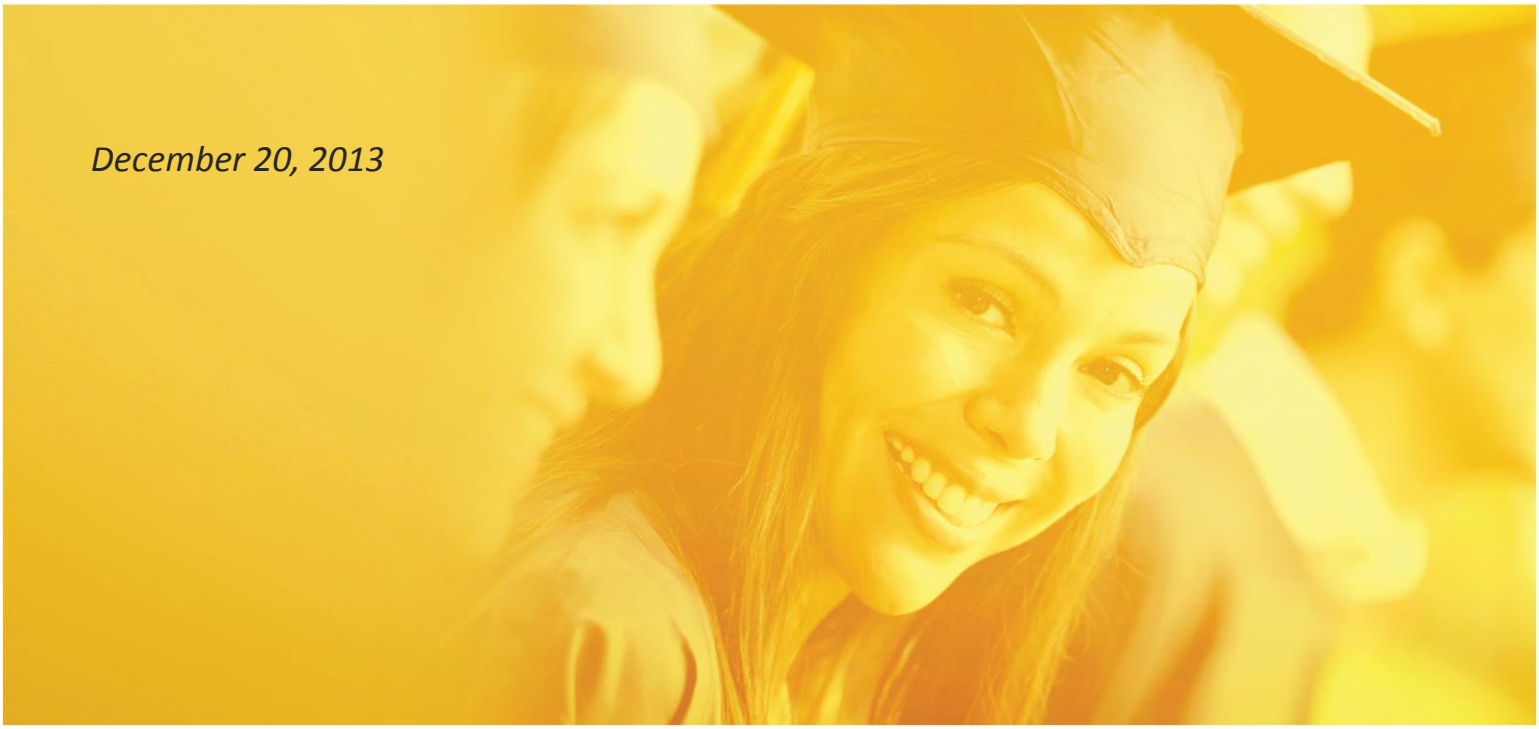
Army Educational Outreach Program

Junior Science & Humanities Symposium

FY13 Annual Program Evaluation Report

ARMY EDUCATIONAL OUTREACH PROGRAM



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Executive Summary

The Junior Science & Humanities Symposium (JSHS), managed by the Academy of Applied Science (AAS), is an Army Educational Outreach Program (AEOP) with tri-service sponsorship from the Army, Navy, and Air Force to provide enrichment to high school students throughout the US, Puerto Rico, and Department of Defense Dependent Schools (DoDDS) in Europe and the Pacific. In 2013, JSHS engaged 8,700 students and teachers in 47 Regional Symposia (R-JSHS) and a National Symposium (N-JSHS). Student participants orally present their original research in an area of science, technology, engineering, and mathematics (STEM) before a panel of expert judges and compete for scholarships and the opportunity to advance to the N-JSHS event.

This report documents the evaluation of JSHS at the levels of the Regional Symposia (R-JSHS) and National Symposium (N-JSHS). The evaluation addressed questions related to the program's strengths and challenges, benefits to participants, and its overall effectiveness in meeting AEOP and program objectives. The assessment strategy for R-JSHS included at-event focus groups with regional directors/representatives attending N-JSHS and post-event questionnaires for R-JSHS students and regional directors/representatives. N-JSHS assessments included at-event focus groups with N-JSHS students and post-event questionnaires for N-JSHS students and judges.

Table 1. 2013 JSHS Fast Facts	
Major Participant Group	High school students from US, Puerto Rico, and DoD Dependent Schools in Europe and the Pacific
Participating Students	7,600
Participating Teachers	1,100
Participating Schools	1,000
Participating Universities	47
Participating DoD Agencies	23 in R-JSHS; 17 in N-JSHS
Participating Army S&Es	Not available

Summary of Findings

The FY13 evaluation of JSHS collected data that provided information about the participant pool, participants' perceptions of program processes, resources, and activities, and indicators of achievement. A summary of findings is provided in Table 2.

Table 2. 2013 JSHS Evaluation Findings	
Participant Profiles	
All evaluation data contribute to the overall narrative of JSHS's efforts and impact, and highlight areas for future exploration in programming and evaluation. However, confidence in evaluation findings varies by participant group.	• The statistical reliability achieved for the N-JSHS students and R-JSHS regional directors/representatives suggest adequate representativeness of the respective participant group populations. Low participation of R-JSHS students in evaluation assessments limit reliability of findings. Only 1% (87) of 7600 R-JSHS participants responded to the R-JSHS student questionnaire. Statistical reliability achieved with the sample (±10.6% margin of error at 95% confidence level) and alternative means of establishing representativeness of the sample, through known respondent and participant characteristics, suggest limited confidence that the R-JSHS student respondents are representative of the larger population of R-JSHS student participants. Findings from R-JSHS students' data should be cautiously generalized, with consideration given to the margins of error and with triangulation of findings from other data sources.
JSHS is successful in attracting participation from females—a population that is historically underrepresented in some STEM fields. JSHS has had limited success with providing outreach to students from historically underserved groups—low socioeconomic and minority race/ethnic groups.	• More females than males completed R-JSHS and N-JSHS student questionnaires, and the majority of students (82% R-JSHS, 86% N-JSHS) identified with race/ethnicity categories of Caucasian (54% R-JSHS, 49% N-JSHS) or Asian (28% R-JSHS, 37% N-JSHS). Less than 15% of students identified as either American Indian or Alaskan Native, Black or African American, Hispanic/Latino at both levels of JSHS. However, this is an improvement from last year where only 1% of questionnaire respondents identified as Black or African American with no other minority race/ethnicities represented.
	• Most R-JSHS and N-JSHS students report they do not qualify for free or reduced lunch—a common indicator of low income or low socioeconomic status. A statistically lower proportion of N-JSHS students (69%) received free or reduced lunch than R-JSHS students (85%).
	• The average age of R-JSHS and N-JSHS students is ~16.5. Statistically higher proportions of 11th graders participated in R-JSHS (52%) as compared to N-JSHS (34%), and higher proportions of 12th graders participated in N-JSHS (43%) as compared to R-JSHS (21%)
JSHS provides outreach to the Nation's future STEM workforce.	• 100% of R-JSHS and N-JSHS students reported intent to pursue a college degree. 87% of R-JSHS and N-JSHS students intend to pursue a STEM degree, with a majority (56% R-JSHS, 65% N-JSHS) intending to pursue a doctoral STEM degree. A statistically higher proportion of R-JSHS students intended to stop with the Bachelor's STEM degree as compared to N-JSHS students.
	• 98% of R-JSHS students indicated their intent to pursue a career in a STEM field. Medicine/Health (48%), Chemistry (11%), Engineering (10%) and Life Science (10%) were chosen most frequently.
Actionable Program Evaluation	
JSHS students are motivated by opportunities that JSHS and other STEM competitions provide them to grow critical skills for STEM research.	• Most students (60% R-JSHS, 89% N-JSHS) participated in one or more science competitions besides JSHS. Statistically higher proportions of N-JSHS students participated in these national, sponsored events as compared to R-JSHS students: Intel Talent Search (17%, 13% R-JSHS) and Intel Science & Engineering Fair (50%, 8% R-JSHS).
	• Students reported participating in STEM competitions for opportunities to engage in and learn from academic research activities (65% R-JSHS, 97% N-JSHS); to advance STEM pathways (11% R-JSHS, 25% N-JSHS); and because of school-based associations that recommend or require their participation in such competitions (21% R-JSHS, 18% N-JSHS).
	• Students most frequently (45% R-JSHS, 43% N-JSHS) reported one or more features of JSHS programming that motivate their participation in JSHS, including JSHS symposia format,

	oral and poster presentation options, the breadth of competition categories, and the prestige of JSHS.
JSHS is largely marketed to schools and teachers, but teachers serve as the primary conduit through which many students come to participate in JSHS.	• Most students (84% R-JSHS, 72% N-JSHS) credited school-based associations—teachers, academic coursework or programs, science departments, and school nominations—for their awareness of JSHS. Of those associations, teachers (58% R-JSHS, 47% N-JSHS) were most frequently cited as the means by which students were attracted to JSHS.
	• Most regional directors employed multi-pronged efforts to reach teachers. Their self-identified "best practices" for outreach, recruitment, and retention strategies for teachers hinged upon establishing and maintaining personal relationships with teachers and ensuring reasonable incentives to facilitate initial and continued involvement. However, regional directors more frequently focused their efforts on teacher outreach and recruitment (74%) rather than on facilitating participation (29%) once teachers are recruited.
	• The majority of regional directors generally agreed that funding to support regional director travel to schools for outreach and recruitment (65%) and for student and teacher travel to events (57%) are necessary to expand participation in JSHS. In many regions, teacher participation is also limited by schools' ability to fund substitute teachers (42%).
JSHS's key elements are regarded highly by students.	• The oral presentations (86% R-JSHS, 91% N-JSHS) and invited speakers (78% R-JSHS, 77% N-JSHS) were especially held in high regard. At both R-JSHS and N-JSHS, fewer poster presenters are satisfied with poster sessions than are oral participants. In particular, statistically fewer N-JSHS poster presenters are satisfied with the specific poster sessions in which they participated (i.e. non-competitive or competitive.)
	• Students considered student research presentations (57% R-JSHS, 49% N-JSHS) and invited speakers (17% R-JSHS, 14% N-JSHS) the two most valuable activities. N-JSHS students also strongly valued peer interactions (17%). The reasons students gave for assigning value to each of the various elements emphasized the nature and breadth of learning experiences and the opportunities JSHS provides to interact with others around STEM.
JSHS presentation and judging processes are enjoyable; however, students want more and useful feedback and fair judging processes.	• Most students enjoyed presenting at JSHS; however, poster presenters (88% R-JSHS, 64% N-JSHS) expressed statistically less enjoyment than oral presenters (91% R-JSHS, 91% N-JSHS). R-JSHS oral presenters (58%) perceived statistically more utility in feedback than do R-JSHS poster presenters (24%) and N-JSHS oral presenters (17%).
	• At R-JSHS, feedback students received from judges depended upon whether students presented research in the oral or poster formats. Poster presenters received less feedback and fewer types of feedback than oral presenters. The only type of feedback reported by N-JSHS presenters is oral feedback. Importantly, a substantial portion of all presenters at R-JSHS and N-JSHS reported receiving no feedback from the judges (22% R-JSHS-Oral, 62% R-JSHS-Poster, ~75% N-JSHS-Oral and NJSHS-Poster).
	• Students' suggestions for improvement most frequently included requests for receiving more feedback from the judges. Concerns were also offered regarding judge qualifications and potential judging bias, suggesting that a number of students at both R-JSHS and N-JSHS perceive that the judging process was not fair.
JSHS feedback mechanisms from judges to students vary considerably across R-JSHS.	• Regional directors employ a range of formal and informal feedback mechanisms from judges, executive committee, or peers; written and oral forms of feedback; at- or post-event feedback; and feedback provided to all, some, or none of the student presenters. No single feedback mechanism described was used by more than 34% of regional directors.
	• Nearly all N-JSHS judges found the online guidance (96%) and online access to abstracts and papers (100%) to be useful for preparing them for judging at N-JSHS. A majority of

JSHS online and at-event resources for N-JSHS judges are not consistent in preparing judges for their work.	judges (65%) did not find the online scoring system to be useful, and one third of judges requested clarification of the relationship between online scoring and at-event judging.
	• A majority of N-JSHS judges felt prepared to judge presentations (65%) and question presenters (65%). Most judges reported that their judging was on-time (90%) and went smoothly (90%). However, more than 40% of judges did not feel prepared to provide feedback or to deliberate winners, or did not perceive that judges in the competition room had shared understandings of the judging process and tools.
JSHS Student mentorship varies. R-JSHS students are less likely to have mentors and especially, STEM professionals as mentors.	• More than two thirds of R-JSHS and N-JSHS students reported having mentors, consisting of parents, teachers, professors and graduate students, and industry researchers. Statistically higher proportions of N-JSHS students (51%, 25% R-JSHS) reported university professors or graduate students as mentors, while statistically higher proportions of R-JSHS students (35%, 10% N-JSHS) reported that they did not have a research mentor.
Outcomes Evaluation	
JSHS is successful at fostering development in critical STEM competencies. However, growth varies by presentation format and mentorship.	• Most oral presenters at both R-JSHS and N-JSHS agreed or strongly agreed that presenting their research at JSHS helped them become a better speaker or presenter (91% R-JSHS, 91% N-JSHS) and that they are more confident in their ability to communicate science after presentation and judging process (83% R-JSHS, 91% N-JSHS). However, fewer of these same students reported that JSHS helped them become better writers (60% R-JSHS, 63% N-JSHS) or that judges' feedback will improve their research (73% R-JSHS, 65% N-JSHS).
	• Participants who presented research posters reported statistically lower perceptions of growth than their oral presentation counterparts at R-JSHS and N-JSHS. They did indicate that the poster process helped improve their presentation skills (88% R-JSHS, 52% N-JSHS) and confidence (88% R-JSHS, 65% N-JSHS).
	• 28% of 32 R-JSHS respondents reported improvement in STEM competencies from working with a mentor, including: development of laboratory skills (16%), writing/presenting skills (9%), and critical thinking skills (3%). In contrast, 79% of 71 N-JSHS respondents—who had a statistically higher proportion of university faculty and graduate students mentors—reported growth in STEM competencies: mentors taught them the fundamental knowledge or practices of research (31%) and exposed them to new ideas in the discipline (28%), in addition to those STEM competencies reported by R-JSHS students.
JSHS inspires and motivates students' further achievement through engagement with a scientific community of peers and STEM professionals from academia, industry and government.	• Key elements of JSHS exposed students to new information/knowledge in STEM (77-84% R-JSHS, 66-90% N-JSHS) and motivated them to achieve more in STEM (52%-65% R-JSHS, 49%-81% N-JSHS). Fewer students felt their current assumptions of STEM were challenged (51%-58% R-JSHS, 34-56% N-JSHS). Oral presenters and invited speakers had the most influence, while poster presentations had the least.
	• N-JSHS students exchanged research ideas with their peers (64%) and found motivation from that exchange (73%). Additionally, N- JSHS students were inspired by their peers (89%) and believed that their peers help them become better scientists (65%). Statistically lower proportions of R-JSHS students, though still the majority, reported that they were inspired by their peers (65%) and motivated to continue STEM research (73%).
	• When asked what activities were most inspirational or motivational, students most frequently reported invited speakers (58% R-JSHS, 57% N-JSHS) and student presentations (18% R-JSHS, 25% N-JSHS). Reasons given suggested that other student participants (peers) inspire more immediate achievement in STEM, but STEM professionals at JSHS events serve an important role in motivating students' future and long-term participation in STEM.

JSHS has limited success in educating students about other AEOP programs in ways that generate lasting awareness and interest.	• Many students (43% R-JSHS, 53% N-JSHS) agreed that JSHS activities or exhibits educated them about AEOP. Yet, the majority of students (85% - 93% R-JSHS, 75% - 94% N-JSHS) indicated that they have never heard about the individual AEOP initiatives. Very few students indicated that they have participated in other AEOPs in the past (<2% in Research and Engineering Apprenticeship Program, eCYBERMISSION, West Point Bridge Design Competition, Gains in the Education of Mathematics and Science, <3% Junior Solar Sprint).
JSHS has limited success in educating students about DoD STEM careers in ways that generate considerable interest or illustrate alignment to students' existing career goals and aspirations.	• JSHS programming exposed students to new career options (64% R-JSHS, 68% N-JSHS) but has less success inspiring and motivating students to pursue DoD/Government service careers (24-27% R-JSHS, 37-44% N-JSHS). Both R-JSHS and N-JSHS events motivated a substantial number of students to explore DoD/Government service careers, but N-JSHS students perceive statistically higher motivation to explore DoD/Government service careers after participating in JSHS activities/exhibits than do R-JSHS students.
	• A majority of students (66-67% R-JSHS, 69-74% N-JSHS) were certain that they will pursue jobs or build careers in STEM. A majority of students (72-75% R-JSHS, 62-65% N-JSHS) expressed low levels of certainty about pursuing Army STEM jobs and careers. Most N-JSHS students reported in focus groups that the DoD does not offer jobs in the fields they are interested in, or admitted to being unaware of DoD STEM careers.

Recommendations

1. Given that JSHS's reach is through the R-JSHS, a commitment should be made to producing more reliable and valid evaluation of the R-JSHS and benefits to students. The FY13 evaluation provides valuable information regarding how R-JSHS are perceived by a small number of participants, and begins to provide evidence for how the program has impacted R-JSHS students in comparison to N-JSHS students. The low response rate from R-JSHS students poses the most significant threat to the validity of these findings—in other words, we have limited confidence that these findings of 87 respondents are representative of the full population of 7600 participants. Coordinated efforts should be made by the Army, AAS managers, and regional directors (who are provided Army funding for these activities), to encourage and improve student participation in the R-JSHS evaluation efforts. Subsequently, evaluators should endeavor to streamline instruments and appropriately incentivize student participation.

2. Creative and strategic marketing is needed to increase awareness of the program. Schools and teachers play a vital role in attracting participation to JSHS, with the majority of students learning about JSHS through school (i.e. 84% R-JSHS level, 72% N-JSHS). Regional directors report that reaching new teachers and schools is critical for reaching new students. The evaluators and AAS collected regional directors' "best practices" for marketing, outreach, recruitment. AAS should devise and implement a plan for sharing findings with regional directors, and supporting them in prioritizing and enacting the most robust marketing, outreach, and recruitment mechanisms possible for their region.

3. As part of this marketing effort, JSHS should continue to expand its outreach to underserved schools that typically have not participated in JSHS or other STEM competitions. Because many students in these schools may not be as invested in STEM or have strong STEM supports as traditional competitors, strategies to engage these students

should tap into their motivations. Furthermore, adequate supports to ensure successful participation in JSHS are needed. “Best practices” reported by regional directors for facilitating these students’ successful participation include inviting new teachers and students to participate in regional symposia as observers, engaging middle school students in high school or similar middle school programs, and professional development for teachers to more effectively support student research.

4. A substantial number of students at both levels do not receive feedback from JSHS judges, and many receiving feedback do not find it useful. Student presenters need timely and specific feedback from judges that will help them understand the strengths and limitations of their presentation materials and delivery, and feedback that can be used to support them in improving their presentations and their future research. Regional directors are employing a variety of different mechanisms for sharing judges’ feedback, suggesting that AAS guidelines for feedback are not interpreted or employed consistently. Systemic changes to regional judging and feedback practices may require strong collaboration between AAS, regional directors, and N-JSHS judges to establish clear and specific expectations and feedback tools for judges to ensure feedback is consistently provided to all students.

5. The judging process must not only be fair, but must be perceived as fair by all who participate at the regional and national symposia. Evaluation findings suggest there is room for improvement in the selection, training, and retention of judges as well as in the quantity and quality of feedback provided to presenters. Efforts to expand the pool of national event judges are clearly successful, and military STEM personnel represent a major portion of the newly recruited judges. However, of significant concern are the findings that so few judges do return to participate in other N-JSHS or R-JSHS events and those that participate are less likely to recommend the provision of feedback to student presenters. Considering that all participant groups surveyed suggested that the engagement and quality of judges are areas for future improvement, future programming should consider how to expand capacity not only in terms of numbers of STEM professionals participating, but also work to increase the quality of judging through deeper knowledge and continued engagement of judges in JSHS programs. Furthermore, both R-JSHS and N-JSHS should give careful thought to feedback mechanisms that are useful for all students but that balance the concerns of judges who would be providing the feedback. Both R-JSHS and N-JSHS programs will benefit from strong partnership between AAS and regional directors in establishing robust mechanisms for training judges about the judging process and providing feedback to students. This collaboration could have significant impact of providing consistency across R-JSHS and N-JSHS programs and improving the experience of all competitors.

6. JSHS’s position in the pipeline of AEOP initiatives is an area with significant growth potential and should continue to be a program priority. While many students (43% R-JSHS, 53% N-JSHS) report that activities or exhibits educated them about educational opportunities offered by DoD, an overwhelming majority of students do not recognize AEOP programs. Approximately 4-17% of JSHS participants at both R-JSHS and N-JSHS expressed interest in in each of the other AEOP initiatives for which they may qualify. A similar percentage of students participating in other AEOP initiatives this summer (and greater in the AEOP apprenticeship programs) expressed interest in submitting

their research projects and papers to JSHS. JSHS and AEOP initiatives should consider a deliberate cross-marketing effort to actively recruit these now-past participants of FY13 programs, increasing JSHS's position as a key component of the pipeline.

7. JSHS should carefully review current practices for generating awareness of and interest in Army/DoD STEM careers and, if possible, recommend that R-JSHS employ best practices identified within its current efforts (e.g., STEM Showcase at N-JSHS) and in other AEOP initiatives that seem to have great success. This is clearly another area with significant growth potential and should be a program priority, as students who have greater awareness of and positive attitudes toward DoD STEM careers are more likely to seek them out in the future. Many regional directors reported in focus groups and questionnaires a strong desire for more "military presence" in their R-JSHS programming. R-JSHS programs in particular would benefit from stronger partnership between regional directors, AAS, and CAMs in connecting with regional DoD and other government agencies conducting STEM research, not just recruiting "military and ROTC personnel," in an effort to better highlight cutting edge, exciting, and impactful STEM research programs and careers offered by DoD and beyond.

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 Symposium (JSHS), at the levels of the Regional Symposia (R-JSHS) and National Symposium (N-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 was performed by Virginia Tech, the Lead Organization (LO) in the AEOP CA consortium.

AEOP Goals

Goal 1: STEM Literate Citizenry.

- Broaden, deepen, and diversity 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

The Junior Science & Humanities Symposium (JSHS) is a tri-service (Army, Navy, and Air Force) sponsored, annual, high school student competition that requires participating youth to complete original research in STEM. JSHS was founded in 1958 with the purpose of encouraging American youth to pursue college degrees and careers in STEM. In line with this original intent, the program is guided by the following priorities:

- Promote research and experimentation in STEM at the high school level;
- Recognize the significance of research in human affairs and the importance of humane and ethical principles in the application of research results;
- 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;
- Recognize innovative and independent research projects of youth in regional and national symposia;
- Expose students to academic and career opportunities to STEM and to the skills required for successful pursuit of STEM;
- Expose students to STEM careers in the Army and/or DoD laboratories; and

- Increase the future pool of talent capable of contributing to the national's scientific and technological progress.

Since its inception, the format of JSHS has modeled what participants will experience as they progress in their STEM pursuits. The review and judging process of JSHS is based on the graduate-level review process that requires communication of research results, comprehension of the implications of research, understanding of the STEM field, and oral defense. While participants are encouraged to obtain assistance from their teachers, mentors, parents, or other students, the written and oral reports that they present at JSHS symposia before a panel of judges comprised of university faculty and DoD personnel represent the participants' original research. The overall test of JSHS is that participants demonstrate valid investigation and experimentation aimed at the discovery of knowledge in one or more of eight competition categories.

JSHS Competition Categories

- Environmental Science
- Engineering & Technology
- Physical Sciences
- Chemistry
- Life Sciences
- Medicine, Health, & Behavioral Science
- Computer Science & Mathematics
- Social Science

In FY13, JSHS engaged 7,600 high school students and 1,100 teachers from US, Puerto Rico, and DoD Dependent Schools in Europe and the Pacific who competed in 47 R-JSHS held on nationwide university campuses. At each of the R-JSHS, the top three participants were awarded scholarships of $2,000, $1,500, and $1,000 respectively. The top five students in each region received an expense-paid trip to the N-JSHS. Of these, the top two students were invited to present their research as part of the national competition; the third place student was invited to display 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. Forty seven teachers, one from each R-JSHS, were awarded $500 to benefit their STEM classrooms.

The N-JSHS is both a competition and a showcase of student research. Much of the reputation of JSHS is based on the prestige of N-JSHS activities. The coordination of N-JSHS activities rotates annually among the Army, Navy, and Air Force, allowing each Department with periodic opportunities to engage its military and civilian STEM professionals in JSHS programming and highlight its research interests and careers opportunities. A total of 235 JSHS R-JSHS finalists, including 94 in the oral research competition and 47 in the poster research competition, advanced to the 2013 N-JSHS (May 1-5, 2013 coordinated by Wright Patterson Air Force Base in Dayton, OH). The first place winners within each competition category were awarded a $12,000 scholarship. The second place finalists in each category received $8,000 scholarships and the third place finalists received $4,000 scholarships. All student participants in the N-JSHS are celebrated as America's future leaders in STEM. Undergraduate tuition scholarships were awarded to 141 winners at the R-JSHS and N-JSHS events. The scholarship awards are payable to the students' college of enrollment upon matriculation.

Evidence Based Program Change

In response to the FY12 JSHS evaluation and in the effort to effectively and efficiently meet AEOP and program objectives, the Academy of Applied Science (AAS) made the following changes/additions to its administration of JSHS in FY13:

1. N-JSHS featured an expanded poster session with an optional non-competitive session for the Student Delegate, providing opportunity for all R-JSHS students advancing to N-JSHS to present their research in the national forum. Poster sessions provide a positive mechanism to engage all students who participate in JSHS, and the N-JSHS poster sessions serve as vehicles for R-JSHS poster presenters to advance to N-JSHS poster sessions.
2. R-JSHS and N-JSHS endeavored to provide and expand the mentor capacity of DoD scientists and engineers. During FY13, DoD personnel participated in 38 of 47 regional symposia. Primary support at the R-JSHS was secured from university ROTC units and laboratories within commuting distance of a regional event. Over 100 military personnel participated in the National symposium as either a judge or presenter in the DoD STEM Showcase. The AAS worked with the AEOP Cooperative Agreement Manager and tri-service representatives to identify STEM personnel representing labs and principal investigators of military-sponsored research.
3. The online competition format piloted in the FY12 Southern California R-JSHS reverted back to an in-person event in response to program evaluations suggesting that students missed the experience provided through traditional regional symposia.

In an effort to both understand current efforts and recommend evidence-based improvements toward expanding and supporting the participation of students from underserved groups, the evaluation incorporated a number of FY12 evaluation recommendations relevant to that objective. The Actionable Program Evaluation section of this report focuses primarily on the findings of these additions to the evaluation:

4. Evaluation of R-JSHS, including:
    - Students' motivations for participating in STEM competitions and other competitions in which they participate;
    - Students' motivations for participating in JSHS and how they learned of JSHS;
    - Students' perceptions of activities, processes, and their value; and,
    - Indicators of program achievement related to student outcomes.
5. Evaluation of marketing, outreach, and recruitment, at the R-JSHS level, including:
    - Regional directors' self-reported "best practices" for expanding participation: targeting of new schools and especially those with high underserved populations and teacher recruitment and retention.
6. Evaluation of judging at both R-JSHS and N-JSHS levels including:
    - Students', regional directors', and judges' perspectives of judging processes, usefulness of judges' feedback, and feedback mechanisms.

FY13 Evaluation At-A-Glance

Virginia Tech, in collaboration with AAS, conducted a comprehensive evaluation study of the JSHS program, including R-JSHS and N-JSHS. 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 regional symposium • STEM professionals judge presentations and select regional winners • Regional winners advance to N-JSHS coordinated by Wright Patterson Air Force Base in Dayton, OH	• 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 R-JSHS and N-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 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 between Regional and National JSHS Student experiences and benefits?

Detailed information about methods and instrumentation, sampling and data collection, and analysis are described in the Evaluation Plan (Appendix A.) In brief, the R-JSHS assessment strategy included at-event focus groups with regional directors/representatives attending N-JSHS (Appendix B), post-event online questionnaires for the regional directors/Representatives (Appendix C) and R-JSHS students (Appendix D). Program reports were also collected from regional directors by AAS and provided to Virginia Tech as an additional data source. The N-JSHS assessment strategy included at-event focus groups with N-JSHS students (Appendix E) and post-event online questionnaires for the N-JSHS students (Appendix F) and judges (Appendix G). Full data summaries are provided for questionnaires in Appendices C, D, F and G. Tables 4-6 outline the information collected in the R-JSHS and N-JSHS assessments by participant group.

