements in science and technology	1 (1%)	3 (4%)	8 (11%)	30 (41%)	32 (43%)	74	**4.20**	0.89
DoD researchers solve real-world problems	1 (1%)	0 (0%)	9 (12%)	20 (27%)	44 (59%)	74	**4.43**	0.81
DoD research is valuable to society	1 (1%)	2 (3%)	8 (11%)	24 (32%)	40 (53%)	75	**4.33**	0.88

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 do each of the following in JSHS?

	1	2	3	4	5	n	Avg.	SD
Learn new science, technology, engineering, or mathematics (STEM) topics	1 (1%)	4 (6%)	18 (25%)	29 (41%)	19 (27%)	71	**3.86**	0.93
Apply STEM knowledge to real life situations	6 (9%)	5 (7%)	16 (23%)	27 (39%)	16 (23%)	70	**3.60**	1.17
Learn about cutting-edge STEM research	3 (4%)	7 (10%)	27 (39%)	20 (29%)	13 (19%)	70	**3.47**	1.05
Learn about different STEM careers	5 (7%)	6 (9%)	30 (43%)	20 (29%)	8 (12%)	69	**3.29**	1.03
Interact with STEM professionals	5 (7%)	11 (16%)	30 (43%)	15 (21%)	9 (13%)	70	**3.17**	1.08
Practice using laboratory or field techniques, procedures, and tools	14 (20%)	6 (9%)	10 (14%)	31 (44%)	9 (13%)	70	**3.21**	1.35
Participate in hands-on STEM activities	11 (15%)	7 (10%)	13 (18%)	31 (44%)	9 (13%)	71	**3.28**	1.27
Work as part of a team	11 (15%)	10 (14%)	20 (28%)	19 (27%)	11 (15%)	71	**3.13**	1.29
Communicate with other students about STEM	2 (3%)	8 (11%)	22 (31%)	23 (33%)	15 (21%)	70	**3.59**	1.04
Pose questions or problems to investigate	9 (13%)	6 (8%)	17 (24%)	26 (37%)	13 (18%)	71	**3.39**	1.25
Design an investigation	16 (23%)	4 (6%)	18 (25%)	22 (31%)	11 (15%)	71	**3.11**	1.38
Carry out an investigation	17 (24%)	5 (7%)	12 (17%)	23 (33%)	13 (19%)	70	**3.14**	1.46
Analyze and interpret data or information	16 (23%)	5 (7%)	13 (18%)	25 (35%)	12 (17%)	71	**3.17**	1.41
Draw conclusions from an investigation	16 (23%)	3 (4%)	14 (20%)	23 (32%)	15 (21%)	71	**3.25**	1.44
Come up with creative explanations or solutions	14 (20%)	4 (6%)	15 (21%)	26 (37%)	12 (17%)	71	**3.25**	1.36
Build (or simulate) something	15 (21%)	7 (10%)	27 (38%)	15 (21%)	7 (10%)	71	**2.89**	1.25

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 JSHS project?

	Freq.	%
Science	59	79%
Technology	3	4%
Engineering	10	13%

Mathematics	3	4%
Total	**75**	**100%**

AS A RESULT OF THE JSHS 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	2 (3%)	4 (5%)	21 (29%)	21 (29%)	25 (34%)	73	**3.86**	1.05
Knowledge of research conducted in a STEM topic or field	1 (1%)	4 (5%)	16 (22%)	24 (33%)	28 (38%)	73	**4.01**	0.98
Knowledge of research processes, ethics, and rules for conduct in STEM	2 (3%)	5 (7%)	24 (33%)	16 (22%)	26 (36%)	73	**3.81**	1.09
Knowledge of how professionals work on real problems in STEM	1 (1%)	6 (8%)	16 (22%)	27 (37%)	23 (32%)	73	**3.89**	0.99
Knowledge of what everyday research work is like in STEM	3 (4%)	4 (5%)	19 (26%)	20 (27%)	27 (37%)	73	**3.88**	1.10