Table 4. 2013 JSHS R-JSHS and N-JSHS Student Assessments	
Category	**Description**
Participant Profile	**Demographics:** Participant gender, age, grade level, race/ethnicity, and socioeconomic status indicators.
	JSHS Participation Role: Oral presenter, poster presenter or student delegate/observer.
	Education and Career Intentions: Degree level, degree field, and career field sought by students.
Satisfaction & Suggestions	Motivating factors for participation, program marketing, satisfaction with and suggestions for improving components of R-JSHS and N-JSHS programming.
AEOP Goal 1 Indicators of Program Achievement	**STEM Competencies:** Change in confidence, knowledge, skills, and/or abilities to conduct and communicate about STEM research resulting from participating in mentored research activities and JSHS oral or poster presentation processes.
	Future STEM Engagement: Extent to which JSHS elements motivated further learning and other engagement in STEM.
	AEOP Opportunities: Past AEOP participation and the extent to which JSHS exposed students to and motivated student interest in other Army-sponsored educational opportunities; **DoD STEM Careers:** Extent to which JSHS exposed students to and motivated student interest in pursuing DoD STEM careers.

Table 5. 2013 JSHS R-JSHS Regional Director/Representatives Assessments	
Category	**Description**
Profile	Occupation, past participation, and region served
Satisfaction & Suggestions	Satisfaction with and suggestions for improving components of JSHS regional and national programs, resources and support provided by AAS.
AEOP Goals 1 and 2 Program Efforts	**Underserved Populations:** Current achievements in inclusion of underserved populations, mechanisms for and challenges in outreach to and recruitment of underserved populations, especially through teachers
	Mentor Capacity: Judging Process and Judges' Feedback - Judge training/preparation, feedback offered, value of judging; **Research Mentors -** Recruitment of mentors, value of mentorship.

Table 6. 2013 JSHS N-JSHS Judge Assessments	
Category	**Description**
Profile	Occupation, past participation, and category judged
Satisfaction & Suggestions	Satisfaction with and suggestions for improving the pre-event and at-event judge training and preparation, the judging process, and mechanisms for feedback to students

Study Sample

Questionnaire respondents included 87 R-JSHS students, 114 N-JSHS students, 55 regional directors/Representatives, and 23 N-JSHS judges. In addition, 18 N-JSHS students and 23 regional directors/Representatives participated in focus groups at the N-JSHS event (1-5 May 2013 in Dayton, OH). Table 7 provides an analysis of evaluation participation and statistical reliability achieved with each sample, as given by the margin of error at the 95% confidence level.

Table 7. 2013 JSHS Questionnaire Participation

Participant Group	Respondents (Sample)	Total Participants (Population)	Response Rate	Margin of Error @ 95% Confidence[1]
R-JSHS Students	87	7600	1%	±10.5%
N-JSHS Students	114	235	49%	±6.6%
R-JSHS Regional Directors	40 symposia	47 symposia	80%	±6.0%
N-JSHS Judges	24	70	34%	±16.3%

The statistical reliability achieved for the N-JSHS and R-JSHS regional directors/representatives suggests adequate representativeness of the respective participant group populations. The higher margin of error for R-JSHS students and N-JSHS judges suggests limited representativeness of the larger population of the respective participant groups. Comparisons of gender, race/ethnicity characteristics, and geographic characteristics of R-JSHS Student questionnaire respondents with program participant data collected from regional program reports—an alternative method of establishing representativeness—also suggest limited representativeness of the R-JSHS student sample. N-JSHS Judge questionnaires did not collect demographic characteristics on which to make a similar determination. Low participation of R-JSHS students in evaluation assessments limit reliability of findings. This is a critical area of improvement for future programming and evaluation. Findings from R-JSHS students' and N-JSHS judges' data should be cautiously generalized, with consideration given to the respective margins of error and with triangulation of findings from other data sources. These data contribute to the overall narrative of JSHS's efforts and impact and highlight areas for future exploration in programming and evaluation.

Respondent Profiles

R-JSHS and N-JSHS Students

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. Here and throughout this report, R-JSHS and N-JSHS data will be examined in parallel, allowing visual comparisons in their perceptions of their respective JSHS experiences and benefits of those experiences. Comparison tests were conducted on key variables to explore the significance of differences between the two samples (e.g., R-JSHS, N-JSHS) as well as between sub-samples (e.g., oral presenters, poster presenters).

[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 5%, if you had asked the question to the entire population, 95% of the time, between 42% (47-5) and 52% (47+5) would have selected that answer. A 2-5% margin of error is generally acceptable at the 95% confidence level.

Demographics. Demographic information collected from R-JSHS and N-JSHS respondents is summarized in Table 8. Similar trends emerge from both data sets. More females than males completed R-JSHS and N-JSHS Student questionnaires and the majority of students (82% R-JSHS, 86% N-JSHS) identified with race/ethnicity categories of Caucasian (54% R-JSHS, 49% N-JSHS) or Asian (28% R-JSHS, 37% N-JSHS). Less than 15% of students identified as either American Indian or Alaskan Native, Black or African American, Hispanic/Latino at both levels of JSHS. However, this is an improvement from last year where only 1% identified as Black or African American with no other minority race/ethnicities represented. Most R-JSHS (69%) and N-JSHS (85%) students do not qualify for free or reduced lunch—a common indicator of low income or low socioeconomic status. The average age of students was between 16 and 17 years old, and most students report having one or more years of high school left. Comparison testing revealed the R-JSHS and N-JSHS groups differ significantly in several demographic variables:[2] Hispanic/Latino ethnicity, free or reduced lunch status, and grade level. Specifically, the N-JSHS sample had significantly lower proportions of Hispanic/Latino students and students that receive free or reduced lunch status, and a higher proportion of participants from grade 12 in comparison to R-JSHS.

Table 8. 2012 JSHS Regional and National Symposia Student Respondent Profile

Demographic Category	R-JSHS Respondents		N-JSHS Respondents	
Respondent Gender				
Female	53	63.1%	63	56.8%
Male	31	36.9%	48	43.2%
Choose not to report	0	0%	1	1%
Respondent Race/Ethnicity				
American Indian or Alaskan Native	0	0%	2	1.8%
Asian or Pacific Islander	24	27.9%	41	41%
Black or African American	3	3.5%	5	4.5%
Hispanic or Latino*	9	10.5%	2	1.8%
White or Caucasian	46	53.6%	57	49.1%
Other	1	1.1%	3	2.6%
Choose not to report	3	3.5%	4	3.5%
Respondent Socioeconomic Indicators (most frequently reported)				
Public School Type	67	79.8%	98	86.6%
Suburban School Setting	46	53.6%	73	64.3%
Do Not Qualify for Free or Reduced Lunch*	59	69.1%	97	84.8%
Respondent Completed Grade Level and Age				
Grade 9	1	1%	6	6%
Grade 10	21	25%	18	18%
Grade 11*	44	52%	34	34%
Grade 12*	18	21%	43	43%

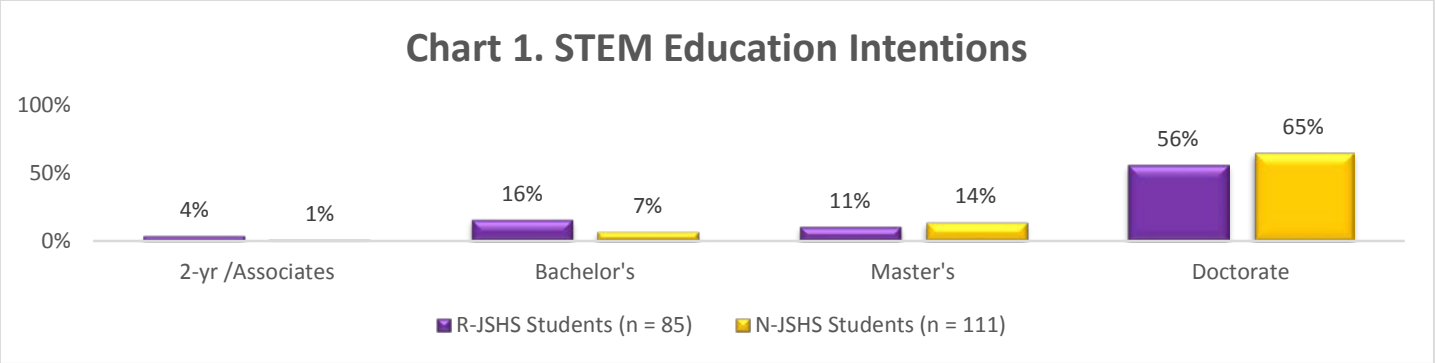
[2] *$p < 0.05$ with Chi-Square, asymptotic test of statistical significance (2-tailed). Hispanic/Latino: Diff = 8.68%, Chi-Square = 7.224, $p = 0.007$; Do Not Qualify for Free or Reduced Lunch: Diff = 15.77%, Chi-Square = 6.974, $p = 0.008$; Grade 11: Diff = 19.4%, Chi-Square = 7.311, $p = 0.007$; Grade 12: Diff = 22.7, Chi-Square = 9.765, $p = 0.001$

JSHS is successful in attracting participation from females—a population that is historically underrepresented in STEM fields. JSHS has had limited success with providing outreach to students from historically underserved low socioeconomic minority race/ethnicity and low-income groups.

Respondent roles. As summarized in Table 9, 58% of R-JSHS students participated in non-presenting roles (student delegate/observer), whereas 91% of N-JSHS Student respondents participated in presenting roles. Of the 46 N-JSHS respondents identifying as Poster Presenters, 23 participated competitively and 23 participated non-competitively. The N-JSHS respondents identifying as student delegates did not choose to participate in the optional non-competitive poster session. Differences in student roles at R-JSHS and N-JSHS are not entirely surprising, given student delegate and observer roles are used to facilitate future participation at R-JSHS level, and N-JSHS is designed to engage most participants as presenters.

Table 9. 2012 JSHS Regional and National Symposia Student Respondent Profile				
Respondent Role at JSHS	**R-JSHS Respondents**		**N-JSHS Respondents**	
Oral Presenter	28	33%	51	45%
Poster Presenter	9	11%	52	46%
Student Delegate / Observer	48	58%	10	9%
Other	1	1%	1	1%

Education and career intentions. All (100%) R-JSHS and N-JSHS students intend to pursue a college degree. Chart 1 summarizes students' intentions to pursue STEM degrees in particular. Eighty seven percent of both R-JSHS and N-JSHS students plan to pursue a degree in a STEM field. The majority of R-JSHS (56%) and N-JSHS (65%) students intend to pursue the terminal doctorate degree in STEM. While the proportion of students intending to pursue a STEM doctoral degree is greater for N-JSHS students than for R-JSHS students, the difference is not significant. However, comparison testing reveals that a significantly higher proportion of R-JSHS students intend to pursue only a Bachelor's degree than N-JSHS students.[3]



The R-JSHS Student questionnaire also captured students' career intentions. Of the 61 respondents, 98% indicated their intent to pursue a career in a STEM field. More respondents intended to pursue careers in Medicine/Health (48%) than

[3] $p < 0.05$ with Chi-Square, asymptotic test of statistical significance (2-tailed). STEM Bachelor's: Diff = 9.4%, Chi-Square = 4.086, $p = 0.043$

any other field, with Chemistry (11%), Engineering (10%) and Life Science (10%) being the next most frequently reported fields.

These data do not discern whether R-JSHS and N-JSHS students have established education and career goals prior to participation, or to what extent their R-JSHS participation in any way affects their pre-event goals. However, from these figures and findings within this report, we can surmise that most JSHS competitors have well-established education and career goals for their STEM pathway and seek out JSHS, among other opportunities, to advance in their STEM pathway. JSHS clearly provides outreach to the Nation's future STEM workforce.

Regional Directors/Representatives

Fifty five individuals representing 40 of 47 regions responded to the R-JSHS regional director/representative questionnaire. Most respondents work in either secondary (36%) or post-secondary (45%) academic settings. Fifty eight percent reported serving as the Regional Director, and the remaining 42% in a capacity other than as regional director. Regardless of the role, most respondents of the Regional Director questionnaire have a long-term relationship with JSHS (Avg. participation ~9 years), and therefore, provide a wealth of knowledge and experience upon which R-JSHS relies. Herein, we will refer to this participant group as "regional directors."

N-JSHS Judges

Twenty four individuals responded to the N-JSHS Judge questionnaire. Most respondents (54%) work as DoD STEM professionals, 17% were university STEM faculty, and 12% were STEM graduate students. Respondents unanimously reported having no prior experience judging for JSHS R-JSHS, and 88% reported having no experience judging for the N-JSHS. This is not surprising given that the overall event coordination rotates between Army, Navy, and Air Force and the event site changes annually depending on the program host. This means that judges are primarily recruited and selected from the hosting service branch's local facilities or sponsored universities. Judges represented all eight competing categories, but most frequently the Life Sciences (38%), Chemistry (17%) and Computer Science & Mathematics (17%).

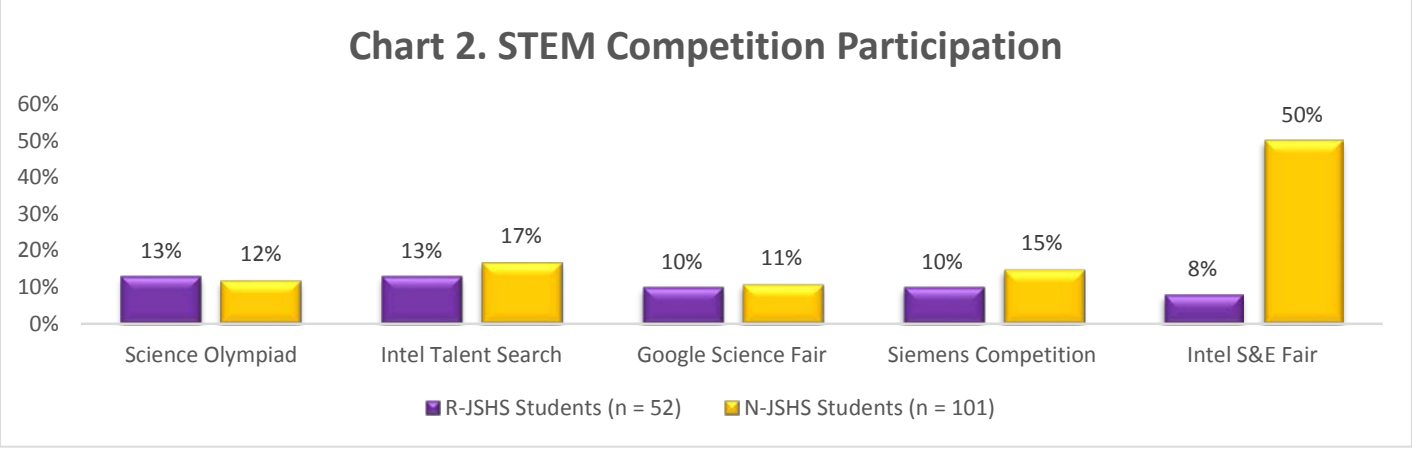
Actionable Program Evaluation

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 4-6 as well as the Goal 2 Program Efforts section of Table 5.

A focus of the Actionable Program Evaluation are efforts toward the long-term goal of JSHS and all of AEOP to increase the future pool of talent capable of contributing to the nation's scientific and technology progress. R-JSHS sites have begun reaching out to students that have traditionally not been involved in the program, especially students of underserved populations. Thus, it is important to consider the factors that motivate students to participate in JSHS, how the program is marketed—to schools, teachers, parents, and the major participant group, students—and what value participants place on programming elements. In the sections that follow, we report perceptions of all participant groups, in an effort to both understand current efforts and recommend evidence-based improvements toward expanding and supporting the participation of students from underserved groups.

Motivating Factors for Students

As recommended by FY12 evaluation, student questionnaires asked students about other science competitions in which they participate. Sixty percent of R-JSHS students and 89% of N-JSHS students participated in one or more science competitions other than R-JSHS or N-JSHS. The most commonly cited type of competition among both groups included regional or state science fairs. A smaller number participated in national, sponsored competitions, as summarized in Chart 2. Comparison testing reveals that significantly higher proportions of N-JSHS students participate in Intel Science & Engineering Fair (50%, 8% R-JSHS) and Intel Talent Search (17%, 13% R-JSHS).[4]



[4] $p < 0.05$ with Chi-Square, asymptotic test of statistical significance (2-tailed). Intel Talent Search: Diff = 9.6%, Chi-Square = 4.369, $p = 0.037$; Intel S&E Fair: Diff = 37.6%, Chi-Square = 32.122, $p = 0.000$

Student questionnaires included two open-ended questions to explore student motivations to participate in science competitions, and specifically, in JSHS. Detailed summaries of these data are found in Appendices D and F and broad themes are described here. Student responses (n = 65 R-JSHS, n = 99 N-JSHS) generally highlighted three broad themes motivating their participation in science competitions. First, students participated for opportunities to engage in and learn from academic research activities (65% R-JSHS, 97% N-JSHS), including sharing and receiving feedback on their research, improving their skills in conducting and communicating about scientific research, and generally engaging in a scientific community of peers. Next, students reported participating to advance STEM pathways (11% R-JSHS, 25% N-JSHS), including to win scholarships, to build applications and resumes, and to explore and clarify STEM fields or careers they will pursue. Finally, many students participated because of school-based associations that recommend or required participation in JSHS (21% R-JSHS, 18% N-JSHS). Teachers, science departments, and schools often nominate students or recommend that they participate, and a number of schools require participation through science research courses.

When asked their motivation to participate in JSHS specifically, respondents (n = 65 R-JSHS, n = 96 N-JSHS) most frequently identified one or more features of JSHS programming (45% R-JSHS, 43% N-JSHS), including JSHS symposia format, oral and poster presentation options, the breadth of competition categories, and the prestige of JSHS. Students reported the same broad themes motivating general science competition participation but also general JSHS event logistics that potentially enabled their participation in JSHS, including regional availability, event location, and scheduled dates (18% R-JSHS, 15% N-JSHS).

JSHS students are motivated by opportunities that JSHS and other STEM competitions provide them to grow critical skills for STEM research. As JSHS expands its participation to include more underserved groups, it will be important to understand their motivation. The evaluation findings of another AEOP competition program, eCYBERMISSION (eCM), indicates that motivations for underserved students are quite different from those of students that, programs like eCM and plausibly, JSHS, have traditionally served. Marketing the program to schools with underserved students may need to emphasize different aspects of the program that attend to their different motivations.

Marketing and Recruiting Underserved Populations

R-JSHS and N-JSHS Symposia Student questionnaires asked an open-ended question to students “How did you hear about JSHS?” in order to understand how JSHS ultimately attracts students. As can be seen in Chart 3 on the next page, most students (84% R-JSHS, 72% N-JSHS) credited one or more school-based associations—teachers, academic coursework or programs, science departments, and school nominations—for their awareness of JSHS. Of those associations, teachers (58% R-JSHS, 47% N-JSHS) were most frequently cited as the means by which students are attracted to JSHS. It is clear that the program is largely marketed to schools, and especially to teachers, rather than directly to students. These data suggest the importance of outreach to and recruitment of new schools and teachers in order to expand student participation and support students in being successful JSHS competitors.

Indeed, JSHS is largely marketed to schools and teachers, and teachers serve as the primary conduit through which many students come to participate in JSHS (58% R-JSHS, 47% N-JSHS). From Regional Director focus groups and questionnaires, we learn that teachers “market” JSHS to students, encourage participation, nominate students, support their research

projects and presentations, and even drive them to events. At events teachers play important roles as regional symposia staff and volunteers. Eighty one percent of regional directors agreed that recruiting new teachers is key to recruiting new students and expanding the geographic, race and ethnic, and socioeconomic diversity of students. FY13 evaluation of R-JSHS assessed regional efforts to expand student participation, through efforts for outreach, recruitment, and retention of teachers and schools having high proportions of underserved students.

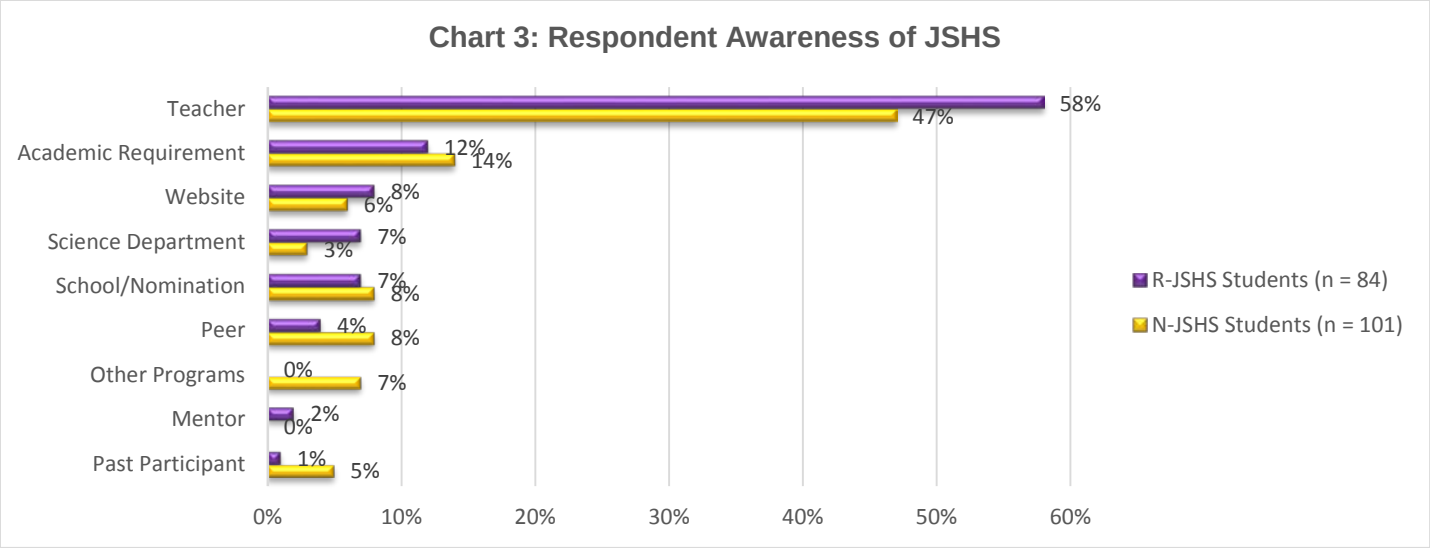


Table 10 highlights some of the most fundamental challenges encountered by regional directors in their efforts to expand student participation. These challenges emerged from focus group discussions and were then posed to the full participant group in the follow-up questionnaire. The majority of regional directors generally agreed that funding to support regional directors' travel to schools for outreach and recruitment (65%) and students' and teachers' travel to events (57%) are necessary to expand participation in JSHS. In many regions, teacher participation is also limited by schools' ability to fund substitute teachers (42%). The response scale for these four items is: 1 = "*Strongly Disagree,*" 2 = "*Disagree,*" 3 = "*Somewhat Disagree,*" 4 = "*Somewhat Agree*," 5 = "*Agree*," 6 = "*Strongly Agree*".

Table 10. Regional Director Perceptions of Outreach and Recruitment Challenges

	Strongly Disagree/ Disagree	Agree / Strongly Agree	n	Avg.	SD
To access new populations of students, I must be able to recruit participation from new schools and teachers	4 (8%)	43 (81%)	53	**5.17**	1.30
Many teachers do not participate in my symposium because their school will not fund substitute teachers	15 (29%)	22 (42%)	52	**3.77**	1.63
My regional symposium needs additional funding to provide travel support to participants	11 (22%)	29 (57%)	51	**4.43**	1.65
I would be able to recruit new teachers to participate in my symposium if I had more funding to travel to their schools	10 (19%)	34 (65%)	52	**4.56**	1.55

Content analysis of regional program reports revealed that most regional directors employ multi-pronged efforts to reach teachers, including by email, phone calls, and face-to-face visits; through state, county, and district agencies and their list-serves and mailing lists; and through universities, educational associations, and professional organizations in contact with teachers. The Regional Director questionnaire asked respondents to share what they consider their "best practices" for increasing teacher involvement and retention in their regions. Most of their best practices endeavored to surmount the challenges described in Table 10, and hinged upon establishing and maintaining personal relationships with teachers and ensuring reasonable incentives such as travel funds and substitute teacher pay to facilitate initial and continued involvement.

Regional reports also suggested that many regions are conducting efforts to expand participation of underserved students, in particular. A summary of efforts described in regional program reports, shown in Table 11 suggests that efforts focused on outreach and recruitment are described more than three times as often as efforts to facilitate successful participation after recruitment. Regional directors in focus groups highlight the importance of facilitating participation, cautioning from experience that underserved students may be initially unable to compete with more traditional participants due to disparity in resources, mentorship, and STEM savvy teachers who can support their research. As R-JSHS endeavors to expand the participation of underserved groups, investment must be made to ensure equitable footing of those groups with their traditional counterparts if JSHS is to be perceived as fair and as nurturing growth of all student participants.

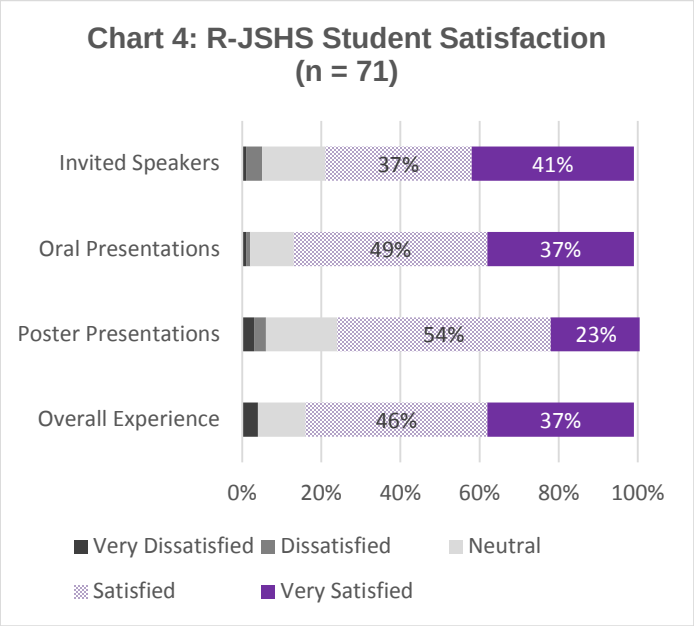
Table 11. Regional Directors' Efforts to Engage Unserved Students in R-JSHS (n = 38)

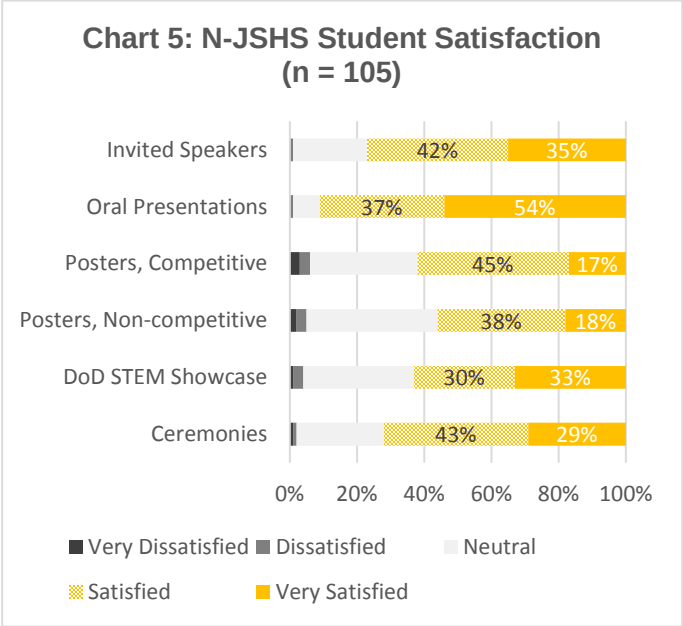
Activity	Freq	%
Outreach/Recruitment	**28**	**74%**
School- or region-specific invitations to sustain or expand minority participation	9	24%
Coordinating efforts with other programs/organizations/agencies to maximize student participant pool	7	18%
Building and/or leveraging relationships with programs already supporting minority students	5	13%
Using past teacher and student participants as recruiters	4	11%
Engaging advisory boards in recruitment with certain schools/teachers	2	5%
Representing minority participants in promotional materials	1	3%
Facilitating Participation	**11**	**29%**
Funding travel for teacher and/or student observers in preparation for future participation	6	16%
Offering "middle school" programs	2	5%
Offering incentives (scholarships, college credit, discounted fees) to disadvantaged students	2	5%
Offering a poster session open to all students who wish to participate	1	3%
eMentoring program to match students with appropriate researcher	1	3%
Professional development opportunities for teachers to better support their students' efforts	1	3%

Most regional directors (88% of 48 questionnaire respondents) generally agree that it is important for regional directors to share best practices about these and other issues. About three quarters expressed willingness to participate in a committee of regional directors for the purpose of sharing best practices, or offered alternatives, mostly web-based or other electronic forms of communication, for facilitating communication among regional directors.

Satisfaction and Value of Event Elements

Satisfaction with JSHS elements. Participants expressed high levels of satisfaction with key elements of R-JSHS and N-JSHS. The oral presentations (86% R-JSHS, 91% N-JSHS) and invited speakers (78% R-JSHS, 77% N-JSHS) were especially held in high regard. Participants generally have lower satisfaction with the student poster presentations.





Comparison testing revealed that satisfaction with poster presentations differ significantly among oral presenters and poster presenters. While, N-JSHS differences in oral presenters', competitive presenters', and noncompetitive poster presenters' satisfaction with competitive poster sessions only approach significance,[5] differences in their respective satisfaction with non-competitive poster sessions are significant.[6] Furthermore, N-JSHS poster presenters are significantly less satisfied with the specific poster sessions in which they participated—either non-competitive or competitive.[7] These data suggest that poster sessions may be an area for future programmatic improvement, especially at N-JSHS, where the intent of the non-competitive poster session is to serve as a positive mechanism to engage more students in presenting at a national forum.

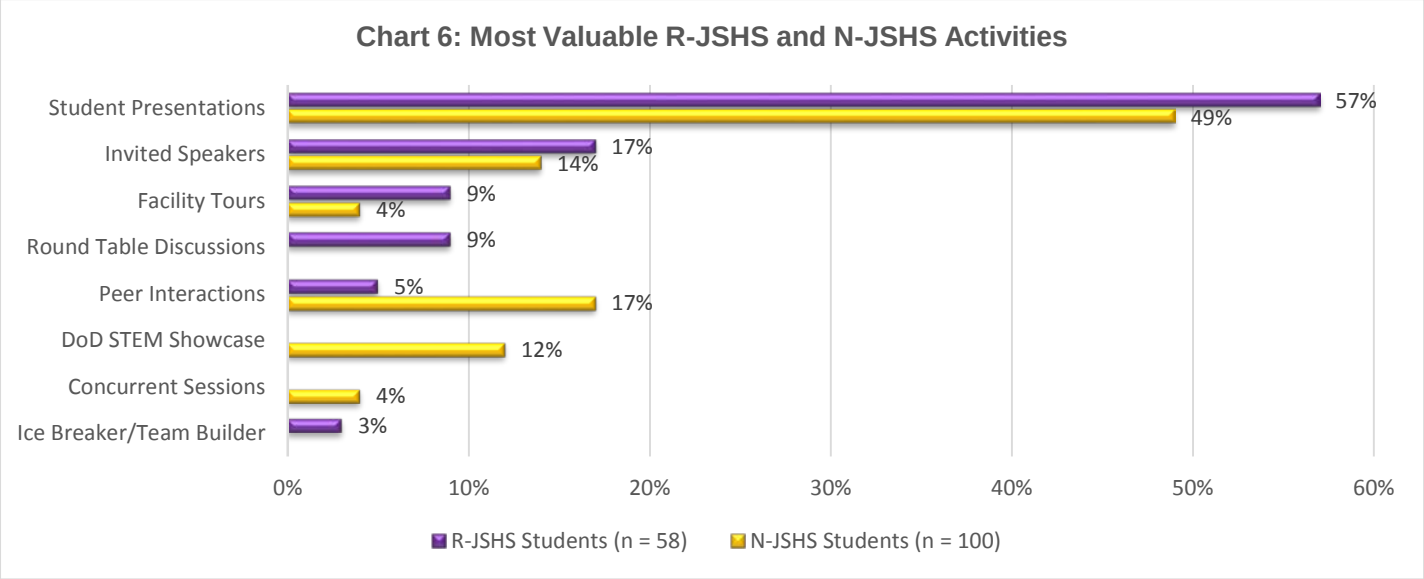
Value of JSHS elements. R-JSHS and N-JSHS students were asked to identify the element or activities of each program that students found most valuable. R-JSHS students were also identified least valuable element or activity.

- "At [Regional/National] JSHS, which activity do you think was the most valuable? Why?"
- "At Regional JSHS, which activity do you think was the most valuable? Why?"

[5] $p > 0.05$ with One-way ANOVA. F = 2.66, $p = 0.075$, approaching significance
[6] $p < 0.05$ with One-way ANOVA. F = 3.300, $p = 0.041$
[7] $p < 0.05$ with ANOVA post-hoc tests of mean difference between groups. Non-competitive Poster Satisfaction: Oral v. competitive poster presenters, Mean Diff = .675, $p = 0.024$; Noncompetitive Poster Satisfaction: Oral v. noncompetitive presenters, Mean Diff = .721, $p = 0.012$

Students' responses to these questions are summarized in Charts 6 with the broad themes identified from students' responses. Categories in R-JSHS that do not have an N-JSHS counterpart are intentionally left "blank" for the N-JSHS participant group and vice versa.

As shown in Chart 6, a majority of R-JSHS and N-JSHS students considered student research presentations (57% R-JSHS, 49% N-JSHS) and invited speakers (17% R-JSHS, 14% N-JSHS) the two most valuable activities. N-JSHS students also strongly valued peer interactions (17%). The reasons students gave for assigning value to each of the various elements in the chart emphasized the nature and breadth of learning experiences and the opportunities JSHS provides to interact with others around STEM. Students mentioned opportunities to learn about interesting STEM topics and fields, what it's like to do STEM research, and different STEM careers. Students reported value in interactions with their peer STEM enthusiasts, opportunities to engage with professional STEM experts, and opportunities to work in teams to solve challenges.



It is also important to note that R-JSHS students considered invited speakers to have "least value" when their presentations were not interesting or were difficult to follow, or when speakers generally lacked enthusiasm. Also, R-JSHS students reported that student presentations had "least value" when the presentation setting prevented students from having meaningful interactions with presenters, or when biased judging "depreciated the student's research." These challenges are important to remedy given the value students place on them, and especially for providing a supportive climate with an expanding participation of students from underserved groups.

Mentor Capacity: Judging Process and Judges' Feedback

Student competitors potentially had access to two different kinds of mentors through JSHS participation: R-JSHS and N-JSHS judges and their research mentors. Judges play a more distant role as mentors through their discourse with and feedback provided to student competitors at or following the event, yet this unique mentorship is highly valued. In focus groups, N-JSHS students reported how important R-JSHS judges' feedback was for improving their presentations for N-JSHS, including improving the clarity of visuals, writing and the overall presentation of ideas. They also reported leveraging judges' feedback to set the direction for future research, such as adjusting research questions or exploring alternative methods. As the judging process and, more specifically, feedback offered by judges, have been cited previously in evaluations as areas for improvement, this evaluation included significant exploration of judging at both R-JSHS and N-JSHS levels. The evaluation gathered students', regional directors', and judges' perspectives of judging processes, usefulness of judges' feedback, and feedback mechanisms.

R-JSHS and N-JSHS students' perceptions. Table 12 summarizes the type of feedback that R-JSHS and N-JSHS students—oral and poster presenters—report receiving from judges. These data might suggest that at the R-JSHS, whether and what type of feedback students received from judges depends upon whether students present research in the oral or poster formats; poster presenters receive less feedback and fewer types of feedback than oral presenters. The only type of feedback reported by N-JSHS presenters is oral feedback. Importantly, a substantial portion of all presenters at R-JSHS and N-JSHS report receiving no feedback from the judges (22% R-JSHS-Oral, 62% R-JSHS-Poster, ~75% N-JSHS-Oral and NJSHS-Poster).

Table 12. R-JSHS and N-JSHS Judge Feedback Types

	RJSHS		NJSHS	
	Oral (n = 23)	**Poster (n = 8)**	**Oral (n = 45)**	**Poster (n = 23)**
Written feedback at the event	4 (17%)	0 (0%)	0 (0%)	0 (0%)
Oral feedback at the event	9 (39%)	3 (38%)	11 (24%)	6 (26%)
Written feedback after the event	5 (22%)	0 (0%)	0 (0%)	0 (0%)
No feedback	5 (22%)	5 (62%)[8]	34 (76%)	17 (74%)

R-JSHS and N-JSHS presenters' enjoyment with the presentation and judging process and their perception of usefulness of the feedback provided are summarized in Charts 7 and 8. Most presenters enjoyed presenting at JSHS events, however, though these data might suggest that presenter enjoyment depends upon whether students present research in the oral or poster formats. Poster presenters (88% R-JSHS, 64% N-JSHS) expressed less enjoyment than oral presenters (91% R-JSHS, 91% N-JSHS). Additionally, R-JSHS oral presenters generally agree that feedback is useful, whereas N-JSHS oral presenters and both R-JSHS and N-JSHS poster presenters generally disagree that the feedback they get from judges is useful.

[8] One student reported receiving an award of recognition after the event; this was not considered "judge feedback."

Comparison testing revealed that presentation format—oral or poster—potentially contributes to differences in enjoyment and perceived utility of feedback. For example, N-JSHS oral presenters expressed significantly higher levels of enjoyment than N-JSHS poster presenters.[9] R-JSHS oral presenters (58%) perceive slightly more utility in feedback than do R-JSHS poster presenters (24%)[10] and N-JSHS oral presenters (17%).[11] Considering the types of feedback that various groups report receiving most frequently, these findings may also suggest that written forms of feedback are generally considered more useful to presenters than other forms of feedback.

Chart 7: R-JSHS Students' Views of Presenting and Feedback

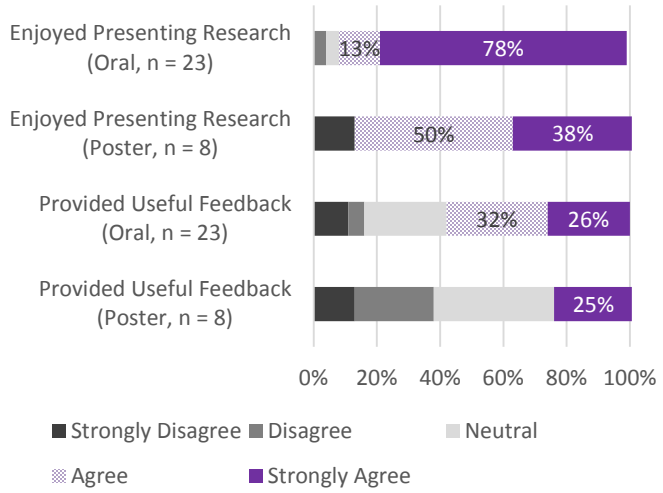
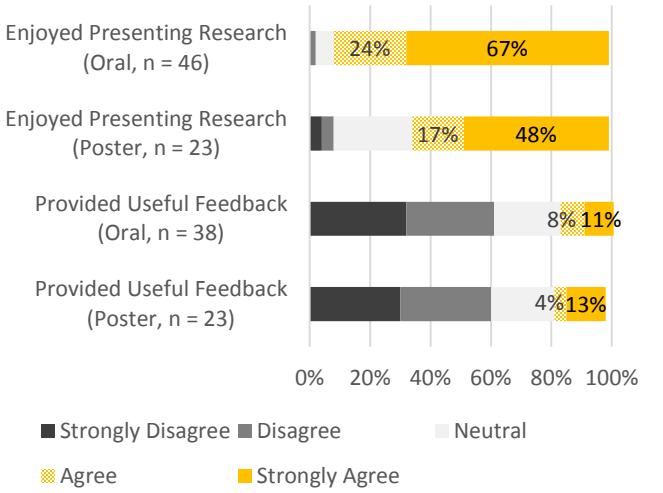


Chart 8: N-JSHS Students' Views of Presenting and Feedback

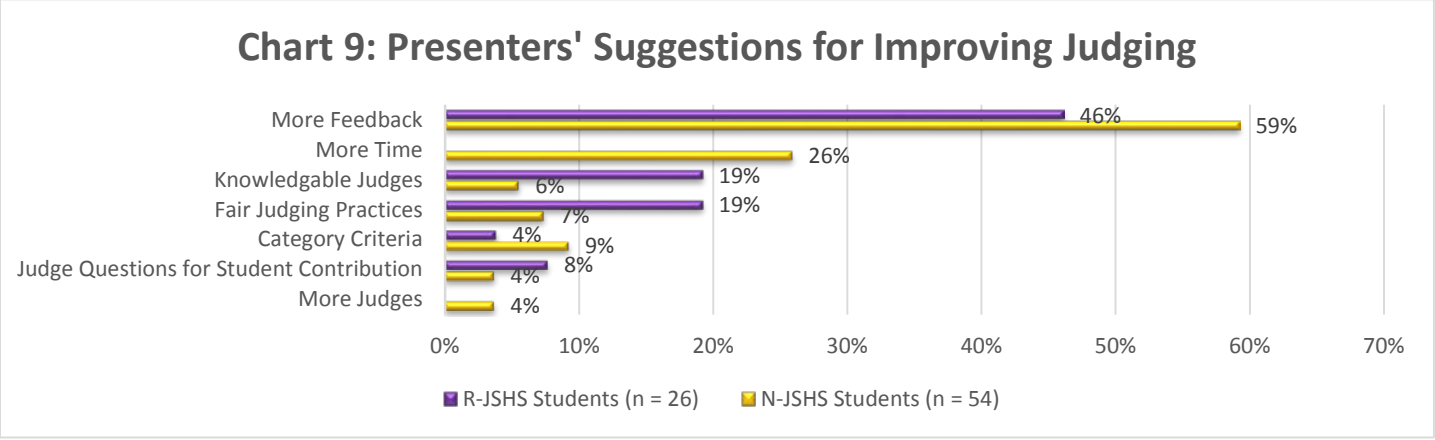


R-JSHS and N-JSHS Student questionnaires asked presenters "How would you improve the judging process?" All recommendations given by at least two R-JSHS and/or N-JSHS participants are summarized in Chart 9 on the next page, but the key findings are that students want more and useful feedback and fair judging processes. These and unique suggestions are further aggregated into oral and poster presenter feedback in the respective Appendices. Students' suggestions for improvement most frequently included requests for receiving more feedback from the judges. Responses included concerns that judges were not knowledgeable of the subjective matter they were adjudicating and may not have judged fairly—harshly criticizing some students and not others, asking too few questions that explored the nature and extent of student contributions to the presented research, and giving preferential consideration to highly mentored or resourced projects over "original" student-driven projects. Taken together, these concerns suggest that a number of students—at both R-JSHS and N-JSHS—perceive that the judging process is not fair.

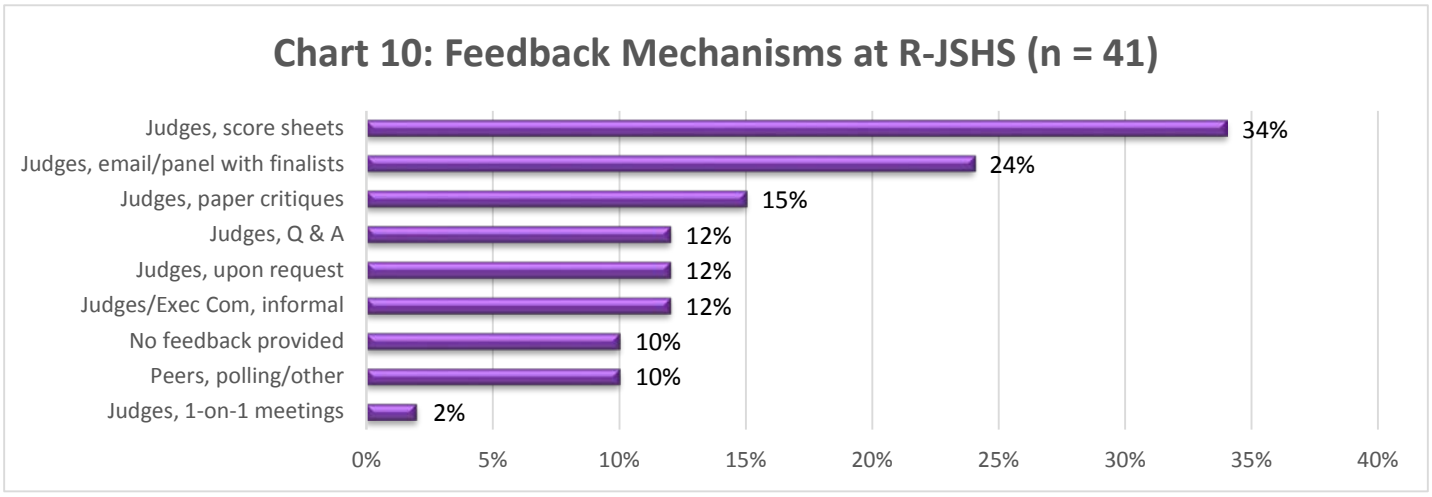
[9] $p < 0.05$ with Mann-Whitney test, asymptotic significance (2-tailed). Mean Diff = .64, Z = 2.083, $p = 0.037$, $r = 0.251$ small effect

[10] $p > 0.05$ with Mann-Whitney test, asymptotic significance (2-tailed). Mean Diff = .99, Z= 1.299, $p = 0.194$ approaching significance, $r = 0.250$ small effect

[11] $p < 0.05$ with Mann-Whitney test, asymptotic significance (2-tailed). Mean Diff = 1.71, Z = 3.325, $p = 0.001$, $r = 0.448$ small effect



Regional directors' perceptions. Regional directors provided additional insight about feedback mechanisms that support the judging process at R-JSHS. The Regional Director questionnaire asked about feedback mechanisms employed at the R-JSHS—what kind of feedback do students receive, what format, when is it received, and who receives it? A range of responses were given and are summarized in Chart 10, including formal and informal feedback from judges, executive committee, or peers; written and oral forms of feedback; at- or post-event feedback; and feedback provided to all, some, or none of the student presenters. No single feedback mechanism described was used by more than 34% of evaluation respondents. JSHS feedback mechanisms from judges to students vary considerably across R-JSHS, suggesting that regional directors may need additional support in interpreting and implementing existing guidelines for judging and feedback if consistency is desired across R-JSHS.



Regional directors were asked in focus groups what they do to ensure that students reap the benefits of judging processes and/or suggestions for improving R-JSHS judging. Fifteen of 25 regional directors offered feedback mechanisms that they consider to be working, including providing compilations of judge's score sheets and comments (53%), providing oral

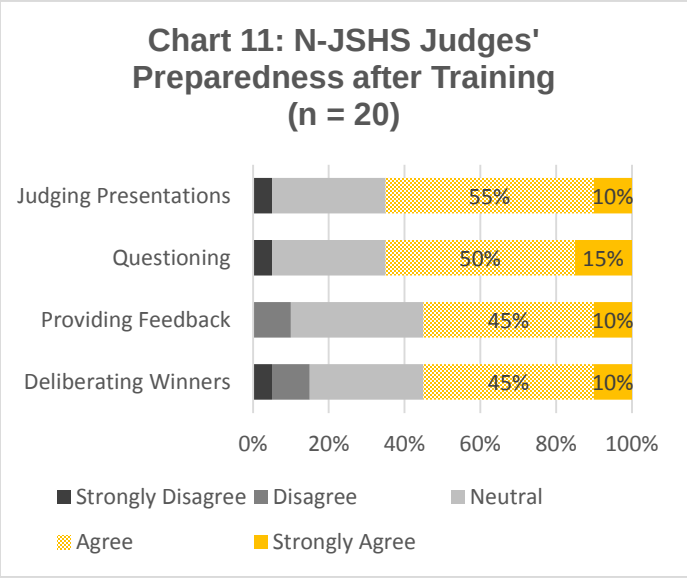
feedback at the event followed up with electronic feedback post-event (33%), and gathering peer feedback at the event (13%). Regional directors also suggested a number of improvements that could be made, including

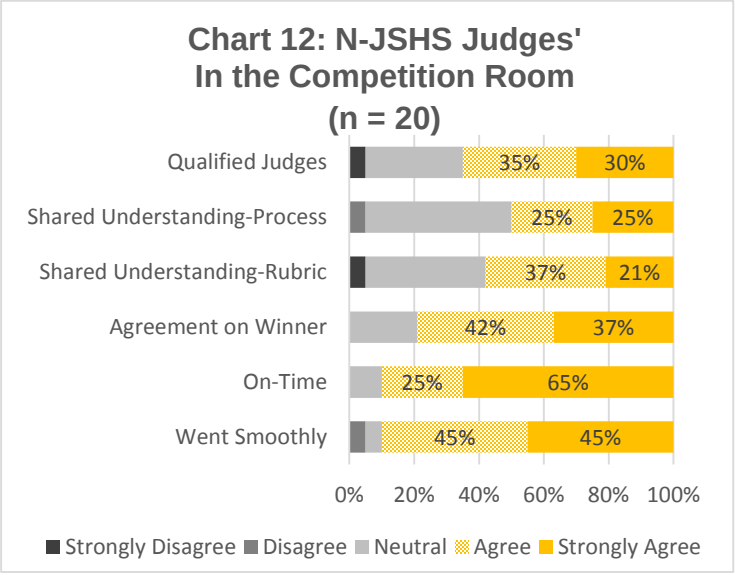
- offering more training and going support to judges;
- revision to judging criteria to reward ownership or autonomy;
- mechanisms to provide instant and peer feedback; and
- more time for judges to give feedback.

N-JSHS judges' perceptions. Through the N-JSHS judges Questionnaire, N-JSHS judges provided additional insight about their experiences with online judging resources, at-event training, and the judging process itself, as well as suggestions for improving the judging process.

Of the 24 N-JSHS Judge questionnaire respondents, nearly all judges found the online guidance (96%) and online access to abstracts and papers (100%) to be useful for preparing them for judging at N-JSHS. On average, N-JSHS judges spent about 4 hours reviewing abstracts and papers prior to their arrival at the event, with only 2 judges reporting difficulty with that portion of the online system. Most judges (65%) did not find the online scoring system to be useful. Subsequently, one third of judges suggested clarifying the relationship between the online scoring and at-event judging processes and/or making improvements to the system to ensure ease of use during the event.

At-event training was also provided to N-JSHS judges. Four of the 24 questionnaire respondents did not attend the training, citing lack of awareness. Chart 11 summarizes N-JSHS judges' self-reported preparedness after participating in the at-event training, in terms of judging presentations, questioning presenters, providing feedback to presenters, and deliberating the selection of winners. Chart 12 summarizes judges' perceptions of the judging process that occurred in their competition room.





A majority of judges felt prepared to judge presentations (65%) and question presenters (65%), and most reported that their judging was on-time (90%) and went smoothly (90%). However, more than 40% did not agree that they were prepared to provide feedback, or to deliberate winners, or that judges in the competition room had shared understandings of the judging process and tools. This suggests that JSHS online and at-event resources for N-JSHS judges are not consistently preparing all N-JSHS judges for their work.

N-JSHS Judge questionnaire included several items eliciting judges' suggestions for improving the training and judging process. National judges provided these suggestions for improving the judging process. Synthesizing from across these the three items, judges generally recommend to

- select judges carefully, ensuring that judges are experienced;
- provide detailed training, especially for new judges, so they aren't perceived as inexperienced or inattentive;
- provide full papers to judges in advance of the judging to ensure judges are prepared; and
- ensure that moderators allow sufficient and consistent lengths of time for judges to question students.

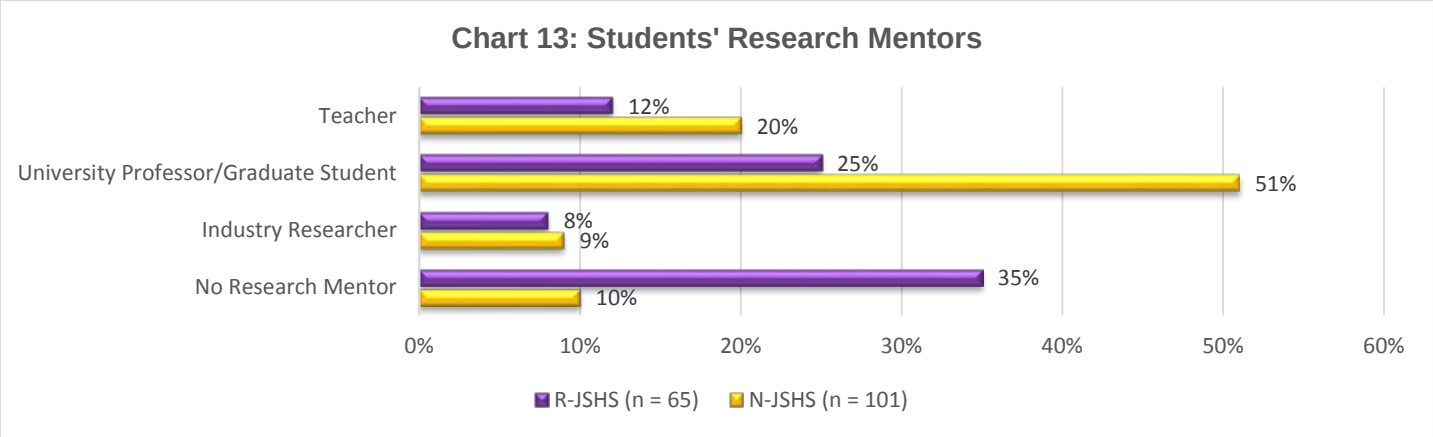
Judges were less likely to recommend the improvement of providing formal feedback to students. Of the 24 judges who responded, less than half would recommend oral feedback (46%) or written feedback on papers (42%) after the competition. Written feedback on the oral presentation was most recommended (58%) by judges. Judges expressed concerns about their anonymity as well as the time commitment and training required to give effective feedback. One judge cautioned that such a requirement might deter prospective judges from serving.

Mentor Capacity: Research Mentors

JSHS's reach with research mentors is limited to two primary mechanisms: materials available to research mentors at the JSHS website and teachers who are deliberately recruited at the R-JSHS level to support students' research. If students desire mentoring beyond what is immediately available, they bear the responsibility for identifying and recruiting appropriate mentors to suit their needs and making sure those mentors have the information they need to guide students in their JSHS pursuits. Thus, having a mentor is not a requirement for participation in JSHS, and not surprisingly, many students who participate in R-JSHS or N-JSHS do not have research mentors.

Regional directors' unanimous reports in focus groups, indicating that most students competing at their R-JSHS do not have mentors, stand in contrast to the more than two thirds of R-JSHS and N-JSHS students who report having mentors—parents, teachers, professors and graduate students, and industry researchers. Chart 13 summarizes the proportion of students reporting each mentor type. It is worth noting that teachers provide mentorship to many students competing in both R-JSHS and N-JSHS. Yet regional directors suggest in focus groups that teachers provide more "guidance" of the research process rather than mentorship, as they often have limited or no background in STEM research themselves. Perhaps regional director claims that most students do not have mentors at the R-JSHS level, may indeed refer specifically to mentors who are STEM professionals and can provide students with discipline specific knowledge, skills, and resources, beyond what a typical teacher can provide.

Chart 13 clearly indicates that JSHS student mentorship varies between R-JSHS and N-JSHS. R-JSHS students are less likely to have mentors and especially, STEM professionals as mentors. Comparison testing revealed a significantly higher proportions of N-JSHS students (51%, 25% R-JSHS) report university professors or graduate students as mentors[12], while significantly higher proportions of R-JSHS Students (35%, 10% N-JSHS) report that they did not have a research mentor.[13]



These findings may corroborate students' perceptions that highly-mentored or highly resourced projects are preferentially advanced over "original" student-driven projects, and presents a hearty challenge for the judging process as participation expands to include more students that typically have less access to STEM savvy mentors and to resources. Regional directors, in focus groups and regional program reports, recommended a number of best practices for supporting students in finding research mentors, including:

- working with students to clarify their needs and identify potential mentors that align with those needs;
- recruiting mentors, especially STEM professionals, from local or state science fair judge pools, or from other STEM organizations with existing mentor programs; and,
- when teachers are the only or best option, develop teachers' capacity to serve as research mentors, through online or in-person STEM research training programs.

[12] $p < 0.05$. with Chi-Square test, asymptotic test of statistical significance (2-tailed); Mean Diff = 26.36%, Chi-square = 11.433, $p = 0.001$
[13] $p < 0.05$. with Chi-Square test, asymptotic test of statistical significance (2-tailed); Mean Diff = 25.58%, Chi-square = 16.385, $p = 0.000$

Outcomes Evaluation

The assessment of R-JSHS and N-JSHS included measurement in several categories to indicate program achievement of objectives aligned with AEOP Goal 1: STEM Literate Citizenry. Toward Goal 1, we measured students' perceptions of JSHS's contributions toward growth in: STEM competencies, motivation to achieve more in STEM, AEOP awareness and interest, Army/DoD STEM career awareness and interest.

STEM Competencies

A key component of developing a STEM Literate Citizenry is developing and expanding students' STEM competencies—the foundational STEM knowledge, skills, and abilities needed to help them be informed citizens and effective decision makers in their everyday lives, or needed to productively engage in the enterprise of STEM research. The evaluation of JSHS measured students self-reported growth is STEM competencies as a result of the presentation and judging process and interactions with their peers at the symposia, as well as from participating in mentored research.

Growth from presentation and judging process. The R-JSHS and N-JSHS questionnaires captured presenters' self-reported growth in their skills and confidence to communicate about their STEM research, and presenters' intent to improve their STEM research as a result of the JSHS oral or poster presentation processes. Data are summarized in Charts 14-17 on the next page.

Most oral presenters at both R-JSHS and N-JSHS agreed or strongly agreed that presenting their research at JSHS helped them become a better speaker/presenter (91% R-JSHS, 91% N-JSHS) and that they are more confident in their ability to communicate science after presentation and judging process (83% R-JSHS, 91% N, JSHS). However, fewer of these same students reported that JSHS helped them become better writers (60% R-JSHS, 63% N-JSHS) or that judges' feedback will improve their research (73% R-JSHS, 65%). Both R-JSHS and N-JSHS data suggest differences in perceptions of growth are dependent upon presentation format.