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

AS A RESULT OF THE JSHS EXPERIENCE, how much did your student(s) GAIN in the following areas?								
	1	2	3	4	5	n	Avg.	SD
Asking questions based on observations of real-world phenomena	3 (6%)	4 (8%)	14 (27%)	16 (31%)	14 (27%)	51	**3.67**	1.14
Asking a question (about a phenomenon) that can be answered with one or more investigations	3 (6%)	3 (6%)	12 (24%)	17 (33%)	16 (31%)	51	**3.78**	1.14
Applying knowledge, logic, and creativity to propose explanations that can be tested with investigations	3 (6%)	3 (6%)	11 (22%)	15 (30%)	18 (36%)	50	**3.84**	1.17
Making a model to represent the key features and functions of an observed phenomenon	4 (8%)	5 (10%)	14 (27%)	15 (29%)	13 (25%)	51	**3.55**	1.21
Deciding what type of data to collect in order to answer a question	4 (8%)	1 (2%)	10 (20%)	17 (34%)	18 (36%)	50	**3.88**	1.17
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	4 (8%)	2 (4%)	8 (16%)	15 (30%)	21 (42%)	50	**3.94**	1.22
Identifying the limitations of data collected in an investigation	4 (8%)	1 (2%)	15 (29%)	15 (29%)	16 (31%)	51	**3.75**	1.16
Carrying out procedures for an investigation and recording data accurately	4 (8%)	1 (2%)	10 (20%)	18 (35%)	18 (35%)	51	**3.88**	1.16
Testing how changing one variable affects another variable, in order to understand relationships between variables	4 (8%)	2 (4%)	13 (25%)	14 (27%)	18 (35%)	51	**3.78**	1.21

Using computer-based models to investigate cause and effect relationships of a simulated phenomenon	9 (18%)	6 (12%)	15 (29%)	8 (16%)	13 (25%)	51	**3.20**	1.41
Considering alternative interpretations of data when deciding on the best explanation for a phenomenon	4 (8%)	5 (10%)	16 (31%)	12 (24%)	14 (27%)	51	**3.53**	1.22
Displaying numeric data from an investigation in charts or graphs to identify patterns and relationships	4 (8%)	2 (4%)	13 (25%)	14 (27%)	18 (35%)	51	**3.78**	1.21
Using mathematics to analyze numeric data	4 (8%)	4 (8%)	12 (24%)	14 (27%)	17 (33%)	51	**3.71**	1.24
Supporting a proposed explanation (for a phenomenon) with data from investigations	4 (8%)	2 (4%)	12 (24%)	17 (33%)	16 (31%)	51	**3.76**	1.18
Supporting a proposed explanation with relevant scientific, mathematical, and/or engineering knowledge	4 (8%)	3 (6%)	12 (24%)	16 (31%)	16 (31%)	51	**3.73**	1.20
Identifying the strengths and limitations of explanations in terms of how well they describe or predict observations	4 (8%)	3 (6%)	13 (25%)	17 (33%)	14 (27%)	51	**3.67**	1.18
Using data or interpretations from other researchers or investigations to improve an explanation	4 (8%)	6 (12%)	16 (31%)	11 (22%)	14 (27%)	51	**3.49**	1.24
Asking questions to understand the data and interpretations others use to support their explanations	4 (8%)	6 (12%)	9 (18%)	16 (32%)	15 (30%)	50	**3.64**	1.26
Using data from investigations to defend an argument that conveys how an explanation describes an observed phenomenon	4 (8%)	5 (10%)	12 (24%)	16 (32%)	13 (26%)	50	**3.58**	1.21
Deciding what additional data or information may be needed to find the best explanation for a phenomenon	4 (8%)	6 (12%)	9 (18%)	19 (37%)	13 (25%)	51	**3.61**	1.22
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	6 (12%)	3 (6%)	14 (27%)	13 (25%)	15 (29%)	51	**3.55**	1.30
Identifying the strengths and limitation of data, interpretations, or arguments presented in technical or scientific texts	5 (10%)	4 (8%)	15 (29%)	15 (29%)	12 (24%)	51	**3.49**	1.22
Integrating information from multiple sources to support your explanations of phenomena	4 (8%)	5 (10%)	14 (27%)	16 (31%)	12 (24%)	51	**3.53**	1.19
Communicating information about your investigations and explanations in different formats (e.g., orally, written, graphically, mathematically)	4 (8%)	2 (4%)	9 (18%)	16 (31%)	20 (39%)	51	**3.90**	1.20