Comparison testing reveals N-JSHS oral presenters perceived significantly higher gains in their presenting,[14] writing,[15] and confidence to communicate scientific ideas[16] as a result of participating than do N-JSHS poster presenters. Additionally, N-JSHS oral presenters reported significantly higher intent to use feedback from the presentation and judging process to improve their research.[17] Additionally, R-JSHS oral presenters perceived significantly more growth as presenters than do R-JSHS poster presenters.[18] These findings suggest that presentation format potentially contributes to differences in perceived growth in STEM competencies. In particular, the oral presentation and judging process had a greater effect than

[14] $p < 0.05$ with Mann-Whitney test, Asymptotic significance (2-tailed). Mean Diff = 1.00, Z = 3.657, $p = 0.000$, $r = .0.447$ small effect
[15] $p < 0.05$ with Mann-Whitney test, Asymptotic significance (2-tailed). Mean Diff = .85, Z = 2.390, $p = 0.017$, $r = .0.291$ small effect
[16] $p < 0.05$ with Mann-Whitney test, Asymptotic significance (2-tailed). Mean Diff = .74, Z = 2.668, $p = 0.008$, $r = .0.326$ small effect
[17] $p < 0.05$ with Mann-Whitney test, Asymptotic significance (2-tailed). Mean Diff = 1.70, Z = 3.818, $p = 0.000$, $r = .0.481$ approaching moderate effect
[18] $p < 0.05$ with Mann-Whitney test, Asymptotic significance (2-tailed). Mean Diff = .85, Z = 2.339, $p = 0.019$, $r = .0.420$ small effect

the poster presentation and judging process. Thus, for students to reap maximum benefit from their JSHS experience, poster presenters should be encouraged to return as oral presenters in subsequent competition years.

Chart 14: R-JSHS Oral Presenters' STEM Compentencies from Presentation & Judging (n = 23)

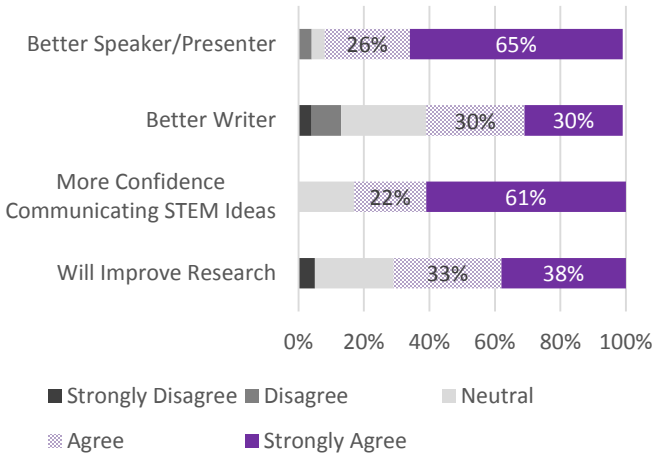


Chart 15: N-JSHS Oral Presenters' STEM Compentencies from Presentation & Judging (n = 23)

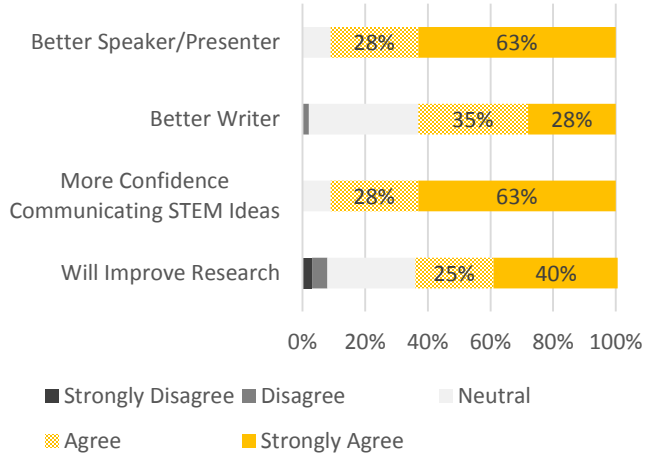


Chart 16: R-JSHS Poster Presenters' STEM Compentencies from Presentation & Judging (n = 8)

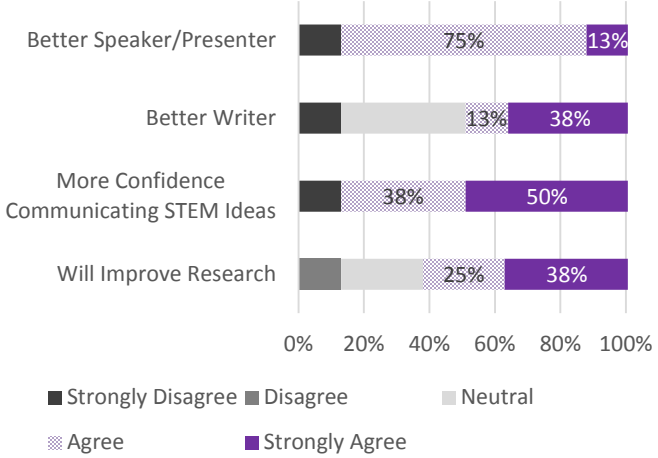
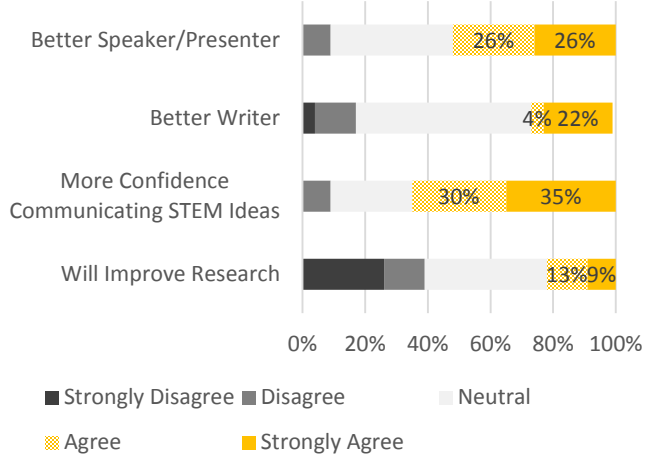
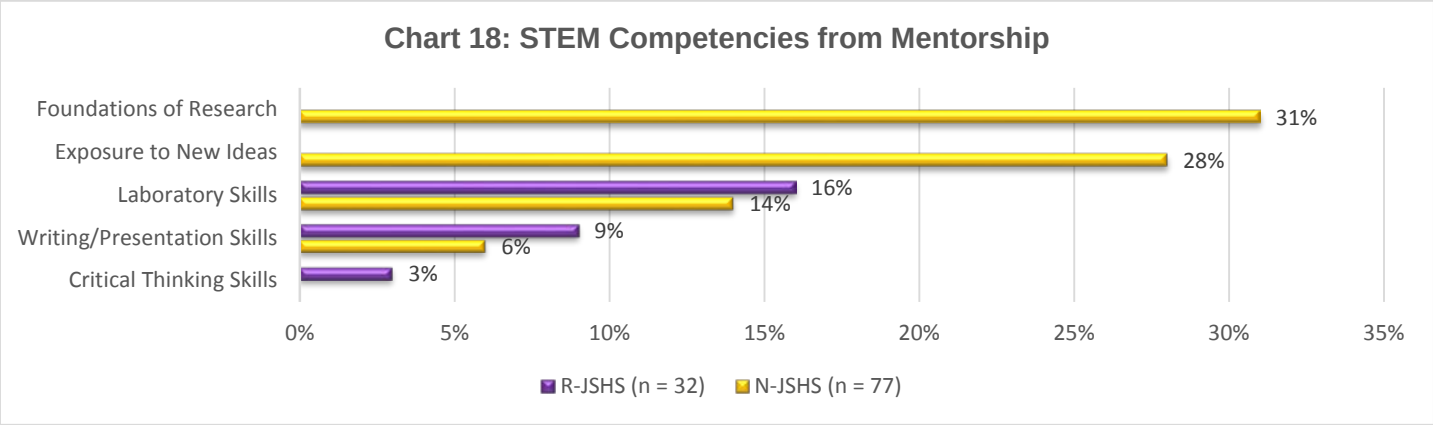


Chart 17: N-JSHS Poster Presenters' STEM Compentencies from Presentation & Judging (n = 46)



Growth from participating in mentored research. Student questionnaires asked an open ended question, "In what other ways has your mentor helped you succeed in JSHS and in your other STEM pursuits?" Responses are summarized in Chart 18. Twenty eight percent of 32 R-JSHS respondents reported improvement in STEM competencies from working with a mentor, including: development of laboratory skills (16%), writing/presenting skills (9%), and critical thinking skills (3%). In comparison, 79% of 71 N-JSHS respondents—who had statistically greater proportions of university faculty and graduate students mentors than R-JSHS students—reported growth in STEM competencies: mentors taught them the fundamental knowledge or practices of research (31%) and exposed them to new ideas (28%), in addition to those STEM competencies reported by R-JSHS students. An interesting finding is that 19% of 32 R-JSHS respondents cited mentors provided critical access to resources, such as laboratory facilities or other materials, whereas only 10% of 71 N-JSHS respondents reported the same.



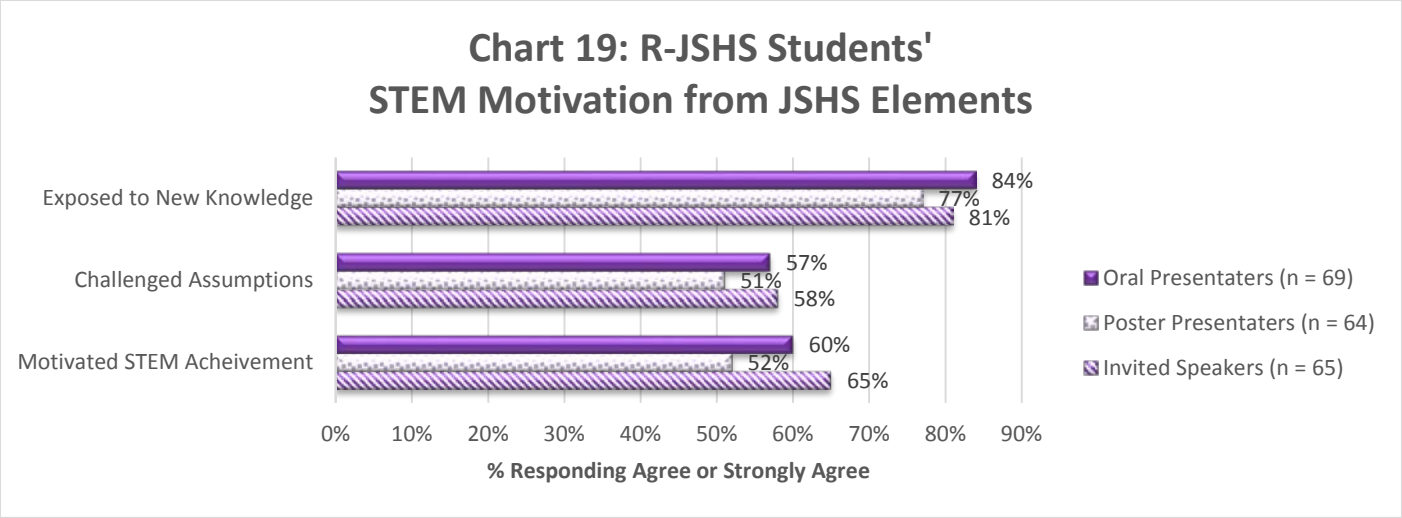
JSHS is successful at fostering development in critical STEM competencies. However, perceived growth varies by presentation format and mentorship. For students to reap maximum benefit from their JSHS experience, poster presenters should be encouraged to return as oral presenters in subsequent competition years, and efforts should be made to assist all students in finding qualified mentors that can provide general guidance and assist students in developing writing and presenting skills, but also apprentice students in learning of knowledge, practices, and tools of a STEM discipline or topic.

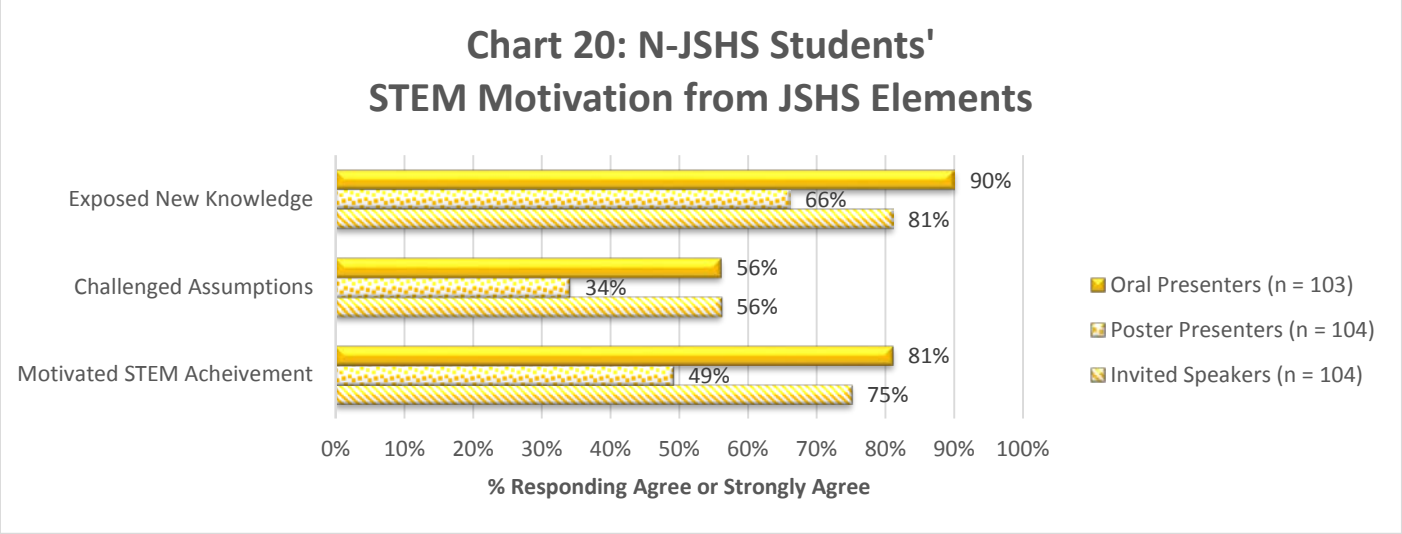
Future STEM Engagement

Another component of developing STEM Literate Citizenry is cultivating sustained student interest in and motivation to continue to engage in and achieve more in STEM. The evaluation of JSHS measured students' self-reported growth in motivation to engage and to achieve more in STEM as a result of participating in key symposia and interacting with their peers at the events, as well as from conducting mentored research.

Motivation from key symposia elements. The regional student questionnaire captured participants' perceptions of the extent to which JSHS regional symposia key components (oral presentations, poster presentations, and invited speakers) effected interest and motivation on three scales: exposed new knowledge, challenged assumptions, and motivated future STEM achievement.

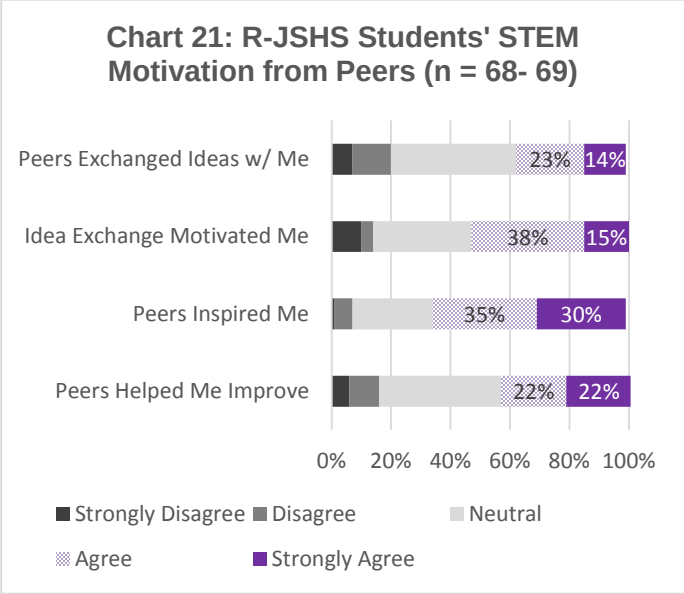
Findings are summarized in Charts 19 and 20 below. A majority of students agreed that elements of JSHS exposed them to new information/knowledge in STEM (77-84% R-JSHS, 66-90% N-JSHS) and motivated them to achieve more in STEM (52%-65% R-JSHS, 49%-81% N-JSHS). Fewer students felt their current assumptions of STEM were challenged (51%-58% R-JSHS, 34-56% N-JSHS). Oral presenters and invited speakers had the most influence, while poster presentations had the least.

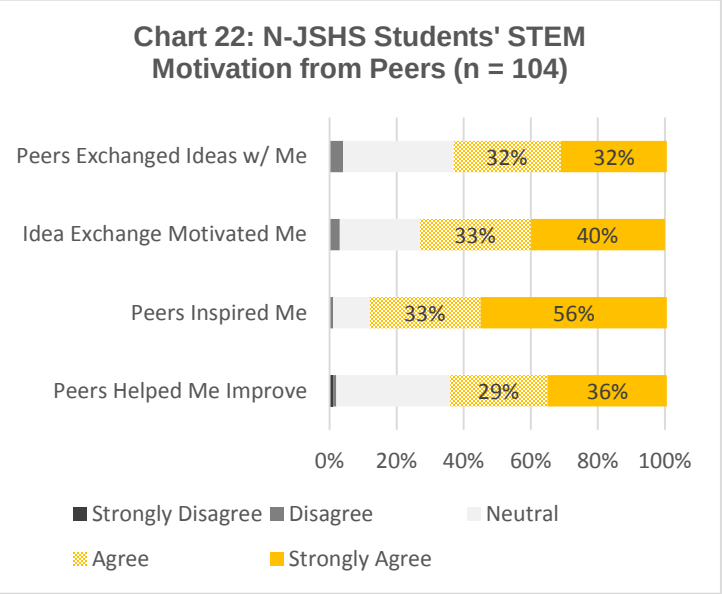




Motivation from peer interactions. Eight items in the Student questionnaires capture student perceptions of and outcomes attributed to their peer interactions at JSHS. Charts 21 and 22 summarize students' agreement with four items that most closely related to inspiration and motivation contributed to their interactions with peers: Me and my peers regularly exchanged research ideas at JSHS; Exchanging Ideas with my peers motivated me to continue STEM research; I was inspired by my peers at JSHS; and My peers at JSHS helped me become a better scientist.

Generally, data indicate that most N-JSHS students exchanged research ideas with their peers (64%) and found motivation from that exchange (73%). Additionally, N- JSHS students were inspired by their peers (89%) and believed that their peers help them become better scientists (65%). Fewer R-JSHS students, though still the majority, also reported that they were inspired by their peers (65%) and motivated to continue STEM research (73%). However, far fewer agreed that they exchanged ideas with peers at R-JSHS (38%) or had become a better scientists because of interactions with their peers (53%).





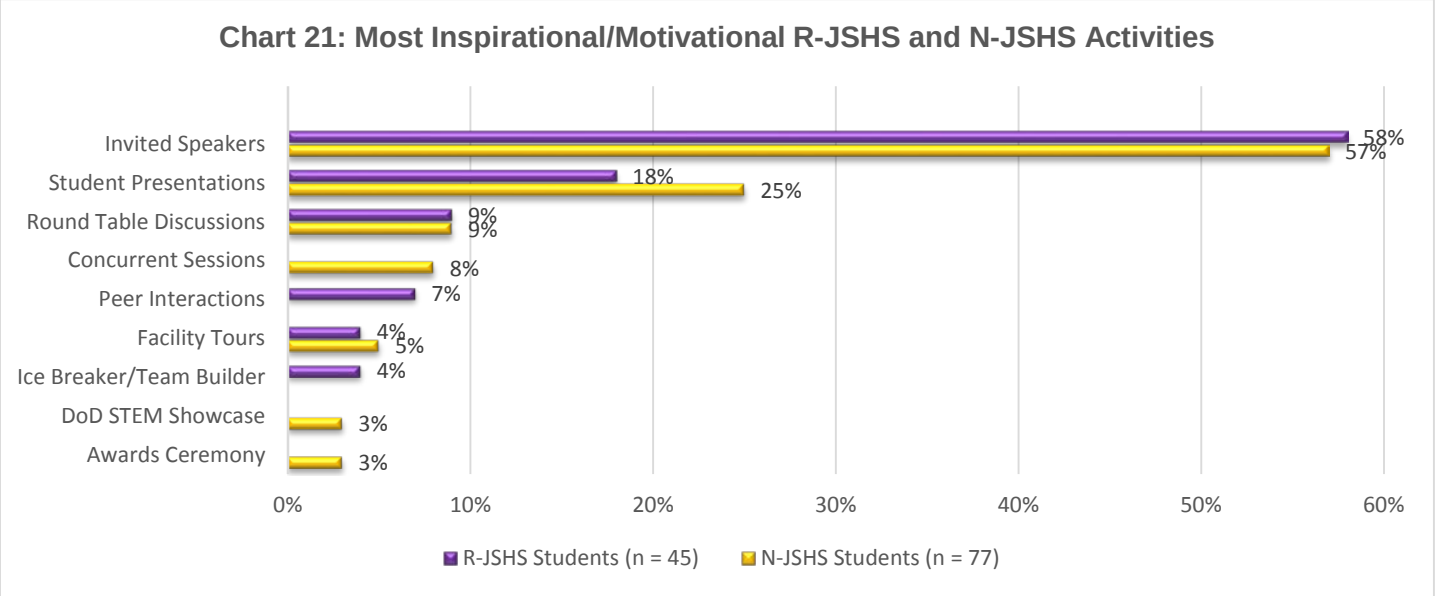
Comparison testing suggests significant differences between R-JSHS and N-JSHS students' inspiration and motivation from peer interactions across all four variables. N-JSHS students consistently reported significantly higher agreement than R-JSHS students that peer interactions resulted in idea exchanges,[19] motivation from those exchanges,[20] inspiration,[21] and improvement as a scientist.[22] These findings suggest that the quality of peer interactions differs between the R-JSHS and N-JSHS events, and that those occurring at the N-JSHS have a greater effect of motivating, inspiring, and improving students in their STEM endeavors. We cannot speculate as to whether these differences are due to student characteristics, JSHS programming, or some combination of both. However, future evaluation might explore whether those R-JSHS regions employing more formal opportunities for high quality peer interactions, such as instant polling, peer scoring, and/or in-person peer feedback sessions, have greater effect on student outcomes.

Most motivational symposia activities. Finally, Student questionnaires posed an open ended question, asking students what JSHS activity they found most inspirational/motivational and why. Students' responses to this open-ended item are

[19] $p < 0.05$ with t test, Asymptotic test of statistical significance (2-tailed). Mean Diff = .886, t = 4.322, $p = 0.000$, $d = 0.714$ moderate effect
[20] $p < 0.05$ with t test,, Asymptotic test of statistical significance (2-tailed). Mean Diff = .887, t = 4.251, $p = 0.000$, $d = 0.720$ moderate effect
[21] $p < 0.05$ with t test,, Asymptotic test of statistical significance (2-tailed). Mean Diff = .687, t = 4.123, $p = 0.000$, $d = 0.704$ moderate effect
[22] $p < 0.05$ with t test, Asymptotic test of statistical significance (2-tailed). Mean Diff = .737, t = 3.583, $p = 0.000$, $d = 0.599$ moderate effect

summarized in Chart 21 with the broad themes identified from students' responses. Categories in R-JSHS that do not have an N-JSHS counterpart are intentionally left "blank" for the N-JSHS participant group and vice versa.

JSHS inspires and motivates students' further achievement through engagement with a scientific community of peers and STEM professionals from academia, industry and government. Chart 21 reveals that the majority of R-JSHS and N-JSHS students considered invited speakers (57-59%) and student presentations (18-25%) to be the top two most inspiration/motivational activities. But looking across all reasons given for assigning inspiration/motivation showed two clear trends. First whether invited speakers, facilitators of round table discussions or concurrent sessions, facility tour guides, or STEM showcase volunteers, STEM professionals inspired students with their lifelong passion and enthusiasm for STEM and motivated students to seek longer-term STEM pathways (e.g., research topics, fields, and careers). Second, whether through student presentations or general peer interactions, students are inspired by other students' contributions to science which serve primarily to motivate more short-term participation in STEM research projects and competitions. These data suggest that other student participants inspire more immediate achievement in STEM, but STEM professionals serve an important role in motivating students' long-term participation in STEM and STEM careers.



AEOP Opportunities

If AEOP is to establish a collaborative, coherent pipeline for developing STEM talent from K-college, each program plays a pivotal role in promoting participants' awareness of AEOP initiatives. Consortium objectives include that each AEOP introduce programming to provide participants with information about additional opportunities within the AEOP. The evaluation of JSHS measured students' self-reported awareness and interest in AEOP after participating in JSHS.

Students were first asked the extent of their agreement that JSHS activities or exhibits educated them about education opportunities offered by DoD, such as other AEOP. Forty three percent of 61 R-JSHS students and 53% of 97 N-JSHS students agreed that JSHS activities or exhibits educated them about DoD-sponsored educational activities.

Students were then asked to describe their past participation and interest in each of nine different AEOPs listed to the right. Tables 22 and 23 (on the next page) clearly illustrate that an overwhelming majority of R-JSHS and N-JSHS students were unaware of AEOPs.

Army Educational Outreach Programs

- Junior Solar Sprint (JSS)
- Gains in Mathematics and Science Education (GEMS)
- West Point Bridge Design Competition (WPBDC)
- eCYBERMISSION (eCM)
- High School Apprenticeship Program (HSAP)
- Research and Engineering Apprenticeship Program (REAP)
- Science and Engineering Apprentices Program (SEAP)
- Undergraduate Research Apprenticeship Program (URAP)
- College Qualified Leaders (CQL)

A majority of students (85% - 93% R-JSHS, 75% - 94% N-JSHS) indicated that they have never heard about the entire catalog of AEOP opportunities. Very few students indicated that they have participated in other AEOPs in the past (<2% in REAP, eCM, WPBDC, GEMS, <3% JSS). A small proportion reported that they want to participate or would have but it was not available in their area (HSAP = 12%, REAP = 13%, SEAP = 14%, URAP = 10%, and CQL = 8%). An even smaller proportion (1-10%) of students expressed awareness of but lack of interest in each of the high school and undergraduate apprenticeship programs. These data suggest that R-JSHS and N-JSHS programming have limited success educating students about AEOPs that generate lasting awareness and interest.

Chart 22: R-JSHS Student Awareness & Interest in AEOP Opportunities (n = 74-76)

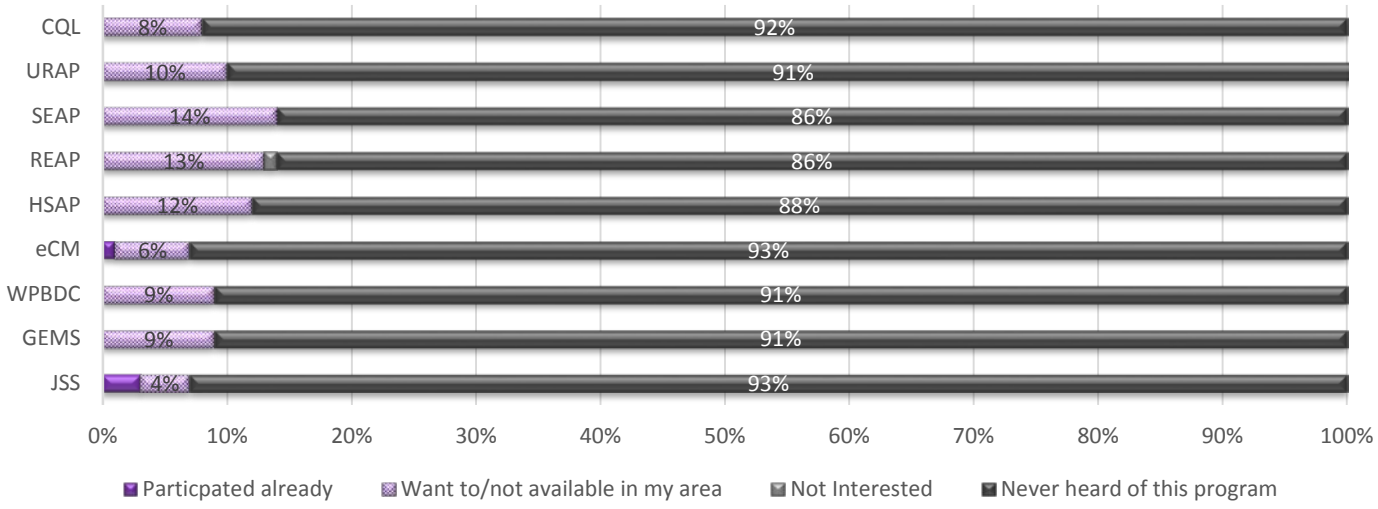
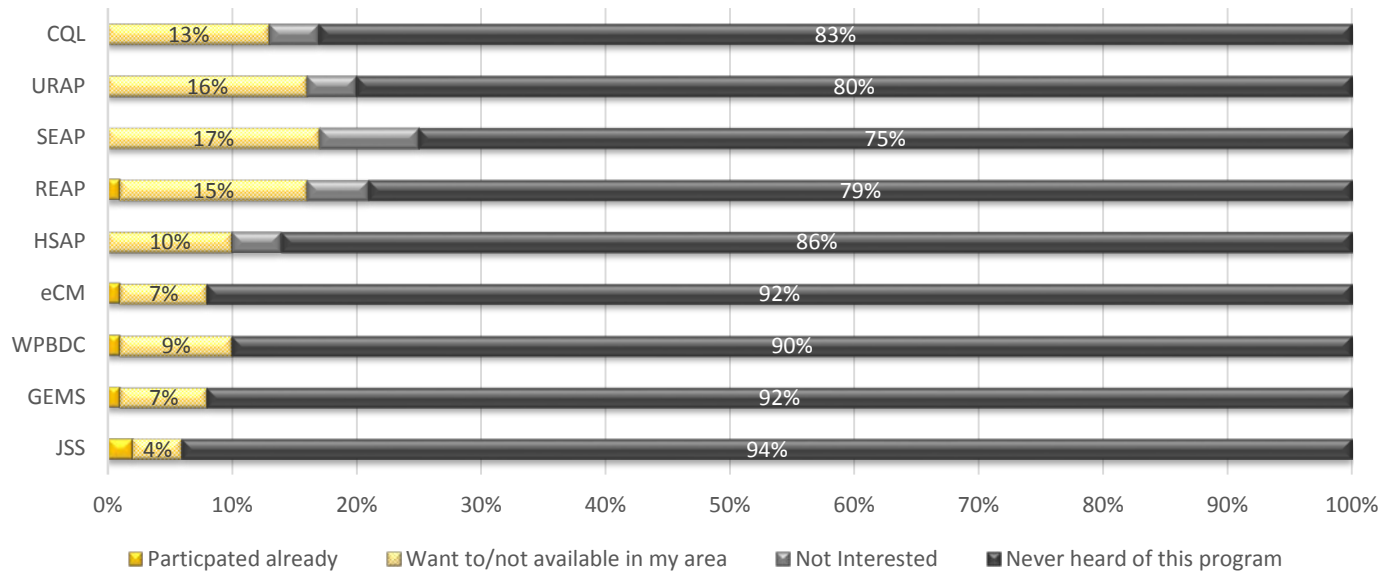


Chart 23: N-JSHS Student Awareness & Interest in AEOP Opportunities (n = 105-106)



DoD STEM Careers

Similarly, if AEOPs like JSHS are to attract STEM talent to the Army and/or DoD, programs plays a pivotal role in promoting participants' awareness of DoD STEM career opportunities. AEOP consortium objectives include that each AEOP introduce programming to provide participants with information about DoD STEM careers. The evaluation of JSHS measured students the extent to which JSHS programming exposed them to and generated interest in STEM careers, and in particular, military and civilian STEM careers within the DoD.

Student questionnaires asked the extent of their agreement that JSHS activities or exhibits and invited speakers exposed them to career options and inspired or motivated interest in DoD or government service careers (herein referred to as DoD/GS careers). Charts 26 and 27 on the next page show similar trends in responses at both R-JSHS and N-JSHS levels: JSHS programming teaches students about new career options (64% R-JSHS, 68% N-JSHS) but has less success inspiring and motivating students to pursue DoD/GS careers (24-27% R-JSHS, 37-44% N-JSHS). Both R-JSHS and N-JSHS events motivated a substantial number of students to explore DoD/GS careers, but comparison testing reveals that N-JSHS students perceive significantly higher motivation to explore DoD/GS careers than R-JSHS students after participating in JSHS activities/exhibits.[23] The more formalized mechanism for highlighting DoD STEM research and careers—the DoD STEM Showcase added to the N-JSHS programming in 2012—may contribute to the difference in N-JSHS and R-JSHS students' motivation.

[23] $p < 0.05$ with t test, asymptotic test of statistical significance (2-tailed); Mean Diff = 0.82, t = 3.64, $p = 0.000$, $d = 0.57$ moderate effect

Chart 26: R-JSHS Awareness & Interest in DoD STEM Careers (n = 59-61)

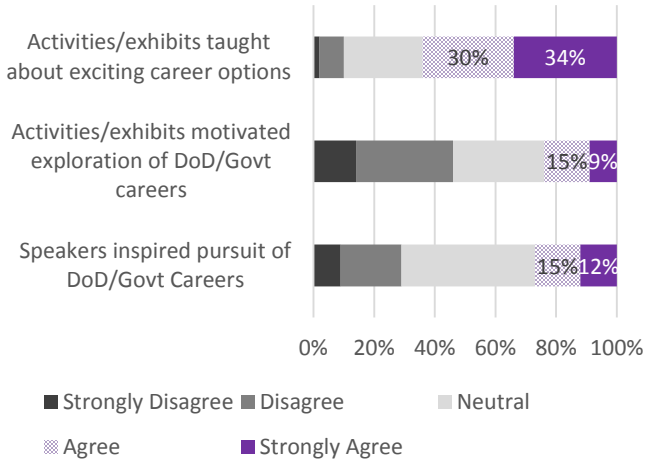
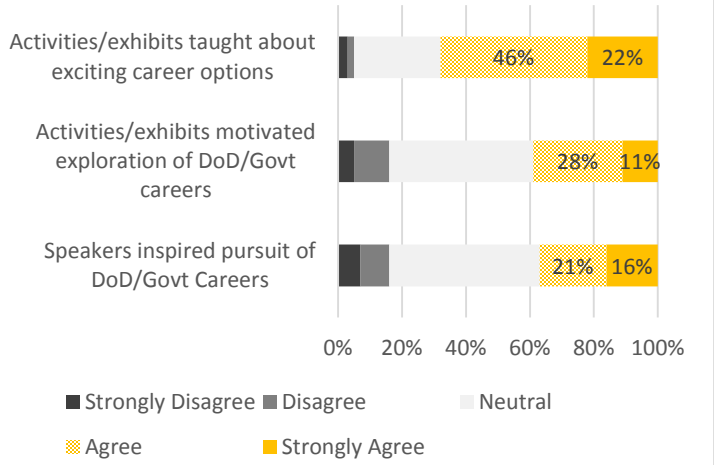


Chart 27: N-JSHS Awareness & Interest in DoD STEM Careers (n = 97-98)



Despite any efforts to expose students to DoD/GS STEM careers and some success in potentially motivating further exploration of these careers, most respondents express little intent to pursue Army STEM jobs or careers in particular. Charts 28 and 29 illustrate that when asked how certain they are that they will pursue jobs or build STEM careers, a majority of students (66-67% R-JSHS, 69-74% N-JSHS) were certain that they will pursue jobs or build careers in STEM. However, a majority of students (72-75% R-JSHS, 62-65% N-JSHS) expressed low levels of certainty about Army STEM jobs and careers.

Chart 28: R-JSHS Intent to Pursue STEM and DoD STEM Careers (n = 81-82)

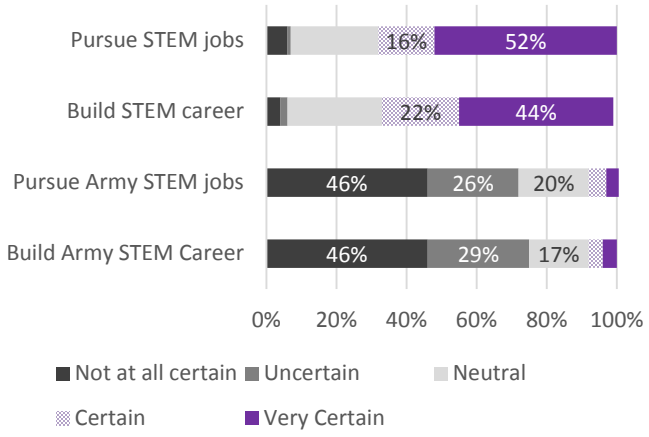
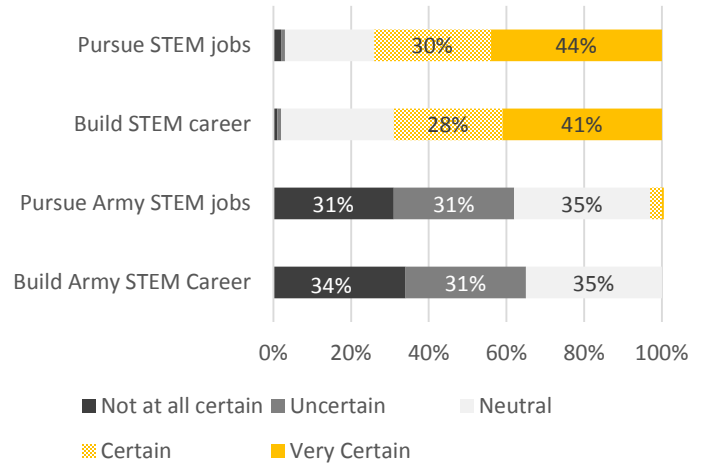


Chart 29: N-JSHS Awareness & Interest in DoD STEM Careers (n = 108-109)



Comparison testing revealed no significant differences found between the R-JSHS and N-JSHS groups' responses. Most N-JSHS students that participated in focus groups perceived that DoD does not offer jobs in the fields they are interested in, or admitted to being unaware of DoD STEM careers. Taken together, these data suggest that JSHS had limited success in educating students about and generating students' interest in DoD STEM careers, particularly in ways that illustrate the relevance or alignment of DoD STEM interests to students' existing career goals and aspirations.

What Participants are Saying

An overwhelming majority of students, regional directors, and judges surveyed and interviewed in focus groups spoke highly of their JSHS experiences. Many regional directors encouraged expansion of JSHS and suggested more and better marketing for recruitment of, especially, underserved and underrepresented students in urban schools. The following quotations provide illustration of overall participant perceptions of their experiences:

Students

- "Winning first place at National JSHS this year changed my life. It's not easy paying for out of state college, so that scholarship will take a massive burden off my family and I, for which I am forever indebted. I hope to repay this generosity someday by means of working for the DoD in research and through mentoring other students like myself in their pursuits of science."
- "I really enjoyed my time this year at the JSHS and would definitely hope to return next year. It was incredible to hear about the research being conducted by the military and to learn a little bit about the civilian programs supported by the military for the research community."
- "My participation in this program has also excited and encouraged other students at my school and in my region to get involved in NJSHS next year. Thank you for supporting this program, especially for those of us who live overseas (DoDEA) and do not have the same number of educational opportunities as stateside students."
- "I had an amazing time at Regional JSHS. I was inspired greatly by the speakers, activities, and especially all the students who performed research projects and spent time and hard work to accomplish their goals. I really hope I can return to Regional JSHS next year…I had a great experience and received helpful information that will help me with my college and career decisions."
- "This was my first year at the Regional JSHS and it was an unforgettable experience which I would love to be a part of it next school year. Thank you for all the Speakers and Educational Activities which taught me a lot."
- "Seeing the things that [students] do and realizing that this is all original research that is performed by a group of high school students is an awe inspiring and humbling realization. I can be great, not because people tell me I can be, but because I see that I can be."
- "Once again, the oral presentations were the most motivational because they demonstrated the depth of passion and intellect that some fellow teenagers possess and thus gave me a goal and a purpose for my future work."
- "The speakers who came to talk about the club, Science Alliance Club, were the most inspirational and motivational because they started something to help students and expand their knowledge about science. I am in the process of starting this club at my high school so they inspired me to make the effort and start this club to mentor and guide students and teach them more about science."

- "My friends from my state and I heard from two men on the BATMAN team of the US military, and it was amazing. Every aspect of their presentation was amazing. And their energy and engagement with us was unbeatable."
- "Meeting new people because I got to network with the future's scientists and engineers. Also, I made many new friends that I was able to see in future competitions. Some people I met will be going to the same college as me in the fall so I can rest assured that I will recognize some familiar faces on the first day of classes"

Regional Directors

- "I am extremely pleased with the support of the Academy. The depth of experience, the perspective based on interaction across the various regions and their recognition of the differences in the regions has been helpful. When I have been faced with issues or problems and wanted direction, I've phoned or emailed. The response was quick, my questions were addressed and this regional program is stronger as a result. Doris, Kate, etc. are knowledgeable."
- "Between 2012 and 2013 we were able to double our school participation. And this would not have been possible without the help of the Academy of Applied Science."
- "My students this year expressed how they like JSHS better than Intel and Siemens. Nationals is amazing to them. They enjoy the presentations from the researchers from around the nation. They are also encouraged by all that the military does in the area of science. Many of the students develop a level of patriotism as they go through the program."
- "Having just returned from the National JSHS, ISWEEEP, and ISEF this year, I can honestly say that the JSHS format and program is the best science competition that I have attended and all of you should be commended for a job well done! The National JSHS has a terrific balance of competition, collegiality and learning that makes for a terrific STEM learning experience for the students and the chaperones."

Judges

- "I very much enjoy the competition - listening to the papers, asking questions of the students, and seeing how they respond. I like that I can help train the newer generation of scientists and it is encouraging to see how competent the participants are."
- "I was so surprised by how advanced the level of understanding was among the presenters. To be so advanced at such a young age really impressed me."
- "I have judged many science fairs and have been an AF special awards judge at 12 Int. Science & Engineering Fairs -- using the poster format. I found the oral presentation format (akin to a professional conference) to be a nice change and generally very rewarding to both the judges & the students."
- "Meeting the other judges and hearing about the great science the young adults are performing!"

Summary of Findings

The FY13 evaluation of JSHS collected data that provided information about the participant pool; participants' perceptions of program processes, resources, and activities, and indicators of achievement. A summary of findings is provided in Table 13.

Table 13. 2013 JSHS Evaluation Findings	
Participant Profiles	
All evaluation data contribute to the overall narrative of JSHS's efforts and impact, and highlight areas for future exploration in programming and evaluation. However, confidence in evaluation findings varies by participant group.	• The statistical reliability achieved for the N-JSHS students and R-JSHS regional directors/representatives suggest adequate representativeness of the respective participant group populations. Low participation of R-JSHS students in evaluation assessments limit reliability of findings. Only 1% (87) of 7600 R-JSHS participants responded to the R-JSHS student questionnaire. Statistical reliability achieved with the sample (±10.6% margin of error at 95% confidence level) and alternative means of establishing representativeness of the sample, through known respondent and participant characteristics, suggest limited confidence that the R-JSHS student respondents are representative of the larger population of R-JSHS student participants. Findings from R-JSHS students' data should be cautiously generalized, with consideration given to the margins of error and with triangulation of findings from other data sources.
JSHS is successful in attracting participation from females—a population that is historically underrepresented in some STEM fields. JSHS has had limited success with providing outreach to students from historically underserved groups—low socioeconomic and minority race/ethnic groups.	• More females than males completed R-JSHS and N-JSHS student questionnaires, and the majority of students (82% R-JSHS, 86% N-JSHS) identified with race/ethnicity categories of Caucasian (54% R-JSHS, 49% N-JSHS) or Asian (28% R-JSHS, 37% N-JSHS). Less than 15% of students identified as either American Indian or Alaskan Native, Black or African American, Hispanic/Latino at both levels of JSHS. However, this is an improvement from last year where only 1% of questionnaire respondents identified as Black or African American with no other minority race/ethnicities represented.
	• Most R-JSHS and N-JSHS students report they do not qualify for free or reduced lunch—a common indicator of low income or low socioeconomic status. A statistically lower proportion of N-JSHS students (69%) received free or reduced lunch than R-JSHS students (85%).
	• The average age of R-JSHS and N-JSHS students is ~16.5. Statistically higher proportions of 11th graders participated in R-JSHS (52%) as compared to N-JSHS (34%), and higher proportions of 12th graders participated in N-JSHS (43%) as compared to R-JSHS (21%)
JSHS provides outreach to the Nation's future STEM workforce.	• 100% of R-JSHS and N-JSHS students reported intent to pursue a college degree. 87% of R-JSHS and N-JSHS students intend to pursue a STEM degree, with a majority (56% R-JSHS, 65% N-JSHS) intending to pursue a doctoral STEM degree. A statistically higher proportion of R-JSHS students intended to stop with the Bachelor's STEM degree as compared to N-JSHS students.
	• 98% of R-JSHS students indicated their intent to pursue a career in a STEM field. Medicine/Health (48%), Chemistry (11%), Engineering (10%) and Life Science (10%) were chosen most frequently.
Actionable Program Evaluation	
JSHS students are motivated by opportunities that JSHS and other STEM competitions	• Most students (60% R-JSHS, 89% N-JSHS) participated in one or more science competitions besides JSHS. Statistically higher proportions of N-JSHS students participated in these national, sponsored events as compared to R-JSHS students: Intel Talent Search (17%, 13% R-JSHS) and Intel Science & Engineering Fair (50%, 8% R-JSHS).

provide them to grow critical skills for STEM research.	• Students reported participating in STEM competitions for opportunities to engage in and learn from academic research activities (65% R-JSHS, 97% N-JSHS); to advance STEM pathways (11% R-JSHS, 25% N-JSHS); and because of school-based associations that recommend or require their participation in such competitions (21% R-JSHS, 18% N-JSHS).
	• Students most frequently (45% R-JSHS, 43% N-JSHS) reported one or more features of JSHS programming that motivate their participation in JSHS, including JSHS symposia format, oral and poster presentation options, the breadth of competition categories, and the prestige of JSHS.
JSHS is largely marketed to schools and teachers, but teachers serve as the primary conduit through which many students come to participate in JSHS.	• Most students (84% R-JSHS, 72% N-JSHS) credited school-based associations—teachers, academic coursework or programs, science departments, and school nominations—for their awareness of JSHS. Of those associations, teachers (58% R-JSHS, 47% N-JSHS) were most frequently cited as the means by which students were attracted to JSHS.
	• Most regional directors employed multi-pronged efforts to reach teachers. Their self-identified "best practices" for outreach, recruitment, and retention strategies for teachers hinged upon establishing and maintaining personal relationships with teachers and ensuring reasonable incentives to facilitate initial and continued involvement. However, regional directors more frequently focused their efforts on teacher outreach and recruitment (74%) rather than on facilitating participation (29%) once teachers are recruited.
	• The majority of regional directors generally agreed that funding to support regional director travel to schools for outreach and recruitment (65%) and for student and teacher travel to events (57%) are necessary to expand participation in JSHS. In many regions, teacher participation is also limited by schools' ability to fund substitute teachers (42%).
JSHS's key elements are regarded highly by students.	• The oral presentations (86% R-JSHS, 91% N-JSHS) and invited speakers (78% R-JSHS, 77% N-JSHS) were especially held in high regard. At both R-JSHS and N-JSHS, fewer poster presenters are satisfied with poster sessions than are oral participants. In particular, statistically fewer N-JSHS poster presenters are satisfied with the specific poster sessions in which they participated (i.e. non-competitive or competitive.)
	• Students considered student research presentations (57% R-JSHS, 49% N-JSHS) and invited speakers (17% R-JSHS, 14% N-JSHS) the two most valuable activities. N-JSHS students also strongly valued peer interactions (17%). The reasons students gave for assigning value to each of the various elements emphasized the nature and breadth of learning experiences and the opportunities JSHS provides to interact with others around STEM.
JSHS presentation and judging processes are enjoyable; however, students want more and useful feedback and fair judging processes.	• Most students enjoyed presenting at JSHS; however, poster presenters (88% R-JSHS, 64% N-JSHS) expressed statistically less enjoyment than oral presenters (91% R-JSHS, 91% N-JSHS). R-JSHS oral presenters (58%) perceived statistically more utility in feedback than do R-JSHS poster presenters (24%) and N-JSHS oral presenters (17%).
	• At R-JSHS, feedback students received from judges depended upon whether students presented research in the oral or poster formats. Poster presenters received less feedback and fewer types of feedback than oral presenters. The only type of feedback reported by N-JSHS presenters is oral feedback. Importantly, a substantial portion of all presenters at R-JSHS and N-JSHS reported receiving no feedback from the judges (22% R-JSHS-Oral, 62% R-JSHS-Poster, ~75% N-JSHS-Oral and NJSHS-Poster).
	• Students' suggestions for improvement most frequently included requests for receiving more feedback from the judges. Concerns were also offered regarding judge qualifications and potential judging bias, suggesting that a number of students at both R-JSHS and N-JSHS perceive that the judging process was not fair.

JSHS feedback mechanisms from judges to students vary considerably across R-JSHS.	• Regional directors employ a range of formal and informal feedback mechanisms from judges, executive committee, or peers; written and oral forms of feedback; at- or post-event feedback; and feedback provided to all, some, or none of the student presenters. No single feedback mechanism described was used by more than 34% of regional directors.
JSHS online and at-event resources for N-JSHS judges are not consistent in preparing judges for their work.	• Nearly all N-JSHS judges found the online guidance (96%) and online access to abstracts and papers (100%) to be useful for preparing them for judging at N-JSHS. A majority of judges (65%) did not find the online scoring system to be useful, and one third of judges requested clarification of the relationship between online scoring and at-event judging.
	• A majority of N-JSHS judges felt prepared to judge presentations (65%) and question presenters (65%). Most judges reported that their judging was on-time (90%) and went smoothly (90%). However, more than 40% of judges did not feel prepared to provide feedback or to deliberate winners, or did not perceive that judges in the competition room had shared understandings of the judging process and tools.
JSHS Student mentorship varies. R-JSHS students are less likely to have mentors and especially, STEM professionals as mentors.	• More than two thirds of R-JSHS and N-JSHS students reported having mentors, consisting of parents, teachers, professors and graduate students, and industry researchers. Statistically higher proportions of N-JSHS students (51%, 25% R-JSHS) reported university professors or graduate students as mentors, while statistically higher proportions of R-JSHS students (35%, 10% N-JSHS) reported that they did not have a research mentor.
Outcomes Evaluation	
JSHS is successful at fostering development in critical STEM competencies. However, growth varies by presentation format and mentorship.	• Most oral presenters at both R-JSHS and N-JSHS agreed or strongly agreed that presenting their research at JSHS helped them become a better speaker or presenter (91% R-JSHS, 91% N-JSHS) and that they are more confident in their ability to communicate science after presentation and judging process (83% R-JSHS, 91% N-JSHS). However, fewer of these same students reported that JSHS helped them become better writers (60% R-JSHS, 63% N-JSHS) or that judges' feedback will improve their research (73% R-JSHS, 65% N-JSHS).
	• Participants who presented research posters reported statistically lower perceptions of growth than their oral presentation counterparts at R-JSHS and N-JSHS. They did indicate that the poster process helped improve their presentation skills (88% R-JSHS, 52% N-JSHS) and confidence (88% R-JSHS, 65% N-JSHS).
	• 28% of 32 R-JSHS respondents reported improvement in STEM competencies from working with a mentor, including: development of laboratory skills (16%), writing/presenting skills (9%), and critical thinking skills (3%). In contrast, 79% of 71 N-JSHS respondents—who had a statistically higher proportion of university faculty and graduate students mentors—reported growth in STEM competencies: mentors taught them the fundamental knowledge or practices of research (31%) and exposed them to new ideas in the discipline (28%), in addition to those STEM competencies reported by R-JSHS students.
JSHS inspires and motivates students' further achievement through engagement with a scientific community of peers and STEM professionals from academia, industry and government.	• Key elements of JSHS exposed students to new information/knowledge in STEM (77-84% R-JSHS, 66-90% N-JSHS) and motivated them to achieve more in STEM (52%-65% R-JSHS, 49%-81% N-JSHS). Fewer students felt their current assumptions of STEM were challenged (51%-58% R-JSHS, 34-56% N-JSHS). Oral presenters and invited speakers had the most influence, while poster presentations had the least.
	• N-JSHS students exchanged research ideas with their peers (64%) and found motivation from that exchange (73%). Additionally, N- JSHS students were inspired by their peers (89%) and believed that their peers help them become better scientists (65%). Statistically lower proportions of R-JSHS students, though still the majority, reported that they were inspired by their peers (65%) and motivated to continue STEM research (73%).

	• When asked what activities were most inspirational or motivational, students most frequently reported invited speakers (58% R-JSHS, 57% N-JSHS) and student presentations (18% R-JSHS, 25% N-JSHS). Reasons given suggested that other student participants (peers) inspire more immediate achievement in STEM, but STEM professionals at JSHS events serve an important role in motivating students' future and long-term participation in STEM.
JSHS has limited success in educating students about other AEOP programs in ways that generate lasting awareness and interest.	• Many students (43% R-JSHS, 53% N-JSHS) agreed that JSHS activities or exhibits educated them about AEOP. Yet, the majority of students (85% - 93% R-JSHS, 75% - 94% N-JSHS) indicated that they have never heard about the individual AEOP initiatives. Very few students indicated that they have participated in other AEOPs in the past (<2% in Research and Engineering Apprenticeship Program, eCYBERMISSION, West Point Bridge Design Competition, Gains in the Education of Mathematics and Science, <3% Junior Solar Sprint).
JSHS has limited success in educating students about DoD STEM careers in ways that generate considerable interest or illustrate alignment to students' existing career goals and aspirations.	• JSHS programming exposed students to new career options (64% R-JSHS, 68% N-JSHS) but has less success inspiring and motivating students to pursue DoD/Government service careers (24-27% R-JSHS, 37-44% N-JSHS). Both R-JSHS and N-JSHS events motivated a substantial number of students to explore DoD/Government service careers, but N-JSHS students perceive statistically higher motivation to explore DoD/Government service careers after participating in JSHS activities/exhibits than do R-JSHS students.
	• A majority of students (66-67% R-JSHS, 69-74% N-JSHS) were certain that they will pursue jobs or build careers in STEM. A majority of students (72-75% R-JSHS, 62-65% N-JSHS) expressed low levels of certainty about pursuing Army STEM jobs and careers. Most N-JSHS students reported in focus groups that the DoD does not offer jobs in the fields they are interested in, or admitted to being unaware of DoD STEM careers.

Recommendations

1. Given that JSHS's reach is through the R-JSHS, a commitment should be made to producing more reliable and valid evaluation of the R-JSHS and benefits to students. The FY13 evaluation provides valuable information regarding how R-JSHS are perceived by a small number of participants, and begins to provide evidence for how the program has impacted R-JSHS students in comparison to N-JSHS students. The low response rate from R-JSHS students poses the most significant threat to the validity of these findings—in other words, we have limited confidence that these findings of 87 respondents are representative of the full population of 7600 participants. Coordinated efforts should be made by the Army, AAS managers, and regional directors (who are provided Army funding for these activities), to encourage and improve student participation in the R-JSHS evaluation efforts. Subsequently, evaluators should endeavor to streamline instruments and appropriately incentivize student participation.

2. Creative and strategic marketing is needed to increase awareness of the program. Schools and teachers play a vital role in attracting participation to JSHS, with the majority of students learning about JSHS through school (i.e. 84% R-JSHS level, 72% N-JSHS). Regional directors report that reaching new teachers and schools is critical for reaching new students. The evaluators and AAS collected regional directors' "best practices" for marketing, outreach, recruitment. AAS should devise and implement a plan for sharing findings with regional directors, and supporting them in prioritizing and enacting the most robust marketing, outreach, and recruitment mechanisms possible for their region.

3. As part of this marketing effort, JSHS should continue to expand its outreach to underserved schools that typically have not participated in JSHS or other STEM competitions. Because many students in these schools may not be as invested in STEM or have strong STEM supports as traditional competitors, strategies to engage these students should tap into their motivations. Furthermore, adequate supports to ensure successful participation in JSHS are needed. "Best practices" reported by regional directors for facilitating these students' successful participation include inviting new teachers and students to participate in regional symposia as observers, engaging middle school students in high school or similar middle school programs, and professional development for teachers to more effectively support student research.

4. A substantial number of students at both levels do not receive feedback from JSHS judges, and many receiving feedback do not find it useful. Student presenters need timely and specific feedback from judges that will help them understand the strengths and limitations of their presentation materials and delivery, and feedback that can be used to support them in improving their presentations and their future research. Regional directors are employing a variety of different mechanisms for sharing judges' feedback, suggesting that AAS guidelines for feedback are not interpreted or employed consistently. Systemic changes to regional judging and feedback practices may require strong collaboration between AAS, regional directors, and N-JSHS judges to establish clear and specific expectations and feedback tools for judges to ensure feedback is consistently provided to all students.

5. The judging process must not only be fair, but must be perceived as fair by all who participate at the regional and national symposia. Evaluation findings suggest there is room for improvement in the selection, training, and retention of judges as well as in the quantity and quality of feedback provided to presenters. Efforts to expand the pool of national event judges are clearly successful, and military STEM personnel represent a major portion of the newly recruited judges. However, of significant concern are the findings that so few judges do return to participate in other N-JSHS or R-JSHS events and those that participate are less likely to recommend the provision of feedback to student presenters. Considering that all participant groups surveyed suggested that the engagement and quality of judges are areas for future improvement, future programming should consider how to expand capacity not only in terms of numbers of STEM professionals participating, but also work to increase the quality of judging through deeper knowledge and continued engagement of judges in JSHS programs. Furthermore, both R-JSHS and N-JSHS should give careful thought to feedback mechanisms that are useful for all students but that balance the concerns of judges who would be providing the feedback. Both R-JSHS and N-JSHS programs will benefit from strong partnership between AAS and regional directors in establishing robust mechanisms for training judges about the judging process and providing feedback to students. This collaboration could have significant impact of providing consistency across R-JSHS and N-JSHS programs and improving the experience of all competitors.

6. JSHS's position in the pipeline of AEOP initiatives is an area with significant growth potential and should continue to be a program priority. While many students (43% R-JSHS, 53% N-JSHS) report that activities or exhibits educated them about educational opportunities offered by DoD, an overwhelming majority of students do not recognize AEOP programs. Approximately 4-17% of JSHS participants at both R-JSHS and N-JSHS expressed interest in in each of the other AEOP initiatives for which they may qualify. A similar percentage of students participating in other AEOP initiatives this summer (and greater in the AEOP apprenticeship programs) expressed interest in submitting their research projects and papers to JSHS. JSHS and AEOP initiatives should consider a deliberate cross-marketing effort to actively recruit these now-past participants of FY13 programs, increasing JSHS's position as a key component of the pipeline.

7. JSHS should carefully review current practices for generating awareness of and interest in Army/DoD STEM careers and, if possible, recommend that R-JSHS employ best practices identified within its current efforts (e.g., STEM Showcase at N-JSHS) and in other AEOP initiatives that seem to have great success. This is clearly another area with significant growth potential and should be a program priority, as students who have greater awareness of and positive attitudes toward DoD STEM careers are more likely to seek them out in the future. Many regional directors reported in focus groups and questionnaires a strong desire for more "military presence" in their R-JSHS programming. R-JSHS programs in particular would benefit from stronger partnership between regional directors, AAS, and CAMs in connecting with regional DoD and other government agencies conducting STEM research, not just recruiting "military and ROTC personnel," in an effort to better highlight cutting edge, exciting, and impactful STEM research programs and careers offered by DoD and beyond.