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

AS A RESULT OF THE JSHS EXPERIENCE, how much did your student(s) GAIN in the following areas?								
	1	2	3	4	5	n	Avg.	SD
Identifying real-world problems based on social, technological, or environmental issues	0 (0%)	1 (7%)	4 (29%)	5 (36%)	4 (29%)	14	**3.86**	0.95
Defining a problem that can be solved by developing a new or improved object, process, or system	0 (0%)	1 (7%)	1 (7%)	6 (43%)	6 (43%)	14	**4.21**	0.89
Applying knowledge, logic, and creativity to propose solutions that can be tested with investigations	0 (0%)	1 (7%)	1 (7%)	7 (50%)	5 (36%)	14	**4.14**	0.86
Making a model that represents the key features or functions of a solution to a problem	1 (7%)	3 (21%)	0 (0%)	7 (50%)	3 (21%)	14	**3.57**	1.28
Deciding what type of data to collect in order to test if a solution functions as intended	0 (0%)	1 (7%)	1 (7%)	8 (57%)	4 (29%)	14	**4.07**	0.83
Designing procedures for investigations, including selecting methods and tools that are appropriate for the data to be collected	0 (0%)	1 (7%)	1 (7%)	8 (57%)	4 (29%)	14	**4.07**	0.83
Identifying the limitations of the data collected in an investigation	1 (7%)	0 (0%)	2 (14%)	7 (50%)	4 (29%)	14	**3.93**	1.07
Carrying out procedures for an investigation and recording data accurately	1 (7%)	0 (0%)	1 (7%)	6 (43%)	6 (43%)	14	**4.14**	1.10
Testing how changing one variable affects another variable in order to determine a solution's failure points or to improve its performance	1 (7%)	0 (0%)	2 (14%)	7 (50%)	4 (29%)	14	**3.93**	1.07
Using computer-based models to investigate cause and effect relationships of a simulated solution	2 (14%)	2 (14%)	3 (21%)	3 (21%)	4 (29%)	14	**3.36**	1.45
Considering alternative interpretations of data when deciding if a solution functions as intended	0 (0%)	2 (14%)	2 (14%)	7 (50%)	3 (21%)	14	**3.79**	0.97
Displaying numeric data in charts or graphs to identify patterns and relationships	0 (0%)	1 (7%)	2 (14%)	5 (36%)	6 (43%)	14	**4.14**	0.95
Using mathematics to analyze numeric data	0 (0%)	2 (14%)	3 (21%)	4 (29%)	5 (36%)	14	**3.86**	1.10
Supporting a proposed solution (for a problem) with data from investigations	0 (0%)	2 (14%)	2 (14%)	5 (36%)	5 (36%)	14	**3.93**	1.07
Supporting a proposed solution with relevant scientific, mathematical, and/or engineering knowledge	0 (0%)	1 (7%)	4 (29%)	5 (36%)	4 (29%)	14	**3.86**	0.95
Identifying the strengths and limitations of solutions in terms of how well they meet design criteria	0 (0%)	1 (7%)	4 (29%)	5 (36%)	4 (29%)	14	**3.86**	0.95
Using data or interpretations from other researchers or investigations to improve a solution	0 (0%)	0 (0%)	5 (36%)	5 (36%)	4 (29%)	14	**3.93**	0.83

Asking questions to understand the data and interpretations others use to support their solutions	0 (0%)	2 (14%)	4 (29%)	4 (29%)	4 (29%)	14	**3.71**	1.07
Using data from investigations to defend an argument that conveys how a solution meets design criteria	0 (0%)	0 (0%)	5 (36%)	4 (29%)	5 (36%)	14	**4.00**	0.88
Deciding what additional data or information may be needed to find the best solution to a problem	0 (0%)	1 (8%)	2 (15%)	5 (38%)	5 (38%)	13	**4.08**	0.95
Reading technical or scientific texts, or using other media, to learn about the natural or designed worlds	0 (0%)	3 (21%)	3 (21%)	3 (21%)	5 (36%)	14	**3.71**	1.20
Identifying the strengths and limitations of data, interpretations, or arguments presented in technical or scientific texts	0 (0%)	2 (14%)	3 (21%)	4 (29%)	5 (36%)	14	**3.86**	1.10
Integrating information from multiple sources to support your solution to a problem	0 (0%)	0 (0%)	5 (36%)	5 (36%)	4 (29%)	14	**3.93**	0.83
Communicating information about your design processes and/or solutions in different formats (e.g., orally, written, graphically, mathematically)	0 (0%)	0 (0%)	4 (29%)	4 (29%)	6 (43%)	14	**4.14**	0.86