Appendices

Appendix A:
FY13 Evaluation Plan

Key Evaluation Questions

The JSHS evaluation gathered information from multiple participant groups about R-JSHS and N-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 program objectives:

- What aspects of Regional and National JSHS programs motivate participation?
- What aspects of Regional and National JSHS program structures 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 Army/DoD STEM careers?
- To what extent were there differences between Regional and National JSHS Student experiences and benefits?

Methods and Instruments

The FY2013 evaluation used a mixed methods approach[1] to allow for broad generalization and for deeper focusing of the evaluation. This mixed methods approach employed quantitative measures to assess level of agreement or satisfaction, as well as qualitative measures, such as open or constructed-response items in surveys and focus groups that provided less structured items assessing perceived value, satisfaction, or suggestions for improvement.

The regional symposia assessment strategy included post-program questionnaires for regional directors/representatives and regional symposia student participants. The national symposium evaluation and assessment strategy included post-program questionnaires with national judges and national symposium participants, as well as structured interviews with student participants and regional directors/representatives in attendance at the national symposium.

Data Collection and Sampling

Data collection efforts for 2013 competition programs occurred during late spring and summer of 2013, during and following R-JSHS and N-JSHS events. On-site focus groups were conducted with students and regional directors attending the N-JSHS event (1-5 May 2013, Dayton, OH) and employed convenience sampling—any participants providing appropriate permissions were invited to join the focus group, without regard to diversity represented by the group—to maximize participation in focus groups. Online questionnaires also employed convenience sampling and were released to all R-JSHS and N-JSHS students, regional directors, and N-JSHS judges via emailed survey links after the respective events. Follow-up emails were sent to regional directors for dissemination to students after 30 days. Questionnaires were opened for data collection for a minimum of 60 days. Regional directors were required to submit final program reports to AAS after their R-JSHS event.

Data Analyses

Evaluators summarized quantitative data with descriptive statistics such as numbers of respondents, frequencies (number) 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. All quantitative data collected from questionnaires are summarized in Appendices C, D, F, and G.

[1] Creswell, 2003; Quinn 2001; Greene & Caracelli, 1997

Appendix A:
FY13 Evaluation Plan

Charts used within the report narrative provide visual representations of proportions of responses. This allows the reviewer to easily apply the determined margin of error for each participant groups; questionnaire responses. For visual simplicity of charts, "Somewhat Disagree" and "Somewhat Agree" (and similar categories) are aggregated as "Neutral" responses.

When appropriate, inferential statistics were used to study any changes in participants or differences in participant groups that could be the effect of their participation in JSHS. Significance testing (herein referred to as comparison testing) included tests for *statistical significance* and *practical significance.* Statistical significance indicates whether a result is different than chance alone. In tests for statistical significance, such as Chi Square, Mann-Whitney, and t tests, $p < 0.05$ is taken as "statistically significant." Practical significance, also known as effect size, indicates how weak or strong an effect is and is usually studied in relation to statistical significance. Practical significance is determined with Cohen's *d* or Pearson's *r*, with *d* or *r* of .250, which is considered weak but "substantively important" at $p < 0.05$.[2] Statistically and/or practically significant findings are noted as "statistical" or "significant" in the report narrative with footnotes providing details about results of statistical tests. For the sample size of student questionnaire respondents, an effect size of 0.25 is likely above that expected by chance alone. Statistically and/or practically significant findings are noted as "statistical" or "significant" or in the report narrative with footnotes providing details about results of statistical tests. Chi Square tests were conducted on the difference between proportions of respondents. Mann-Whitney and t-tests were conducted on differences between means, calculated from "average" response to balanced response scales (e.g., 1 = "Strongly Disagree" to 6 = "Strongly Agree").

Evaluators analyzed qualitative data, including constructed-response questionnaire and focus group data for emergent themes. These data are then summarized by theme and by frequency of participants addressing a theme. When possible, two raters analyze each complete qualitative data set. When not possible, a portion of the data set are analyzed by both raters to determine and ensure inter-rater reliability. Thus, the summary of themes and frequency represent consensus ratings.

To the extent possible, findings were triangulated across data sources (regional and national students, regional directors, judges), data types (quantitative survey data and qualitative data from questionnaires, focus groups, and program reports), and evaluators conducting the analyses and reporting. This triangulation enhances the credibility of findings synthesized from single data sources or data types. For example, evaluators cite major trends from the qualitative data—emergent themes with high frequencies in respondents addressing them—to provide additional evidence of, explanation for, or illustrations of quantitative data. We have posed plausible explanations when divergence between data sources or data types is evident; any such explanations are worthy of further exploration in the full study and, potentially, in future evaluation efforts. Periodically, less unique perspectives are reported and identified as such when they provide illustration that captures the spirit of JSHS or AEOP objectives.

[2] U.S. Department of Education, What Work's Clearinghouse Procedures and Standards Handbook, accessed June 30 http://ies.ed.gov/ncee/wwc/pdf/reference_resources/wwc_procedures_v3_0_draft_standards_handbook.pdf

Appendix B:
2013 JSHS Regional Director/Representative Focus Group Protocol

1. The Army would like to know if your needs at the regional level are currently being met?
    - What suggestions do you have for improving the JSHS program?
    - Have you entered into any new strategic partnerships this year?

2. What initiatives have you instituted at your regional symposium to increase the diversity of students and staff participants?
    - What seems to work the best?
    - What seems to be the least successful type of diversity initiative?

3. The JSHS judging process is a unique and powerful component of this program, what have you done recently to make sure that students reap the benefits of the judging process? (e.g., formal feedback, meetings, etc.)
    - What works the best?
    - What doesn't seem to work?

4. Participants need access to supportive adults or mentors to be successful in JSHS as well as other research endeavors. How do participant in your region find mentors?
    - Other than providing expertise, what do mentors provide that enables students' success?

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Dear Regional JSHS Directors,
Thank you for your participation in this study about the 2013 Regional and National Junior Science & Humanities Symposia (JSHS). This questionnaire is intended to collect information about you and your experiences with JSHS in 2013. The purpose of this study is to help guide program improvement and to report pertinent outcomes to our funders. The results will be used to critically review JSHS's current practices and their relation to improving student participation in Science, Technology, Engineering, and Mathematics (STEM) related endeavors.

- While this survey is not anonymous, be assured that your responses are CONFIDENTIAL; when analyzing data and reporting results, your name will not be associated with any of the item responses or any comments you make.
- Additionally, the AEOP reserves the right to contact you at a later date in an effort to gauge your academic and career success.
- Responding to this survey is completely voluntary, you are not required to participate, although we hope you do because your responses will provide JSHS with valuable information for meaningful and continuous improvement.

*****By choosing to click the ">>" button below and completing this survey, you are providing consent for us to use your responses as part of this study*****

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

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

Donna Burnette, Virginia Tech
Director, AEOPCA
(540) 231-6120, donna.augustine@vt.edu

Doris Cousens, Academy of Applied Science, Inc.
Program Director, Junior Science and Humanities Symposium
(603) 228-4520, dcousens@aas-world.org

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Please fill out the personal information below:

First Name: _____

Last Name: _____

How many years have you worked with JSHS? _____, years.

How long have you served as Regional Director? _____, years.

Which of the following best describes your occupation?

- ❍ University faculty member/researcher
- ❍ University employee
- ❍ High School Teacher
- ❍ I work for a non-profit organization
- ❍ Other (specify): _____

Which JSHS region do you work with? _____

The following panel contains statements obtained from Regional Directors and Chaperones during focus groups at the 2013 National JSHS event. They were asked what they thought was needed in order to improve Regional JSHS. Use the scale provided to indicate the extent to which you agree or disagree with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
My regional symposium needs additional funding to provide travel support to participants	❍	❍	❍	❍	❍	❍
Many teachers do not participate in my symposium because their school will not fund substitute teachers	❍	❍	❍	❍	❍	❍
I would be able to recruit new teachers to participate in my symposium if I had more funding to travel to their schools	❍	❍	❍	❍	❍	❍
To access new populations of students, I must be able to recruit participation from new schools and teachers	❍	❍	❍	❍	❍	❍

Also from our focus groups, we know that TEACHER INVOLVEMENT and RETENTION are critical for the success of regional symposia. What recommendations or best practices would you like to share that have helped you increase teacher involvement in your region? Do you have any recommendations or best practices that have helped you retain teachers that are already involved?

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Use the scale provided to indicate the extent to which you agree or disagree with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I would like help or guidance from other regional directors on forming and maintaining strategic partnerships with outside organizations	❍	❍	❍	❍	❍	❍
It is important for regional directors to share best practices with one another	❍	❍	❍	❍	❍	❍
Aside from funding, the Academy of Applied Science provides essential support for National JSHS	❍	❍	❍	❍	❍	❍
Aside from funding, the Academy of Applied Science provides critical support for regional JSHS	❍	❍	❍	❍	❍	❍

Please list the organizations that you partner with for your Regional Symposium? Would you be willing to share how you garnered support from these organizations with your fellow regional directors?

Would you participate in a committee of regional directors for the purpose of sharing best practices and improving JSHS? Do you have alternative suggestions to facilitate communication among regional directors?

Is the Academy of Applied Science meeting your needs as the administrator of JSHS? Are there any areas in which they can improve?

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

The Judging process at JSHS is a unique and powerful component of this program. What kind of feedback do students receive from judges at your regional? If they receive feedback, what format does it come in and when do they receive it? Do all participants receive feedback or only those who advance to National JSHS?

Do you have any suggestions for improving your Regional Symposium?

Do you have any suggestions for improving the National Symposium?

Thank you for your input and remember that your responses are completely confidential.

If you have any questions or concerns, please email:
Rebecca Kruse – rkruse75@vt.edu or Tanner Bateman – tbateman@vt.edu

Appendix C:

2013 JSHS Regional Director Questionnaire and Data Summary

How many years have you worked with JSHS? (Avg. = 9.07 years)						
Response (in years)	**Freq.**	**%**		**Response (in years)**	**Freq.**	**%**
1	7	13%		16	1	2%
2	4	8%		17	1	2%
3	6	11%		18	1	2%
4	3	6%		19	1	2%
5	5	9%		20	2	4%
6	0	0%		21	1	2%
7	4	8%		22	0	0%
8	1	2%		23	0	0%
9	1	2%		24	0	0%
10	3	6%		25	1	2%
11	1	2%		26	0	0%
12	3	6%		27	0	0%
13	0	0%		28	1	2%
14	0	0%		29	0	0%
15	2	4%		30	4	8%
				Total	**53**	**100%**

How long have you served as Regional Director? (Avg. = 7.71 years)						
Response (in years)	**Freq.**	**%**		**Response (in years)**	**Freq.**	**%**
1	4	13%		15	1	3%
2	1	3%		16	1	3%
3	5	16%		17	0	0%
4	2	6%		18	1	3%
5	5	16%		19	0	0%
6	1	3%		20	2	6%
7	1	3%		21	0	0%
8	2	6%		22	0	0%
9	0	0%		23	0	0%
10	1	3%		24	0	0%
11	0	0%		25	0	0%
12	3	9%		26	0	0%
13	0	0%		27	0	0%
14	0	0%		28	1	3%
				Total	**32**	**100%**

Appendix C:

2013 JSHS Regional Director Questionnaire and Data Summary

Which of the following best describes your occupation?

	Freq.	%
University faculty member/researcher	14	25%
University employee	11	20%
High School Teacher	20	36%
I work for a non-profit organization	3	5%
Other (specify):	7	13%
Total	**55**	**100%**

Note. Other = *"Middle school teacher," "Spouse volunteer," "Independent Educational consultant and science fair/camp coordinator," "Activities coordinator," "Director, educational outreach, Dean's office," "I volunteer for our regional science fair and will now be helping spread the word about JSHS," "I am also an adjunct faculty"*

Which JSHS region do you work with?

Region	Freq.	%		Region	Freq.	%
Alabama	0	0%		**Missouri**	1	2%
Alaska	1	2%		**New Jersey - Monmouth**	1	2%
Arizona	1	2%		**New Jersey - North New Jersey**	2	4%
Arkansas	1	2%		**New York - Metro**	1	2%
California - Northern California & Western Nevada	1	2%		**New York - Long Island**	1	2%
California - Southern California	1	2%		**New York - Upstate**	1	2%
Connecticut	2	4%		**North Carolina**	1	2%
DoD Dependent Schools - Europe	2	4%		**North Central – Dakotas, Minnesota**	1	2%
DoD Dependent Schools - Pacific	2	4%		**New England - Northern**	1	2%
District of Columbia	1	2%		**New England - Southern**	0	0%
Florida	1	2%		**Ohio**	0	0%
Georgia	2	4%		**Oregon**	1	2%
Hawaii	1	2%		**Pennsylvania**	1	2%
Illinois - Chicago	2	4%		**Puerto Rico**	2	4%
Illinois	1	2%		**South Carolina**	1	2%
Indiana	0	0%		**Southwest**	0	0%
Intermountain - Colorado, Montana, Idaho, Nevada, Utah	1	2%		**Tennessee**	2	4%
Iowa	2	4%		**Texas**	2	4%
Kansas - Nebraska - Oklahoma	1	2%		**Virginia**	2	4%
Kentucky	0	0%		**Washington**	1	2%
Louisiana	1	2%		**West Virginia**	0	0%
Maryland	1	2%		**Wisconsin - W. Wisc./N. Michigan**	3	6%
Michigan -Southeastern	1	2%		**Wisconsin**	1	2%
Mississippi	1	2%		**Wyoming- Eastern Colorado**	1	2%
				Total	**54**	**100%**

Appendix C:

2013 JSHS Regional Director Questionnaire and Data Summary

The following panel contains statements obtained from Regional Directors and Chaperones during focus groups at the 2013 National JSHS event. They were asked what they thought was needed in order to improve Regional JSHS.

	1	2	3	4	5	6	n	Avg.	SD
My regional symposium needs additional funding to provide travel support to participants	3 (6%)	8 (16%)	1 (2%)	10 (20%)	10 (20%)	19 (37%)	51	**4.43**	1.65
Many teachers do not participate in my symposium because their school will not fund substitute teachers	4 (8%)	11 (21%)	9 (17%)	6 (12%)	13 (25%)	9 (17%)	52	**3.77**	1.63
I would be able to recruit new teachers to participate in my symposium if I had more funding to travel to their schools	2 (4%)	8 (15%)	1 (2%)	7 (13%)	16 (31%)	18 (35%)	52	**4.56**	1.55
To access new populations of students, I must be able to recruit participation from new schools and teachers	2 (4%)	2 (4%)	1 (2%)	5 (9%)	13 (25%)	30 (57%)	53	**5.17**	1.30

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Also from our focus groups, we know that TEACHER INVOLVEMENT and RETENTION are critical for the success of regional symposia. What recommendations or best practices would you like to share that have helped you increase teacher involvement in your region? Do you have any recommendations or best practices that have helped you retain teachers that are already involved? (n = 25)

Broad Theme	Narrow Theme	Freq.	Example Response(s)
Best practices for in-school outreach		**8**	
	Personal contact with teachers and administrators to promote JSHS	6	• "Personal visits to schools to meet with superintendents and/or principals to personally thank them for the schools involvement." • "Direct contact with past teachers inviting their continued participation."
	Promote science research courses in local schools	2	• "We promote Science Research courses in high schools throughout New York state, New Jersey, and also in Connecticut. Teachers of these courses automatically look to the JSHS as a chief venue for promoting their students."
Best practices for general outreach		**6**	
	Use, partner, or work directly with existing organizations to promote JSHS	4	• State boards/departments of education • Judging at other science fairs • University outreach programs • Professional teaching organizations and conferences
	Provide teacher workshops	1	• "Teachers like workshops but they need to be a discussion or interactive."
	Bringing teachers with competitors at no cost	1	• "Continue to provide free participation to teachers and students submitting papers. This has been a great benefit for us."
Best practices for teacher retention		**6**	
	Recognize teachers with awards / nominate them for awards	4	• "I use the teacher award to bring them to the national JSHS." • "Nominating STEM teachers for state and regional STEM awards --highlighting science research and competition involvement."
	Give teachers positions on executive committee / advisory board	2	• "I engage them in jobs on my executive committee."
Recommended support for teachers		**11**	
	Funding for travel expenses	5	• "With our current funding situation in Wisconsin, funds for substitutes and travel are a huge issue for schools and teachers alike."

	Funding to cover additional teachers' attendance	3	• "We need to expand "visitation" of our local symposium by teachers. [funding] is scarcer now."
	Funding for substitute teachers	2	• "It all has to do with funding for… substitutes."
	Increase resources for teachers	1	• "Provide teachers with assistance as best you can, for example helping with identifying research mentors and providing guidelines about how they can fit the JSHS experience into their curriculum."
Recommended in-school outreach		**4**	
	School visits to promote and support research programs	2	• "Funding to allow us to meet personally with teachers in their schools to encourage them to initiate research programs; funding to allow us to meet with teachers in their schools to help support existing research programs."
	Class visits to help students	1	• "Visit the classrooms to talk with students and assist them with identifying doable and interesting research questions."
	Use graduate students to perform on-site outreach	1	• "I think a graduate or even an undergraduate student interested in outreach/teaching/STEM education would be the best ambassador to travel to schools for recruitment."
General Recommendations		**2**	
	Website	1	• "Having a good website that is updated every year."
	Increase DoDEA participation	1	• "In DoDEA each school should be required to have applicants. Our schools have no excuse for not participating."

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Use the scale provided to indicate the extent to which you agree or disagree with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I would like help or guidance from other regional directors on forming and maintaining strategic partnerships with outside organizations	0 (0%)	3 (7%)	4 (9%)	17 (37%)	14 (30%)	8 (17%)	46	**4.43**	1.09
It is important for regional directors to share best practices with one another	1 (2%)	0 (0%)	0 (0%)	5 (10%)	18 (38%)	24 (50%)	48	**5.31**	0.93
Aside from funding, the Academy of Applied Science provides essential support for National JSHS	0 (0%)	0 (0%)	1 (2%)	2 (4%)	15 (33%)	27 (60%)	45	**5.51**	0.69
Aside from funding, the Academy of Applied Science provides critical support for regional JSHS	0 (0%)	0 (0%)	1 (2%)	7 (16%)	16 (36%)	20 (45%)	44	**5.25**	0.81

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Appendix C:

2013 JSHS Regional Director Questionnaire and Data Summary

Please list the organizations that you partner with for your Regional Symposium? (n = 32)

List	Freq.	%	List	Freq.	%
ROTC programs	2	3%	MSEN Summer Ventures Program	1	1%
Tskuba University Japan	2	3%	Municipal schools	1	1%
University researchers	2	3%	New York state schools	1	1%
Alaska Science Consortium	1	1%	New/Early Colleges-New Schools Initiative	1	1%
Alberici Corporation	1	1%	NYC Department of Education	1	1%
Armed Forces Communications and Electronics Association	1	1%	Office of Research Services at Loyola University Chicago	1	1%
Atlanta Chapter of Old Crowes	1	1%	Oracle Software	1	1%
Bay area Science Fair	1	1%	Picatinny Arsenal	1	1%
Charlotte Area Science Network	1	1%	Piney Woods Country Life School	1	1%
Chevron	1	1%	Private foundations in Florida.	1	1%
College of Liberal Arts and Sciences UConn	1	1%	Puerto Rico Junior Academy of Sciences	1	1%
Connecticut Academy Science and Engineering	1	1%	Rankin County Schools	1	1%
Connecticut Pre-Engineering Program	1	1%	School of Engineering UCONN	1	1%
Connecticut Science Fair	1	1%	School of Science and Math	1	1%
Connecticut Science Supervisors Associations	1	1%	Sigma Aldrich	1	1%
Connecticut Science Teachers Association	1	1%	St. Louis Paint and Coating Society	1	1%
Department of Defense Labs	1	1%	student science organizations	1	1%
Donald Danforth Plant Science Center	1	1%	Subway	1	1%
Eastman Company	1	1%	Tank Automotive Research Development and Engineering Center	1	1%
Fairbanks Memorial Hospital and Denali Center	1	1%	Texas A&M	1	1%
Hawaii State Department of Education	1	1%	The Evolutions Program	1	1%
Innovative STEM Foundation	1	1%	Tougaloo College	1	1%
Innoventor	1	1%	University of Connecticut	1	1%
Jackson State University	1	1%	University of Georgia ROTC	1	1%
James Madison University	1	1%	University of Hawaii at Manoa	1	1%
James Madison University Foundation	1	1%	University of Mississippi Medical Center	1	1%
Korea area Corp. Of Engineers	1	1%	University of Oregon.	1	1%
LMI Aerospace	1	1%	University of South Carolina	1	1%
Madison County Schools	1	1%	University of Tennessee at Knoxville	1	1%

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Merck	1	1%		University of Wisconsin La Crosse	1	1%
Millsaps College	1	1%		US Army Corp of Engineers	1	1%
Mississippi Science Teachers Association	1	1%		US Army Corps of Engineers and Jackson Public Schools	1	1%
Mississippi State University	1	1%		Usibelli Foundation	1	1%
Missouri American Water Co.	1	1%		Virginia Academy of Science	1	1%
Monsanto	1	1%		Virginia State Science and Engineering Fair	1	1%
MSEN Pre-College Program	1	1%		Yale Peabody Museum	1	1%
				Total	**75**	**100%**

Would you be willing to share how you garnered support from these organizations with your fellow regional directors? (n = 35)

	Freq.	Example Response(s)
Would share with others	**7**	• "Yes, I would share."
Utilize existing relationships	**2**	• "The relationship with Merck was developed from our existing relationship with them through the Governor's School where I act as the Assistant Director."
Request assistance	**1**	• "In addition, we request assistance for judging from NASA, the NSF Tokyo Office, and the Office of Air Force Research at Hardy Barracks, Tokyo. "
Knock on doors	**1**	• "Knock on doors."

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Would you participate in a committee of regional directors for the purpose of sharing best practices and improving JSHS? Do you have alternative suggestions to facilitate communication among regional directors? (n = 35)			
Participation	**Response**	**Freq.**	**Example Response(s)**
Would you participate in a committee?		**25**	
	Yes	21	• "Yes, I would be willing to participate."
	Currently too busy	2	• "Not at this time -- very busy"
	No	2	• "I am not particularly interested."
Alternative Suggestions	**Narrow Theme**	**Freq.**	**Example Response(s)**
Communication over the internet		**15**	
	Utilize conference calls/Skype	6	• "I suggest a video conferencing session where we can all remotely share lessons learned."
	Create a director's listserv	3	• "Maybe a director's listserv could work to keep us connected and working together more."
	Use Google groups / documents	2	• "…having a Google Doc[ument] or some other central repository that serves as a clearinghouse for good ideas and best practices would be helpful."
	Create a blog	2	• "A blog within the JSHS web page would be a good venue for communication."
	Host a yearly webinar	1	• "Perhaps a yearly webinar in the Fall."
	Allow for uploading and downloading of resources	1	• "Also enable the site to be robust enough to allow uploading and downloading of resources that Directors might want to share."
	Centralize the website	1	• "A centralized website that links to all fairs that is fully loaded with information."
Communication/Programs in person		**2**	
	Travel to sites to assist with Regional Symposia	1	• "The best [method] was when I actually traveled to sites on a pre-visit and then to help out with their symposium. If someone has the time this is really best: face to face."
	Revive the Regional Directors Executive Committee	1	• "We should revive the Regional Directors Executive Committee which functioned very effectively for decades.

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Is the Academy of Applied Science meeting your needs as the administrator of JSHS? Are there any areas in which they can improve? (n = 35)		
Meeting Needs	**Freq.**	**Example Response(s)**
Yes	27	
Ways to Improve	**Freq.**	**Example Response(s)**
Additional funding	1	• "Additional funding would allow for continued growth."
Increased communication	1	• "More communications about what get help regionals be more successful would be an improvement."
Providing minutes from meetings	1	• "Providing minutes from meetings such as the RD meetings and other committees."
Scientific Advisory Board	1	• "It could use a Scientific Advisory Board to include members of the national Academy and may be a couple of Nobel laureates."
Update website	1	• "The website is not very user friendly from a new user perspective."

Appendix C:

2013 JSHS Regional Director Questionnaire and Data Summary

The Judging process at JSHS is a unique and powerful component of this program. What kind of feedback do students receive from judges at your regional? If they receive feedback, what format does it come in and when do they receive it? Do all participants receive feedback or only those who advance to National JSHS? (n = 41)

Type of feedback	Freq.	Example Response(s)
Judging sheets with commentary	14	• "The judges use the national score sheet and are asked for comments."
Winning students get extra feedback in preparation for national JSHS	10	• "Only the finalists receive feedback in the form of an email with a summary of the judges' advice." • "Students who were selected to present at National, and their teachers, meet with the panel of judges for the final round to receive specific feedback on how to better prepare themselves to present at national."
Students receive written ratings and critiques of paper submissions	6	• "All students receive feedback on their written work from our judges."
Question and answer period after presentations only	5	• "Students receive some feedback from judges during the question portion following their presentation at the regional JSHS."
Feedback provided only upon students' request	5	• "Not unless they ask for it."
No feedback provided	4	• "Students do not receive feedback from the judges in this region."
Peer feedback	4	• "We have also done 'Poll Everywhere' for the oral presentations. This is a feedback mechanism from [peers]. All participants rate the speaker and have the options of giving comments. The comments are moderated by the director and given back to the presenters."
Informal feedback from judges	4	• "…we also have a lunch where there is an informal exchange between the executive committee and presenters (all poster and oral)."
Non-competitive poster presenters are given a special feedback session	1	• "We have a category called Rising Stars - a non-competitive poster session- They receive feedback directly from our executive committee."
Formal, one-on-one feedback sessions	1	• "After all presentations are made, the judges all meet with each student for a 5-10 minute briefing."

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Do you have any suggestions for improving your Regional Symposium? (n = 36)			
Broad Theme	**Narrow Theme**	**Freq.**	**Example Response(s)**
Increase participation of individuals		**17**	
	General students	7	• "…we need to get a lot more participation, which has really waned in the last 10 years."
	Schools	3	• "We are trying to increase the number of schools that participate.
	Students in underrepresented groups	2	• "We are always looking to increase minority and underserved populations' participation in our JSHS."
	Students in middle school and early high school	2	• "…encourage middle school students and ninth & tenth graders to attend."
	Judges	2	• "Continue to work at getting more judges who specialize in the sciences."
	Military personnel	1	• "…have more NAVY and Air Force presence to act as presider and/or judges."
Aspects of the program		**11**	
	Provide judges' feedback to students	3	• "Develop a better method to provide feedback to all presenters.
	Reorganize symposium borders	2	• "One idea would be to realign symposium borders to encourage the population you want to participate."
	Organize more tours	1	• "I would like to be able to offer tours of the Navy and Army research labs every year."
	Hire a full time staff member	1	• "…have a paid full time staff member who could spend considerable time going to schools, consulting on setting up a research program, and finding out ways to better meet the needs of the students."
	Make certain to have fairness in judging	1	• "Ensure that the top projects are based on merit, not "inclusion." Some projects that were chosen as finalists were not even complete (some had not collected any data)."
	Do not limit number of participants per school	1	• "The number of participants per school should not be limited."
	Provide an overall list of possible speakers	1	• "It would be helpful if I had a list of individuals that would be willing to speak at regional competitions."
	Give away promotional material	1	• "Would be nice to be allowed to give away promotional materials, such as hats, t-shirts, flash drives, etc."
Monetary issues		**6**	
	Raising awareness of JSHS	2	• "Right now we're very focused on raising awareness of the program among the High School science teachers in our state."

	Provide more funding	2	• "More funding would enable the regional symposium to increase participation and support better student preparation."
	Assist with travel expenditures	2	• "I would like to have travel funds to bring in key note speakers from outside of this region.

Appendix C:
2013 JSHS Regional Director Questionnaire and Data Summary

Do you have any suggestions for improving the National Symposium? (n = 35)			
Broad Theme	**Narrow Theme**	**Freq.**	**Example Response(s)**
Activities at National JSHS		**18**	
	Host a social event for students and/or directors	8	• "This year it was a bit disappointing that there wasn't a "social" for the students or for the Directors." • "Please note that ON THEIR OWN, they put together their own dance social Saturday night. We need to be careful that students don't choose to skip JSHS so that they can have a fuller experience elsewhere."
	Increase lab tours	4	• "Get the students out into the surrounding area even if it is only for a couple of hours." • "This year's was the first one not to have lab visits; not a good idea. Bring the lab visits back."
	Host career round-tables	1	• "I thought the career round-tables were effective. Is there a possibility they could come back?"
	Hold more workshops	1	• "Provide more workshops for students as well as adults."
	Stop lunchtime talks	1	• "No lunchtime talks."
	Create student led sessions	1	• "I suggest using the leadership skills of the students in order to conduct sessions."
	Increase student down time	1	• "A bit more "down time" built in for the kids."
	Have top three students present	1	• "I would like to see the top three students be allowed to present."
Aspects of National JSHS		**16**	
	Adjust scholarship and winnings	3	• "The higher scholarship amount primarily attracts the "professional" science competitor and does not help the JSHS to reach the target audience of inner city, rural and disadvantaged students."
	Hold it at a different time in the year	2	• "If there were a way to hold the National away from the AP exams it might stress the students less."
	Ensure judging fairness	2	• "…the judging is biased away from the research the majority of students present and that is very discouraging to these students and to me as well because it sometimes appears to be an unfair process type of work appears more important than the quality and research excellence of the project."
	Provide the students feedback from judges	2	• "Written feedback from judges on forms given to the competitors."
	Have all students eligible for awards	1	• "All attending from a regional team should have the opportunity to either orally or poster present. There

			should be judges for all and all should be eligible for some award."
	Provide food and drinks		• "…have some simple, healthy snacks and cold water available to the participants as they arrive from a long day of travel to hold them over until dinner."
	Address presentation limitations	1	• "Would it be possible to have more judges or allow students more time with the judges?"
	Change the location	1	• "I found that Dayton was far from an ideal host city."
	Focus more on Humanities	1	• "I think we need some infusion of arts and such. The experience should deal with the whole student as a person."
	Increase funding for teachers	1	• "Provide funding for more pre-college teachers to attend."
	Acknowledge the regional directors	1	• "…we receive no acknowledgement from the military at the National Symposium. It is like the regional directors do not exist."

Appendix D:
2013 JSHS Regional Symposium Student Questionnaire and Data Summary

Thank you for your participation in this study about the 2013 National Junior Science & Humanities Symposium (JSHS). This questionnaire is intended to collect information about you and your experiences with JSHS in 2013. The purpose of this study is to help guide program improvement and to report pertinent outcomes to our funders. The results will be used to critically review JSHS's current practices and their relation to improving student participation in Science, Technology, Engineering, and Mathematics (STEM) related endeavors.

- While this survey is not anonymous, be assured that your responses are CONFIDENTIAL; when analyzing data and reporting results, your name will not be associated with any of the item responses or any comments you make.
- Additionally, the AEOP reserves the right to contact you at a later date in an effort to gauge your academic and career success.
- Responding to this survey is completely voluntary, you are not required to participate, although we hope you do because your responses will provide JSHS with valuable information for meaningful and continuous improvement.

*****By choosing to click the ">>" button below and completing this survey, you are providing consent for us to use your responses as part of this study*****

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

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Appendix D:

2013 JSHS Regional Symposium Student Questionnaire and Data Summary

Please fill out the personal information below:

First Name: _____

Last Name: _____

Email Address: _____

Age (in years): _____, years.

Grade Level you are currently in or have just completed (e.g., 9, 10, 11, or 12): _____, grade.

In 2013, which Regional JSHS did you participate in? _____.

What was your role at Regional JSHS?

- ❍ Oral Presentation
- ❍ Research Poster
- ❍ Submitted a paper but did not do an oral presentation or research poster
- ❍ Observer
- ❍ Other, please specify: _____

Which of the following best describes you?

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

Which of the following best describes your race/ethnicity?

- ❍ American Indian or Alaskan Native
- ❍ Asian or Pacific Islander
- ❍ Black or African American
- ❍ Hispanic or Latino
- ❍ White/Caucasian
- ❍ Some other ethnicity/race: _____
- ❍ Choose not to report

Which of the following best describes your REGULAR SCHOOL?

- ❍ Public
- ❍ Private
- ❍ Home School
- ❍ Other (Please Specify) _____

Which of the following best describes your REGULAR SCHOOL?

- ❍ It is in a RURAL setting
- ❍ It is in a SUBURBAN setting
- ❍ It is in an URBAN setting
- ❍ Other (Please Specify) _____

Do you qualify for free/reduced lunch at school?

- ❍ Yes
- ❍ No
- ❍ I don't know / choose not to answer

Appendix D:
2013 JSHS Regional Symposium Student Questionnaire and Data Summary

How did you hear about JSHS?

Aside from regional and national JSHS, what other science competitions did you participate in this year?

What is the highest level of education that you plan to pursue?

- ❍ I plan to enter college and complete a 2-year/Associate's degree in a science, technology, engineering, and/or mathematics (STEM) related field.
- ❍ I plan to enter college and complete a 2-year/Associate's degree in something other than a STEM-related field.
- ❍ I plan to enter college and complete a bachelor's degree in a science, technology, engineering, and/or mathematics (STEM) related field.
- ❍ I plan to enter college and complete a bachelor's degree in something other than a STEM-related field.
- ❍ I plan to pursue a master's degree in a STEM-related field.
- ❍ I plan to pursue a master's degree in something other than a STEM-related field.
- ❍ I plan to pursue a doctoral degree in a STEM-related field.
- ❍ I plan to pursue a doctoral degree in something other than a STEM-related field.
- ❍ I do not plan to attend college.

Which of the following categories best describes the STEM field you want to pursue?

- ❍ Engineering (e.g., technology, robotics, computers, etc.)
- ❍ Environmental Science (e.g., pollution, ecosystems, bioremediation, climatology, meteorology, etc.)
- ❍ Physical Science (e.g., physics, astronomy, etc.)
- ❍ Chemistry (e.g., geochemistry, material science, alternative fuels, etc.)
- ❍ Life Science (e.g., biology, animal science, ecology, etc.)
- ❍ Medicine / Health (e.g., behavioral science, medicine, public health, etc.)
- ❍ Computer Science
- ❍ Mathematics
- ❍ Social Science (e.g., sociology, psychology, economics, etc.)
- ❍ Other STEM field
- ❍ A field unrelated to STEM

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Thinking about your educational goals, use the scale provided to tell us how certain you are that you will be able to do each of the following?

	Not at all Certain	Uncertain	Relatively Uncertain	Relatively Certain	Certain	Very Certain
I will be admitted to my college and program of choice	❍	❍	❍	❍	❍	❍
I will attend college to pursue this educational degree	❍	❍	❍	❍	❍	❍
I will get good grades in my classes	❍	❍	❍	❍	❍	❍
I will be able to overcome any obstacle between me and this educational degree	❍	❍	❍	❍	❍	❍
I will finish this degree	❍	❍	❍	❍	❍	❍

Use the scale provided to tell us how certain you are that you will do the following activities in the future?

	Not at all Certain	Uncertain	Relatively Uncertain	Relatively Certain	Certain	Very Certain
I will apply for jobs in a STEM-related field	❍	❍	❍	❍	❍	❍
I will get a job in a STEM field	❍	❍	❍	❍	❍	❍
I will build a career around my STEM skills	❍	❍	❍	❍	❍	❍
I will pursue STEM jobs within the Army	❍	❍	❍	❍	❍	❍
I will build a STEM career within the Army	❍	❍	❍	❍	❍	❍

Why did you decide to participate in a science competition this year?

Why, specifically, did you choose JSHS?

Appendix D:
2013 JSHS Regional Symposium Student Questionnaire and Data Summary

Have you ever participated in or heard about any of the following programs that are sponsored by the U.S. Army?

	Yes, I participated	I would have participated but it was not available in my area	I have never heard about this program
JSS: Junior Solar Sprint	❍	❍	❍
GEMS: Gains in the Education of Math and Science	❍	❍	❍
The West Point Bridge Contest	❍	❍	❍
eCYBERMISSION	❍	❍	❍

Have you been provided with information about the following programs that are sponsored by the U.S. Army? Do you want to participate?

	I already participated in this program	Yes - I want to participate	Yes - I would participate but it is not available in my area	Yes - but I do not want to participate	I have not heard about this program
HSAP: High School Apprenticeship Program	❍	❍	❍	❍	❍
REAP: Research and Engineering Apprenticeship Program	❍	❍	❍	❍	❍
SEAP: Science and Engineering Apprenticeship Program	❍	❍	❍	❍	❍
URAP: Undergraduate Research Apprenticeship Program	❍	❍	❍	❍	❍
CQL: College Qualified Leaders	❍	❍	❍	❍	❍

Please indicate your level of satisfaction with each portion of the Regional JSHS event.

	Very Dissatisfied	Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Satisfied	Very Satisfied
Students' Oral Research presentation session(s)	❍	❍	❍	❍	❍	❍
The invited speakers	❍	❍	❍	❍	❍	❍
Research poster presentations	❍	❍	❍	❍	❍	❍
The entire Regional JSHS experience	❍	❍	❍	❍	❍	❍

At Regional JSHS, which activity do you think was the MOST VALUABLE? Why?

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At Regional JSHS, which activity or speaker was the MOST INSPIRATIONAL/MOTIVATIONAL? Why?

At Regional JSHS, which activity did you find to be of the LEAST VALUE? Why?

Appendix D:
2013 JSHS Regional Symposium Student Questionnaire and Data Summary

Think back on your ORAL PRESENTATION experience at Regional JSHS and indicate your level of agreement with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Presenting at Regional JSHS has helped me become a better speaker and presenter of scientific research.	❍	❍	❍	❍	❍	❍
I am more confident in my ability to effectively communicate scientific ideas after presenting at Regional JSHS.	❍	❍	❍	❍	❍	❍
Presenting at Regional JSHS has helped me become a better writer.	❍	❍	❍	❍	❍	❍
Overall, I enjoyed presenting my research at Regional JSHS.	❍	❍	❍	❍	❍	❍

What type of feedback did you receive on your oral presentation at the Regional JSHS event?

❍ Written feedback at the event
❍ Oral feedback at the event
❍ Written feedback (either in paper or over email) after the event
❍ No feedback
❍ Other (specify): _____

Please indicate your level of agreement with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	Not Applicable
I will improve my research in the future as a result of undergoing the Regional JSHS judging process.	❍	❍	❍	❍	❍	❍	❍
The Judges at Regional JSHS provided me with feedback that will be useful for my research in the future.	❍	❍	❍	❍	❍	❍	❍

How would you improve the judging process for oral presentations at Regional JSHS?

Appendix D:
2013 JSHS Regional Symposium Student Questionnaire and Data Summary

Think back on your POSTER PRESENTATION experience at Regional JSHS and indicate your level of agreement with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Regional JSHS has helped me become a better presenter of scientific research.	❍	❍	❍	❍	❍	❍
I am more confident in my ability to effectively communicate scientific ideas after presenting my poster at Regional JSHS.	❍	❍	❍	❍	❍	❍
Presenting my poster at Regional JSHS has helped me become a better writer.	❍	❍	❍	❍	❍	❍
Overall, I enjoyed presenting my research poster at Regional JSHS.	❍	❍	❍	❍	❍	❍

What type of feedback did you receive on your poster presentation at the Regional JSHS event?

❍ Written feedback at the event
❍ Oral feedback at the event
❍ Written feedback (either in paper or over email) after the event
❍ No feedback
❍ Other (specify): _____

Think back on your POSTER PRESENTATION experience at Regional JSHS and indicate your level of agreement with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I will improve my research in the future as a result of the feedback I received from judges.	❍	❍	❍	❍	❍	❍
Poster judges at Regional JSHS provided me with feedback that is useful for my research in the future.	❍	❍	❍	❍	❍	❍

How would you improve the judging process for research posters at Regional JSHS?

Appendix D:
2013 JSHS Regional Symposium Student Questionnaire and Data Summary

Think back to the ORAL research presentations made by students at Regional JSHS and indicate the extent to which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
The presenters challenged my previous thinking and/or assumptions	❍	❍	❍	❍	❍	❍
The presenters motivated me to achieve more in STEM-related fields	❍	❍	❍	❍	❍	❍
The presenters increased my interest in STEM-related subjects	❍	❍	❍	❍	❍	❍
The presenters exposed me to new information/knowledge in STEM	❍	❍	❍	❍	❍	❍

Think back on the invited speakers at Regional JSHS and indicate the extent to which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
The speakers challenged my previous thinking and/or assumptions	❍	❍	❍	❍	❍	❍
The speakers motivated me to achieve more in STEM-related fields	❍	❍	❍	❍	❍	❍
The speakers presented me with new information or knowledge in STEM	❍	❍	❍	❍	❍	❍
The speakers inspired me to pursue DoD or government service/careers	❍	❍	❍	❍	❍	❍

Think back to the research POSTER presentations made by students at Regional JSHS and indicate the extent to which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Research posters challenged my previous thinking and/or assumptions	❍	❍	❍	❍	❍	❍
Research posters expanded my academic horizons	❍	❍	❍	❍	❍	❍
Research posters motivated me to achieve more in STEM-related fields	❍	❍	❍	❍	❍	❍
Research posters exposed me to new information and knowledge in STEM	❍	❍	❍	❍	❍	❍

Appendix D:

2013 JSHS Regional Symposium Student Questionnaire and Data Summary

Think back to your entire Regional JSHS experience and tell us the extent to which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	Not applicable / did not participate
Regional JSHS taught me about new and exciting career options	❍	❍	❍	❍	❍	❍	❍
Regional JSHS motivated me to explore Department of Defense and Government career options	❍	❍	❍	❍	❍	❍	❍
The activities/exhibits educated me about educational opportunities offered by the Military (e.g., internships, apprenticeships, etc.)	❍	❍	❍	❍	❍	❍	❍

Please take a moment to reflect about your peers at Regional JSHS then use the scale provided to indicate the extent to which you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I made new friends at Regional JSHS	❍	❍	❍	❍	❍	❍
Me and my peers regularly exchanged research ideas at Regional JSHS	❍	❍	❍	❍	❍	❍
Exchanging ideas with my peers motivated me to continue STEM research	❍	❍	❍	❍	❍	❍
I found it easier to relate to my peers at Regional JSHS than my peers at school	❍	❍	❍	❍	❍	❍
I was inspired by my peers at Regional JSHS	❍	❍	❍	❍	❍	❍
I felt a sense of camaraderie with my peers at Regional JSHS	❍	❍	❍	❍	❍	❍
My peers at Regional JSHS helped me become a better scientist	❍	❍	❍	❍	❍	❍
I have and will maintain contact with my peers from Regional JSHS	❍	❍	❍	❍	❍	❍

What do you think are the benefits of meeting new peers at Regional JSHS? Is there any downside?

Appendix D:
2013 JSHS Regional Symposium Student Questionnaire and Data Summary

Who helped you perform your research project for JSHS in 2013?

- ❍ My parent(s) served as my research mentor
- ❍ My teacher was my mentor
- ❍ An Army, Navy, or Air Force researcher
- ❍ A university-affiliated professor
- ❍ A university-affiliated graduate student
- ❍ An industry researcher (e.g., medical, pharmaceutical, engineering, or independent laboratory researcher, etc.)
- ❍ I did not have a research mentor
- ❍ Other, (specify): _____

How did you find and begin to work with your mentor?

- ❍ My parent(s) connected me with my research mentor
- ❍ My teacher connected me with my research mentor
- ❍ I actively searched and found my research mentor
- ❍ Other (please specify): _____

Please take a moment to reflect on your relationship with your research mentor. To what extent do you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I learned more from my mentor than I did from my regular high-school experience	❍	❍	❍	❍	❍	❍
My mentor has helped motivated me to pursue STEM-research	❍	❍	❍	❍	❍	❍
My mentor was critical to my success in JSHS	❍	❍	❍	❍	❍	❍
I have a better understanding of the scientific method due to my mentor	❍	❍	❍	❍	❍	❍
My mentor supplied a laboratory space for me to work	❍	❍	❍	❍	❍	❍
My mentor supplied lab equipment for me to use	❍	❍	❍	❍	❍	❍

In what other ways has your mentor helped you succeed in JSHS and in your other STEM pursuits?

Is there anything else that you would like to tell us about your Regional JSHS experience this year?

Thank you for your input and remember that your responses are completely confidential.

If you have any questions or concerns, please email:
Rebecca Kruse – rkruse75@vt.edu or Tanner Bateman – tbateman@vt.edu

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Age (in years):		
	Freq.	**%**
14	1	1%
15	9	11%
16	34	40%
17	30	36%
18	9	11%
19	1	1%
Total	84	100%

Note. Average age = 16.5 years

Grade level you are currently in or have just completed (e.g., 9, 10, 11, or 12):		
	Freq.	**%**
9	1	1%
10	21	25%
11	44	52%
12	18	21%
Total	84	100%

What was your role at Regional JSHS?		
Role	**Freq.**	**%**
Oral Presentation	28	33%
Research Poster	9	11%
Submitted a paper but did not do an oral presentation or research poster	4	5%
Observer	43	51%
Other, please specify:	1	1%
Total	**85**	**100%**

Note: Other = *"Observer this year, oral presenter last year."*

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In 2013, which Regional JSHS did you participate in?						
Region	**Freq.**	**%**		**Region**	**Freq.**	**%**
Alabama	0	0%		**Missouri**	0	0%
Alaska	0	0%		**New Jersey - Monmouth**	1	1%
Arizona	0	0%		**New Jersey - North New Jersey**	18	21%
Arkansas	0	0%		**New York - Metro**	9	11%
California - Northern California & Western Nevada	12	14%		**New York - Long Island**	0	0%
California - Southern California	0	0%		**New York - Upstate**	8	10%
Connecticut	31	37%		**North Carolina**	1	1%
DoD Dependent Schools - Europe	0	0%		**North Central - Minnesota, N. Dakota, S. Dakota**	0	0%
DoD Dependent Schools - Pacific	0	0%		**New England - Northern**	0	0%
District of Columbia	0	0%		**New England - Southern**	0	0%
Florida	0	0%		**Ohio**	0	0%
Georgia	0	0%		**Oregon**	0	0%
Hawaii	0	0%		**Pennsylvania**	4	5%
Illinois - Chicago	0	0%		**Puerto Rico**	0	0%
Illinois	0	0%		**South Carolina**	0	0%
Indiana	0	0%		**Southwest**	0	0%
Intermountain - Colorado, Montana, Idaho, Nevada, Utah	0	0%		**Tennessee**	0	0%
Iowa	0	0%		**Texas**	0	0%
Kansas - Nebraska - Oklahoma	0	0%		**Virginia**	0	0%
Kentucky	0	0%		**Washington**	0	0%
Louisiana	0	0%		**West Virginia**	0	0%
Maryland	0	0%		**Wisconsin - W. Wisc./Upper Michigan**	0	0%
Michigan -Southeastern	0	0%		**Wisconsin**	0	0%
Mississippi	0	0%		**Wyoming- Eastern Colorado**	0	0%
				Total	**84**	**100 %**

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Which of the following best describes you?		
	Freq.	**%**
Male	31	36%
Female	55	64%
Choose not to report	0	0%
Total	**86**	**100%**

Which of the following best describes your race/ethnicity?		
	Freq.	**%**
American Indian or Alaskan Native	0	0%
Asian or Pacific Islander	24	28%
Black or African American	3	3%
Hispanic or Latino	9	10%
White/Caucasian	46	53%
Other	1	1%
Choose not to report	3	3%
Total	**86**	**100%**

Note. Other = *"Egyptian"*

Which of the following best describes your REGULAR SCHOOL?		
	Freq.	**%**
Public	67	77%
Private	18	21%
Home School	1	1%
Other (Please Specify):	1	1%
Total	**87**	**100%**

Note. Other = *"Vocational"*

Which of the following best describes your REGULAR SCHOOL?		
	Freq.	**%**
It is in a RURAL setting	19	22%
It is in a SUBURBAN setting	46	53%
It is in an URBAN setting	21	24%
Other (Please Specify)	0	0%
Total	**86**	**100%**

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Do you qualify for free/reduced lunch at school?		
	Freq.	**%**
Yes	16	19%
No	59	69%
I don't know/choose not to answer	11	13%
Total	**86**	**100%**

How did you hear about JSHS? (n = 84)			
Broad Theme	**Narrow Theme(s)**	**Freq.**	**Example Response(s)**
School association		**72**	
	Teacher recommended	48	• "My science teacher told me about it and I was interested."
	Academic requirement	10	• "I am part of the Science Research Program at my school.
	School/Nomination	6	• "My school." • "I was selected to attend due to my science background."
	Science Department	6	• "Science department recommended the program."
Website/Internet		**7**	"We were searching for competitions through Google and found out about JSHS."
Peers		**3**	• "[Through a] friend" • "Other fellow competitors."
Non-school mentor		**2**	"My mentor notified me of JSHS when I discussed with him about my internal combustion engine design."
Repeat Participant		**1**	"I was a past participant."

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Aside from regional and national JSHS, what other science competitions did you participate in this year? (n = 52)						
List	**Freq.**	**%**		**List**	**Freq.**	**%**
Intel Science and Engineering Fair	7	9%		DuPont Challenge	2	2%
Hudson County Science Fair	7	9%		Pennsylvania Junior Academy of Science	2	2%
Siemens Competition	7	9%		New Jersey Regional Science Fair	2	2%
New York City Science Engineering Fair	6	7%		Sigma Xi Student Research Showcase	1	1%
St. Joseph's Research Competition	6	7%		Greater Capital Region Science and Engineering Fair	1	1%
Google Science Fair	5	6%		International Sustainable World Project Olympiad	1	1%
Intel Science Talent Search	5	6%		Exploravision	1	1%
California State Science Fair	5	6%		Northern New Jersey American Chemical Society	1	1%
Science Olympiad	4	5%		Contra Costa Science Fair	1	1%
Seton Hall Competition	3	4%		BioGENEius	1	1%
Synopsys Science Fair	3	4%		New York City ACT-SO	1	1%
York College Science and Mathematics Exposition	2	2%		Oracle thinkquest	1	1%
Connecticut state science fair	2	2%		Pittsburgh Regional Science and Engineering Fair	1	1%
Southern Connecticut Science Fair	2	2%		San Joaquin County Science Fair	1	1%
				Total	**81**	**100%**

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What is the highest level of education you plan to pursue?		
	Freq.	**%**
I plan to enter college and complete a 2-year/Associate's degree in a science, technology, engineering, and/or mathematics (STEM) related field.	3	4%
I plan to enter college and complete a 2-year/Associate's degree in something other than a STEM-related field.	0	0%
I plan to enter college and complete a bachelor's degree in a science, technology, engineering, and/or mathematics (STEM) related field.	14	16%
I plan to enter college and complete a bachelor's degree in something other than a STEM-related field.	3	4%
I plan to pursue a master's degree in a STEM-related field.	9	11%
I plan to pursue a master's degree in something other than a STEM-related field.	2	2%
I plan to pursue a doctoral degree in a STEM-related field.	48	56%
I plan to pursue a doctoral degree in something other than a STEM-related field.	6	7%
I do not plan to attend college.	0	0%
Total	**85**	**100%**

Which of the following categories best describes the STEM field you want to pursue?		
	Freq.	**%**
Engineering (e.g., technology, robotics, computers, etc.)	6	10%
Environmental Science (e.g., pollution, ecosystems, bioremediation, climatology, meteorology, etc.)	2	3%
Physical Science (e.g., physics, astronomy, etc.)	3	5%
Chemistry (e.g., geochemistry, material science, alternative fuels, etc.)	7	11%
Life Science (e.g., biology, animal science, ecology, etc.)	6	10%
Medicine / Health (e.g., behavioral science, medicine, public health, etc.)	29	48%
Computer Science	4	7%
Mathematics	3	5%
Social Science (e.g., sociology, psychology, economics, etc.)	1	2%
Other STEM field	0	0%
A field unrelated to STEM	0	0%
Total	**61**	**100 %**

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Thinking about your educational goals, use the scale provided to tell us how certain you are that you will be able to do each of the following?									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I will be admitted to my college and program of choice	1 (1%)	2 (2%)	11 (13%)	21 (25%)	18 (21%)	32 (38%)	85	**4.75**	1.22
I will attend college to pursue this educational degree	0 (0%)	1 (1%)	1 (1%)	8 (9%)	12 (14%)	63 (74%)	85	**5.59**	0.81
I will get good grades in my classes	0 (0%)	0 (0%)	2 (2%)	13 (15%)	25 (29%)	45 (53%)	85	**5.33**	0.82
I will be able to overcome any obstacle between me and this educational degree	0 (0%)	0 (0%)	2 (2%)	16 (19%)	20 (24%)	47 (55%)	85	**5.32**	0.86
I will finish this degree	0 (0%)	0 (0%)	0 (0%)	6 (7%)	20 (24%)	59 (69%)	85	**5.62**	0.62

Note. Response scale: **1** = "*Not at all Certain,*" **2** = "*Uncertain,*" **3** = *"Relatively Uncertain,"* **4** = "*Relatively Certain,*" **5** = "*Certain*," **6** = "*Very Certain*".

Use the scale provided to tell us how certain you are that you will do the following activities in the future?									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I will apply for jobs in a STEM-related field	5 (6%)	1 (1%)	5 (6%)	15 (19%)	13 (16%)	42 (52%)	81	**4.93**	1.44
I will get a job in a STEM field	4 (5%)	2 (2%)	10 (12%)	16 (20%)	18 (22%)	32 (39%)	82	**4.68**	1.41
I will build a career around my STEM skills	3 (4%)	2 (2%)	8 (10%)	14 (17%)	18 (22%)	36 (44%)	81	**4.85**	1.35
I will pursue STEM jobs within the Army	38 (46%)	21 (26%)	12 (15%)	4 (5%)	4 (5%)	3 (4%)	82	**2.07**	1.36
I will build a STEM career within the Army	38 (46%)	24 (29%)	9 (11%)	5 (6%)	3 (4%)	3 (4%)	82	**2.02**	1.32

Note. Response scale: **1** = "*Not at all Certain,*" **2** = "*Uncertain,*" **3** = *"Relatively Uncertain,"* **4** = "*Relatively Certain,*" **5** = "*Certain*," **6** = "*Very Certain*".

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Why did you decide to participate in a science competition this year? (n = 65)			
Broad Theme	**Narrow Theme**	**Freq.**	**Example Response(s)**
Academic Research Activities		**42**	
	Presenting/sharing research	17	• "I feel that science competitions are the best way to demonstrate my knowledge to other people who did not know what my research project." • "I wanted to see if my research would be considered something beneficial by the other people around me and also it was a chance to let others know about my research and to share the things that I enjoy researching about."
	Receiving feedback on research	6	• "I wanted feedback on my research from professionals and specialists in the field."
	Improve scientific research and communication skills	6	• "To gain experience, knowledge, and familiarity with research and presentations."
	Engaging in scientific community of peers	6	• "This sounded like a great opportunity to engage in the sciences and interact with others around the state."
	Personal improvement in research	4	• "By listening to such intelligent people discuss subjects that I have never contemplated on, I become inspired to do my best."
	Exposure to new ideas/fields	3	• "I always love to know about new innovations/ Ideas within the scientific field." • "To see other students' ideas and how my idea compared to theirs."
School association		**13**	
	Observation in preparation	7	• "My science teachers encouraged me to observe the competition."
	Teacher recommended	4	• "My teacher said it would be a good experience for me."
	Academic requirement	2	• "It is a requirement for my advanced science research class."
STEM Pathway		**7**	
	Resume/application builder	3	• "I was told that participating in a science competition such as this was very good for the college admissions process."
	Scholarship opportunities	2	• "I wanted to see if I could get a scholarship for my hospice project that I have completed."
	Relates to career intentions	2	• "After working with college professors on a research project and considering that I plan to become a scientist, participating in a science competition made a lot of sense."
Previous experience in JSHS		**2**	
	Inspired as previous observer	2	• "I was an observer last year and I really enjoyed it, so i decided to compete this year with my research project."
Other		**8**	

	Love for science	4	• "I love science!"
	Enjoy the competitive environment	3	• "I decided to participate because I enjoy the competition and the work involved in doing a science competition."
	Tradition	1	• "Tradition."

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Why, specifically, did you choose JSHS? (n = 65)			
Broad Theme	**Narrow Theme**	**Freq.**	**Example Response(s)**
Characteristics of JSHS		**29**	
	Presentation format	13	• "…an opportunity to give an oral presentation, which means a direct interaction with experts." • "It seemed to be one of the most distinguished poster competitions in the nation."
	Opportunity to interact with peers that are conducting research	7	• "…the intimate setting of the regional symposium allowed for more interactions with the other presenters and student observers." • "JSHS offers a friendly, relatively non-competitive environment for students to share their research and meet others."
	Prestigious national competition	6	• "JSHS is a well-known competition that endorses high-level high school science projects, and I wanted to participate and compete like many others in this great Symposium."
	Broad research topics	2	• "When looking at competitions to submit to, a lot of them seemed to cater too heavily to medical, chemical, or biological research topics. JSHS seemed to accept more Engineering and CS topics."
	Option to present a research poster	1	• "It seemed to be one of the most distinguished poster competitions in the nation."
School association		**23**	
	Teacher recommended	15	• "My AP biology teacher told me about it."
	Academic requirement	5	• "It was offered by my Science Research program."
	School/Nomination	3	• "this was the program they nominated me for"
Logistics		**11**	
		7	• "it was a close and nearby competition"
		4	• "I chose JSHS because it was the only one that I had heard about at the time."
Previous experience with JSHS		**6**	
	Inspired as previous observer	4	• "I attended the JSHS competition as a viewer the year before and I was so impressed by all the research I saw. It became my goal to be one of those presenters like I had seen."
	Inspired as previous competitor	2	• "This is my second year competing at JSHS and I will be competing in my future years."
Mentor recommended		**2**	• "Because my mentor…told me that I should enter the competition."