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

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

	1	2	3	4	5	n	Avg.	SD
Learning to work independently	3 (5%)	3 (5%)	10 (15%)	28 (42%)	22 (33%)	66	**3.95**	1.04
Setting goals and reflecting on performance	3 (5%)	4 (6%)	14 (21%)	22 (33%)	23 (35%)	66	**3.88**	1.10
Persevering with a task	1 (2%)	5 (8%)	11 (17%)	25 (38%)	23 (35%)	65	**3.98**	0.99
Making changes when things do not go as planned	2 (3%)	4 (6%)	12 (19%)	23 (36%)	23 (36%)	64	**3.95**	1.05
Patience for the slow pace of research	4 (6%)	6 (9%)	13 (20%)	24 (36%)	19 (29%)	66	**3.73**	1.16
Working collaboratively with a team	6 (9%)	7 (11%)	19 (29%)	15 (23%)	18 (28%)	65	**3.49**	1.26
Communicating effectively with others	2 (3%)	2 (3%)	13 (20%)	20 (30%)	29 (44%)	66	**4.09**	1.02
Including others' perspectives when making decisions	3 (5%)	8 (12%)	18 (28%)	19 (29%)	17 (26%)	65	**3.60**	1.14
Sense of being part of a learning community	2 (3%)	3 (5%)	18 (28%)	20 (31%)	22 (34%)	65	**3.88**	1.04
Sense of contributing to a body of knowledge	3 (5%)	5 (8%)	13 (20%)	24 (37%)	20 (31%)	65	**3.82**	1.10
Building relationships with professionals in a field	3 (5%)	5 (8%)	16 (25%)	15 (23%)	26 (40%)	65	**3.86**	1.17
Connecting a topic or field and their personal values	2 (3%)	6 (9%)	13 (20%)	22 (34%)	21 (33%)	64	**3.84**	1.09

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 the JSHS program?

	1	2	3	4	n	Avg.	SD
More confident in STEM knowledge, skills, and abilities	2 (3%)	7 (11%)	45 (71%)	9 (14%)	63	**2.97**	0.62
More interested in participating in STEM activities outside of school requirements	2 (3%)	10 (16%)	39 (63%)	11 (18%)	62	**2.95**	0.69
More aware of other AEOPs	25 (42%)	4 (7%)	19 (32%)	12 (20%)	60	**2.30**	1.21
More interested in participating in other AEOPs	28 (47%)	2 (3%)	18 (31%)	11 (19%)	59	**2.20**	1.23
More interested in taking STEM classes in school	7 (11%)	12 (19%)	31 (50%)	12 (19%)	62	**2.77**	0.89
More interested in attending college	5 (8%)	20 (32%)	31 (50%)	6 (10%)	62	**2.61**	0.78
More interested in earning a STEM degree in college	4 (7%)	18 (30%)	32 (52%)	7 (11%)	61	**2.69**	0.76
More interested in pursuing a STEM career	3 (5%)	16 (26%)	34 (55%)	9 (15%)	62	**2.79**	0.75
More aware of Department of Defense (DoD) STEM research and careers	13 (22%)	6 (10%)	25 (42%)	16 (27%)	60	**2.73**	1.09
Greater appreciation of DoD STEM research and careers	15 (25%)	4 (7%)	26 (43%)	16 (26%)	61	**2.70**	1.12
More interested in pursuing a STEM career with the DoD	25 (42%)	3 (5%)	21 (36%)	10 (17%)	59	**2.27**	1.19

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

Appendix D

FY14 JSHS Apprentice Focus Group and Interview Protocols

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.

2014 Army Educational Outreach Program
Apprentice Interview

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 JSHS 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[58] (provide citations)**
    - **Publications[59] (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**
    - **Other**

Participants

[58] 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.

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

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	$