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Have you ever participated in or heard about any of the following programs that are sponsored by the U.S. Army?				
	Yes, I participated	I would have participated but it was not available in my area	I have never heard about this program	n
JSS: Junior Solar Sprint	2 (3%)	3 (4%)	71 (93%)	76
GEMS: Gains in the Education of Math and Science	0 (0%)	7 (9%)	69 (91%)	76
The West Point Bridge Contest	0 (0%)	7 (9%)	69 (91%)	76
eCYBERMISSION	1 (1%)	4 (6%)	69 (93%)	74

Have you ever participated in or heard about any of the following programs that are sponsored by the U.S. Army?						
	I already participated in this program	Yes - I want to participate	Yes - I would participate but it is not available in my area	Yes - but I do not want to participate	I have not heard about this program	n
HSAP: High School Apprenticeship Program	0 (0%)	4 (5%)	5 (7%)	0 (0%)	65 (88%)	74
REAP: Research and Engineering Apprenticeship Program	0 (0%)	9 (12%)	1 (1%)	0 (0%)	64 (86%)	74
SEAP: Science and Engineering Apprenticeship Program	0 (0%)	8 (11%)	2 (3%)	1 (1%)	63 (85%)	74
URAP: Undergraduate Research Apprenticeship Program	0 (0%)	5 (7%)	2 (3%)	0 (0%)	67 (91%)	74
CQL: College Qualified Leaders	0 (0%)	5 (7%)	1 (1%)	0 (0%)	68 (92%)	74

Please indicate your level of satisfaction with each portion of the Regional JSHS event.									
	1	2	3	4	5	6	n	Avg.	SD
Students' Oral Research presentation session(s)	1 (1%)	1 (1%)	5 (7%)	3 (4%)	35 (49%)	26 (37%)	71	**5.08**	1.02
The invited speakers	1 (1%)	3 (4%)	2 (3%)	9 (13%)	26 (37%)	29 (41%)	70	**5.04**	1.13
Research poster presentations	2 (3%)	2 (3%)	3 (4%)	10 (14%)	38 (54%)	16 (23%)	71	**4.80**	1.10
The entire Regional JSHS experience	3 (4%)	0 (0%)	3 (4%)	6 (8%)	33 (46%)	26 (37%)	71	**5.03**	1.15

Note. Response scale: **1** = "*Very Dissatisfied,*" **2** = "*Dissatisfied,*" **3** = "*Somewhat Dissatisfied,*" **4** = "*Somewhat Satisfied*," **5** = "*Satisfied*," **6** = "*Very Satisfied*".

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At Regional JSHS, which activity do you think was the most valuable? Why? (n = 58)			
List	**"Why?"**	**Freq.**	**Example Response(s)**
Students' Research Presentations		**33**	
	Unspecified	12	• "the oral presentations"
	Student contributions to science	10	• "… others could learn a lot from them and see what a positive direction our generation is headed in through science." • "Oral presentation because it shows the students' knowledge of the subject"
	Inspired personal achievement	6	• "The student oral research presentation inspired me to want to participate in future science research."
	Range of interesting topics	4	• "…it was interesting and I wish I had the opportunity to participate in like programs." • "…there was much to choose from and watch."
	Meeting other students	1	• "… you meet other students who have created wonderful projects."
Invited Speakers		**10**	
	Provided a unique and inspiring learning opportunity	6	• "The speaker presentation, because the observers got to see the person doing the experiment, point of view."
	General	2	• "The speeches of the invited speakers were extremely valuable."
	Provided information about working in STEM	2	• "Invited speakers --- a chance to hear how actual science research was/is done
Facility Tours		**5**	
	Exposure to new ideas/fields/technologies	2	• "The Cancer lab tour was informative and provided insight into cutting-edge research."
	Provided information about working in STEM	2	• "The most valuable activity was going to a department of science and living out a STEM occupation. It assured my idea of going into a medical field related occupation."
	It was a novel experience	1	• "Going to the nuclear reactor because it was something I'd never seen before."
Round Table Discussions		**5**	
	Exposure to new ideas/fields/technologies	3	• "The round table discussions […] allowed the participants to hear information of their choosing/interest aside from what was already presented."
	Opportunity to meet scientists and professionals	2	• "The roundtables provide me with an opportunity to meet scientists in various fields and discuss with them their experience."
Peer Interactions		**3**	
	Opportunity to share interests / bond	1	• "Time to interact with other students because I learned more about other people's research."

	Opportunity to meet people with similar interests	1	• "I got to know other kids interested in science."
	Learning through peer judging	1	• "…when students judged the poster presentations…because it gave us the chance and the experience to learn about others' research…"
Ice Breakers/ Team Builders		**2**	• "[The marshmallow] challenge was meant to be fun for the students who attended this event, but I saw this activity as a perfect way to demonstrate how to work with others and what conditions and supplies you have to work around with."

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At Regional JSHS, which activity or speaker was the MOST INSPIRATIONAL/MOTIVATIONAL? Why? (n = 45)			
Activity/Speaker	**Why?**	**Freq.**	**Example Response(s)**
Invited Speakers		**26**	
	Interesting/engaging	11	• "The keynote speaker, his topic of astrobiology was fascinating." • "…he was an accomplished speaker and extremely enthralling."
	Motivational / inspirational	12	• "…the speakers, especially when they were previous JSHS participants." • "…he definitely inspired and encouraged all the participants to pursue a STEM degree and job." • "…made me wonder if I wanted to venture into the field myself
	Illuminated possibilities for future impact	3	• "…He showed us that we can do something even though we're just going to become freshman in college. I mean college students were the ones who helped to create the solar panel parking lot system at Rutgers. If we can leave a good impact on the world then we should try to do that."
Students' Research Presentations		**8**	
	Others inspired my personal achievement	7	• "The student oral research presentation--the students had the same educational background as I have, yet had the initiative to do the projects. I want to do the same." • "The poster presentations inspired me to do research of my own."
	Completing the oral presentation inspired me	1	• "The oral because we're alone in front explaining to the crowd."
Round Table Discussions		**4**	
	Provided general information about STEM research	3	• "…we gathered at different tables with guest speakers…I found that the speakers were very informative…" • "It is really amazing to hear what the professors and researchers have been working on throughout their lives."
	Learning more about a topic of interest	1	• "hearing from someone who is passionate about the same topic as I am was inspiring and encouraging."
Peer Interactions		**3**	
	Help to define a path to succeed as a researcher	2	• "Talking firsthand with [peers] about their projects so that I know what ideas I can have, the contacts I need, the research obstacles to overcome as a young teenager, etc."
	Building positive peer relationships	1	• "The entire JSHS experience inspired me because of the other students that were there. I now have so many new role models and friends, and I look forward to seeing what they will be able to do in the future."
Facilities Tours		**2**	• "Visiting the Neuroscience research facility was very motivational…I especially liked seeing the grad students."

Ice Breaker/ Team Builder		**2**	• "I liked the marshmallow challenge. It was a good team building exercise and showed me a lot about the way we think and approach problems."

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At Regional JSHS, which activity did you find to be of the least value? Why? (n = 27)			
List	**"Why?"**	**Freq.**	**Example Response(s)**
Invited Speaker(s)		**9**	
	Uninteresting speaker	3	• "...there were some special guest presentations that were not that great in keeping the audience interested. "
	Difficult to understand	3	• "The presentations made by the invited speakers were complicated and difficult to follow."
	Unspecified	2	• "invited speakers"
	Research presented is unrealistic	1	• "The invited speak because I can't do anything like his experiment, he spent years doing it and I don't have that kind of time."
Students' Research Presentations		**5**	
	Poster sessions were poorly organized	3	• "The posters. The room was cramped and it was impossible to get useful information out of the presenters."
	Biased Judging	2	• "I thought the judging in the oral presentations was rather biased and depreciated the student's research."
	Uninteresting topics	1	• "I didn't really enjoy listening to some of the student presenters. Some of their topics weren't of interest to me so they didn't really grab my attention. "
Ice Breaker/ Team Building		**5**	
	Didn't help students get acquainted	3	• "The Ice Cream Social was the least valuable because most students had already relatively known each other beforehand." • "The bingo icebreaker because it was an ineffective way for people to get to know each other."
	Didn't help students learn	2	• "The least valuable activity was going the marshmallow tower because I did not really learn much from it."
General Logistics		**4**	
	Down time	2	• "There seemed to be a lot of wasted time in the evening. There could have been more science activities but they gave us a ton of free rec time instead."
	Symposium introduction	1	• "Introduction"
	Obligation to stay overnight	1	• "I did not think the overnight aspect of the JSHS competition was needed."
Facilities Tours		**3**	• "The tour, because the number of participants would often be limited and some students would go on tours they were not interested in."
Roundtable Discussions		1	• "…seminars and workshops, which seemed more like forceful presentations then enthusiastic displays of research. "

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Think back on your ORAL PRESENTATION experience at Regional JSHS and indicate your level of agreement with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
Presenting at Regional JSHS has helped me become a better speaker and presenter of scientific research.	0 (0%)	1 (4%)	0 (0%)	1 (4%)	6 (26%)	15 (65%)	23	**5.48**	0.95
I am more confident in my ability to effectively communicate scientific ideas after presenting at Regional JSHS.	0 (0%)	0 (0%)	1 (4%)	3 (13%)	5 (22%)	14 (61%)	23	**5.39**	0.89
Presenting at Regional JSHS has helped me become a better writer.	1 (4%)	2 (9%)	1 (4%)	5 (22%)	7 (30%)	7 (30%)	23	**4.57**	1.44
Overall, I enjoyed presenting my research at Regional JSHS.	0 (0%)	1 (4%)	1 (4%)	0 (0%)	3 (13%)	18 (78%)	23	**5.57**	1.04

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

What type of feedback did you receive on your oral presentation at the Regional JSHS event?		
	Freq.	**%**
Written feedback at the event	4	17%
Oral feedback at the event	9	39%
Written feedback (either in paper or over email) after the event	5	22%
No feedback	5	22%
Total	**23**	**100%**

Please indicate your level of agreement with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I will improve my research in the future as a result of undergoing the Regional JSHS judging process.	1 (5%)	0 (0%)	0 (0%)	5 (24%)	7 (33%)	8 (38%)	21	**4.95**	1.20
The Judges at Regional JSHS provided me with feedback that will be useful for my research in the future.	2 (11%)	1 (5%)	1 (5%)	4 (21%)	6 (32%)	5 (26%)	19	**4.37**	1.61

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Appendix D:
2013 JSHS Regional Student Questionnaire and Data Summary

How would you improve the [oral presentation] judging process at regional JSHS? (n = 19)		
Broad theme	**Freq.**	**Example Response(s)**
Formal feedback	**8**	• "I think participants should get more feedback from judges afterwards because without proper feedback, it's difficult to tell what exactly you did wrong, or could have done better. **"**
Knowledgeable judges	**5**	• "Make sure the judges are knowledgeable about the subject…"
Fair judging	**3**	• "I think it's unfair that some students beat others when they just compiled graduate students data." • "…our work was exceptional, but we weren't rewarded. It seemed a bit unfair."
Judge questioning for student contribution	**2**	• "The judges should ask questions that go in depth about the experimentation process rather than in depth questions about background research. A student can just memorize and memorize about the subject but if they don't know the methods they used, it's obvious that they didn't do the project themselves."
Provide judge/audience background information	**1**	• "…get more biographical information on the judges so we know our audience and can prepare accordingly."

Think back on your POSTER PRESENTATION experience at Regional JSHS and indicate your level of agreement with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
Regional JSHS has helped me become a better presenter of scientific research.	1 (13%)	0 (0%)	0 (0%)	0 (0%)	6 (75%)	1 (13%)	8	**4.63**	1.51
I am more confident in my ability to effectively communicate scientific ideas after presenting my poster at Regional JSHS.	1 (13%)	0 (0%)	0 (0%)	0 (0%)	3 (38%)	4 (50%)	8	**5.00**	1.69
Presenting my poster at Regional JSHS has helped me become a better writer.	1 (13%)	0 (0%)	0 (0%)	3 (38%)	1 (13%)	3 (38%)	8	**4.50**	1.69
Overall, I enjoyed presenting my research poster at Regional JSHS.	1 (13%)	0 (0%)	0 (0%)	0 (0%)	4 (50%)	3 (38%)	8	**4.88**	1.64

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,"* **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

What type of feedback did you receive on your poster presentation at the Regional JSHS event?		
	Freq.	**%**
Written feedback at the event	0	0%
Oral feedback at the event	3	38%
Written feedback (either in paper or over email) after the event	0	0%
No feedback	4	50%
Other (specify): • *"I was selected orally by the Office of Naval Research Science and Technology for an award of recognition"*	1	13%
Total	8	100%

Appendix D:
2013 JSHS Regional Student Questionnaire and Data Summary

Think back on your POSTER PRESENTATION experience at Regional JSHS and indicate your level of agreement with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I will improve my research in the future as a result of the feedback I received from judges.	0 (0%)	1 (13%)	0 (0%)	2 (25%)	2 (25%)	3 (38%)	8	**4.75**	1.39
Poster judges at Regional JSHS provided me with feedback that is useful for my research in the future.	1 (13%)	2 (25%)	2 (25%)	1 (13%)	0 (0%)	2 (25%)	8	**3.38**	1.85

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,"* **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

How would you improve the [poster] judging process for research posters at regional JSHS? (n = 7)		
Broad Theme	**Freq**	**Example Response(s)**
Formal feedback	**4**	• "Have the poster judges give students feedback so they can improve."
Fair judging	**2**	• "I feel that the judges should focus more on the originality of the research topic, the amount of research/development time spent, and whether the research was done independently or aided by groups/mentors."
Criteria for entry categories	**1**	• "The categories was an issue because some research poster that I believe they should not be a part of the same categories were there."

Appendix D:
2013 JSHS Regional Student Questionnaire and Data Summary

Think back to the ORAL research presentations made by students at Regional JSHS and indicate the extent to which you agree or disagree with the following statements.

	1	2	3	4	5	6	n	Avg.	SD
The presenters challenged my previous thinking and/or assumptions	3 (4%)	1 (1%)	4 (6%)	21 (31%)	22 (32%)	17 (25%)	68	**4.60**	1.22
The presenters motivated me to achieve more in STEM-related fields	2 (3%)	3 (4%)	6 (9%)	16 (23%)	21 (30%)	21 (30%)	69	**4.65**	1.28
The presenters increased my interest in STEM-related subjects	1 (1%)	3 (4%)	4 (6%)	16 (23%)	29 (42%)	16 (23%)	69	**4.70**	1.12
The presenters exposed me to new information/knowledge in STEM	1 (1%)	0 (0%)	0 (0%)	10 (14%)	21 (30%)	37 (54%)	69	**5.33**	0.90

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Think back on the invited speakers at Regional JSHS and indicate the extent to which you agree or disagree with the following statements.

	1	2	3	4	5	6	n	Avg.	SD
The speakers challenged my previous thinking and/or assumptions	1 (2%)	2 (3%)	3 (5%)	21 (32%)	17 (26%)	21 (32%)	65	**4.75**	1.15
The speakers motivated me to achieve more in STEM-related fields	1 (2%)	1 (2%)	6 (9%)	15 (23%)	22 (33%)	21 (32%)	66	**4.80**	1.13
The speakers presented me with new information or knowledge in STEM	1 (2%)	0 (0%)	1 (2%)	10 (15%)	21 (32%)	32 (49%)	65	**5.25**	0.95
The speakers inspired me to pursue DoD or government service/careers	6 (9%)	13 (20%)	11 (17%)	18 (27%)	10 (15%)	8 (12%)	66	**3.56**	1.50

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Think back to the research POSTER presentations made by students at Regional JSHS and indicate the extent to which you agree or disagree with the following statements.

	1	2	3	4	5	6	n	Avg.	SD
Research posters challenged my previous thinking and/or assumptions	3 (5%)	3 (5%)	4 (6%)	21 (33%)	20 (32%)	12 (19%)	63	**4.40**	1.28
Research posters expanded my academic horizons	3 (5%)	4 (6%)	3 (5%)	16 (25%)	20 (31%)	18 (28%)	64	**4.56**	1.37
Research posters motivated me to achieve more in STEM-related fields	4 (6%)	4 (6%)	2 (3%)	20 (32%)	17 (27%)	16 (25%)	63	**4.43**	1.41
Research posters exposed me to new information and knowledge in STEM	3 (5%)	1 (2%)	2 (3%)	9 (14%)	24 (38%)	25 (39%)	64	**4.95**	1.25

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Appendix D:
2013 JSHS Regional Student Questionnaire and Data Summary

Think back to your entire Regional JSHS experience and tell us the extent to which you agree or disagree with the following statements.										
	1	**2**	**3**	**4**	**5**	**6**	**N/A**	**n**	**Avg.**	**SD**
Regional JSHS taught me about new and exciting career options	1 (1%)	5 (7%)	5 (7%)	11 (16%)	18 (27%)	21 (31%)	6 (9%)	67	**4.69**	1.34
Regional JSHS motivated me to explore Department of Defense and Government career options	8 (12%)	19 (28%)	9 (13%)	9 (13%)	9 (13%)	5 (7%)	8 (12%)	67	**3.12**	1.55
The activities/exhibits educated me about educational opportunities offered by the Military (e.g., internships, apprenticeships, etc.)	7 (10%)	18 (27%)	6 (9%)	4 (6%)	18 (27%)	8 (12%)	6 (9%)	67	**3.52**	1.72

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,"* **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*", **N/A** = "*Not applicable / did not participate*" and is excluded from analysis.

Please take a moment to reflect about your peers at Regional JSHS then use the scale provided to indicate the extent to which you agree or disagree with the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I made new friends at Regional JSHS	4 (6%)	8 (12%)	4 (6%)	14 (20%)	22 (32%)	17 (25%)	69	**4.35**	1.50
Me and my peers regularly exchanged research ideas at Regional JSHS	5 (7%)	9 (13%)	8 (12%)	21 (30%)	16 (23%)	10 (14%)	69	**3.93**	1.46
Exchanging ideas with my peers motivated me to continue STEM research	7 (10%)	3 (4%)	10 (15%)	12 (18%)	26 (38%)	10 (15%)	68	**4.13**	1.50
I found it easier to relate to my peers at Regional JSHS than my peers at school	10 (14%)	7 (10%)	13 (19%)	10 (14%)	17 (25%)	12 (17%)	69	**3.77**	1.68
I was inspired by my peers at Regional JSHS	1 (1%)	4 (6%)	5 (7%)	14 (20%)	24 (35%)	21 (30%)	69	**4.72**	1.22
I felt a sense of camaraderie with my peers at Regional JSHS	4 (6%)	4 (6%)	7 (10%)	12 (18%)	25 (37%)	16 (24%)	68	**4.44**	1.42
My peers at Regional JSHS helped me become a better scientist	4 (6%)	7 (10%)	9 (13%)	19 (28%)	15 (22%)	15 (22%)	69	**4.14**	1.47
I have and will maintain contact with my peers from Regional JSHS	9 (13%)	11 (16%)	9 (13%)	15 (22%)	14 (20%)	11 (16%)	69	**3.68**	1.65

Note. Response scale: 1 = "*Strongly Disagree,*" 2 = "*Disagree,*" 3 = *"Somewhat Disagree,"* 4 = "*Somewhat Agree*," 5 = "*Agree*," 6 = "*Strongly Agree*".

Appendix D:
2013 JSHS Regional Student Questionnaire and Data Summary

What do you think are the benefits of meeting new peers at Regional JSHS? Is there any downside? (n = 49)			
List	**Broad Themes**	**Freq.**	**Example Response(s)**
Benefits		**50**	
	Similar interests in science	17	• "…being able to form friendships with new people interested in the same types of things at me." • "They are intelligent people who like science just as much as I do so we can relate on some level."
	Networking	10	• "…because in a world of networking and globalization, the more future successful people you know the better."
	Others inspired my personal achievement	8	• "It encouraged me to strive further and work harder at my STEM classes because I realized that these people are the very same people that I am going to be competing with for college engineering program spots."
	Make new friends	6	• "…allows you to have friends with a similar interest that live in your area."
	Experience different perspectives	4	• "Each of us was strong in a different area and it was fun to share our knowledge. It was nice to meet new people and experience different personalities."
	Sharing, learning, generating new ideas	3	• "You learn more through your peers about more research."
	High standards of intelligence	2	• "It's nice to meet other people at the same academic level as me, since I go to a small high school."
Downsides		**7**	
	Competitive environment	4	• "There were several, small in number but very noticeable, who were fiercely competitive (accompanied by equally fiercely competitive parents) just to earn the prize."
	Live too far away to see them again	1	• "The only down side is that I live too far to really see them again."
	Difficult to meet others when you come alone	1	• "…it can be hard at first to meet and introduce yourself when you are the only one from your school there."
	Not much opportunity	1	• "…for the oral presenters there really weren't any opportunities to meet with the other students and actually talk."

Appendix D:
2013 JSHS Regional Student Questionnaire and Data Summary

Who helped you perform your research project for JSHS in 2013?	Freq.	%
My parent(s) served as my research mentor	1	2%
My teacher was my mentor	8	12%
An Army, Navy, or Air Force researcher	0	0%
A university-affiliated professor	13	20%
A university-affiliated graduate student	3	5%
An industry researcher (e.g., medical, pharmaceutical, engineering, or independent laboratory researcher, etc.)	5	8%
I did not have a research mentor	23	35%
Other, (specify): • *"Robotics mentor"* • *"An amalgamation of all these people helped guide me in completing the project."* • *"university-affiliated post-doctoral fellow"* • 7 students did not do a research project yet, assume they were delegates/observers in 2013	12	18%
Total	**65**	**100%**

How did you find and begin to work with your mentor?	Freq.	%
My parent(s) connected me with my research mentor	0	0
My teacher connected me with my research mentor	0	0
I actively searched and found my research mentor	0	0
Other (please specify): _____	0	0

Please take a moment to reflect on your relationship with your research mentor. To what extent do you agree or disagree with the following statements:

	1	2	3	4	5	6	n	Avg.	SD
I learned more from my mentor than I did from my regular high-school experience	0	0	0	0	0	0	0	-	-
My mentor has helped motivated me to pursue STEM-research	0	0	0	0	0	0	0	-	-
My mentor was critical to my success in JSHS	0	0	0	0	0	0	0	-	-
I have a better understanding of the scientific method due to my mentor	0	0	0	0	0	0	0	-	-
My mentor supplied a laboratory space for me to work	0	0	0	0	0	0	0	-	-
My mentor supplied lab equipment for me to use	0	0	0	0	0	0	0	-	-

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,"* **4** = "*Somewhat Agree,*" **5** = "*Agree,*" **6** = "*Strongly Agree*".

Appendix D:
2013 JSHS Regional Student Questionnaire and Data Summary

In what other ways has your mentor helped you succeed in JSHS and in your other STEM pursuits? (n = 35)			
Broad Theme	**Narrow Theme**	**Freq.**	**Example Response(s)**
Academic Research Skill Development		**9**	
	Laboratory skills	5	• "She helped build my lab skills."
	Writing / presenting skills	3	• "My mentor helped me to become a better presenter." • "She's a pro at writing good research papers. I was told that my research paper was very well written. I think my mentor was so helpful with editing it and giving suggestions."
	Critical thinking skills	1	• "My mentor has helped me to become a better person with better thinking skills and a better sense of independence and responsibility than before."
Effective Mentorship		**8**	
	Encouragement, motivation, and/or passion for science	8	• "My teacher inspires me that one can be an amazing scientist, yet stay humble at the same time." • "My mentor has nurtured my growth as a scientist and has continuously encouraged me throughout the research experience."
STEM Pathway		**8**	
	Advice for future research	5	• "Her assistance in expanding my research project to new horizons and applications were of a great benefit in helping me succeed in JSHS." • "He has provided me with a deep understanding for my project for future reference."
	Careers in STEM	2	• "As a Chemistry teacher, he has opened my eyes to future STEM careers…"
	Supported student achievement	1	• "She opened my eyes to [programs] where I could discuss my research."
Access to resources		**6**	• "Provided me with generous access to the lab and critical mentorship during and after my research experimentation."
Did not have a mentor		**4**	

Appendix D:
2013 JSHS Regional Student Questionnaire and Data Summary

Is there anything else that you would like to tell us about your Regional JSHS experience this year? (n = 34)

List	"Why?"	Freq.	Example Response(s)
Satisfaction with symposium		**28**	
	JSHS was a great experience	16	• "…it was an unforgettable experience which I would love to be a part of it next school year"
	Would recommend/ return to JSHS	5	• "I'd love to do it again if I got the opportunity."
	JSHS had a significant impact	2	• "It has changed my life. The people that I met and the experience that I had are things that I will never forget."
	JSHS was enjoyable	2	• "I thoroughly enjoyed attending the Regional JSHS this year. I felt that nearly everything was organized magnificently and I'm looking forward to attending next year if possible."
	JSHS is a valuable/ beneficial program	2	• "…it was extremely beneficial and truly raised my confidence. It prepared me for future endeavors in my career."
	Increased interest	1	• "This program really did increase my love for science."
Ways to improve the regional symposiums		**8**	
	Fair judging	3	• "I did my best, expecting that everything will be done fairly. I was clearly wrong and I can testify this by numerous comforting emails from other participants (students and teachers from other schools) I received after I returned home."
	Organization	1	• "…it was often difficult to dig back and find all the emails with the information. It would have been nice to put them all on a website or document."
	Accommodations/ hospitality	1	• "I recommend using better sleeping accommodations."
	Social activities	1	• "I think it would be nice if we could interact with other groups more often, because it seemed as if everyone kept to themselves."
	Space for poster presentations	1	• "More room for poster presentations."
	Staff/hospitality	1	• "College counselors were very rude."

Appendix E:
2013 JSHS National Student Focus Group Protocol

1. Why did you choose to participate in a science competition this year?
    - Why did you choose JSHS?
    - How did you hear about JSHS?
    - What other science competitions are you participating in?

2. To complete your research project, each of you had help from a mentor or the support of an adult, who was your mentor or the adult that supported you?
    - How did you find your mentor?
    - What did your mentor do to support you and your research?
    - How else were they important to your success? (i.e., did they motivate you, fund you, etc.)

3. Tell me about the JSHS judging process, what kind of feedback did you get from judges?
    - How will you use it in the future?
    - Do you have anything else to say about judging?

4. The Army and other Department of Defense agencies offer a lot of jobs in STEM, are you interested in any of them?
    - Why or why not?

5. What kinds of information do you get from your JSHS peers that you don't get from your peers at your regular school?

6. Overall, were you happy that you chose to participate in JSHS?
    - What would you do to improve the JSHS experience in the future?

Appendix F:
2013 JSHS National Symposium Student Questionnaire and Data Summary

Dear National JSHS Participant,
Thank you for your participation in this study about the 2013 National Junior Science & Humanities Symposium (JSHS). This questionnaire is intended to collect information about you and your experiences with JSHS in 2013. The purpose of this study is to help guide program improvement and to report pertinent outcomes to our funders. The results will be used to critically review JSHS's current practices and their relation to improving student participation in Science, Technology, Engineering, and Mathematics (STEM) related endeavors.

- While this survey is not anonymous, be assured that your responses are CONFIDENTIAL; when analyzing data and reporting results, your name will not be associated with any of the item responses or any comments you make.
- Additionally, the AEOP reserves the right to contact you at a later date in an effort to gauge your academic and career success.
- Responding to this survey is completely voluntary, you are not required to participate, although we hope you do because your responses will provide JSHS with valuable information for meaningful and continuous improvement.

*****By choosing to click the ">>" button below and completing this survey, you are providing assent for us to use your responses as part of this study*****

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

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

Donna Burnette, Virginia Tech
Director, AEOPCA
(540) 231-6120, donna.augustine@vt.edu

Doris Cousens, Academy of Applied Science, Inc.
Program Director, Junior Science and Humanities Symposium
(603) 228-4520, dcousens@aas-world.org

Appendix F:

2013 JSHS National Symposium Student Questionnaire and Data Summary

Please fill out the personal information below:

First Name: _____

Last Name: _____

Email Address: _____

Age (in years): _____, years.

Grade Level you are currently in or have just completed (e.g., 9, 10, 11, or 12): _____, grade.

What was your role at the 2013 National JSHS?

- ❍ Oral Presenter
- ❍ Poster Presenter: Competitive
- ❍ Poster Presenter: Non-competitive
- ❍ Student Delegate
- ❍ Other, please specify: _____

Which of the following best describes you?

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

Which of the following best describes your race/ethnicity?

- ❍ American Indian or Alaskan Native
- ❍ Asian or Pacific Islander
- ❍ Black or African American
- ❍ Hispanic or Latino
- ❍ White/Caucasian
- ❍ Some other ethnicity/race: _____
- ❍ Choose not to report

Which of the following best describes your REGULAR SCHOOL?

- ❍ Public
- ❍ Private
- ❍ Home School
- ❍ Other (Please Specify) _____

Which of the following best describes your REGULAR SCHOOL?

- ❍ It is in a RURAL setting
- ❍ It is in a SUBURBAN setting
- ❍ It is in an URBAN setting
- ❍ Other (Please Specify) _____

Do you qualify for free/reduced lunch at school?

- ❍ Yes
- ❍ No
- ❍ I don't know / choose not to answer

Appendix F:
2013 JSHS National Symposium Student Questionnaire and Data Summary

How did you hear about JSHS?

Aside from regional and national JSHS, what other science competitions did you participate in this year?

What is the highest level of education that you plan to pursue?

- ❍ I plan to enter college and complete a 2-year/Associate's degree in a science, technology, engineering, and/or mathematics (STEM) related field.
- ❍ I plan to enter college and complete a 2-year/Associate's degree in something other than a STEM-related field.
- ❍ I plan to enter college and complete a bachelor's degree in a science, technology, engineering, and/or mathematics (STEM) related field.
- ❍ I plan to enter college and complete a bachelor's degree in something other than a STEM-related field.
- ❍ I plan to pursue a master's degree in a STEM-related field.
- ❍ I plan to pursue a master's degree in something other than a STEM-related field.
- ❍ I plan to pursue a doctoral degree in a STEM-related field.
- ❍ I plan to pursue a doctoral degree in something other than a STEM-related field.
- ❍ I do not plan to attend college.

Which of the following categories best describes the STEM field you want to pursue?

- ❍ Engineering (e.g., technology, robotics, computers, etc.)
- ❍ Environmental Science (e.g., pollution, ecosystems, bioremediation, climatology, meteorology, etc.)
- ❍ Physical Science (e.g., physics, astronomy, etc.)
- ❍ Chemistry (e.g., geochemistry, material science, alternative fuels, etc.)
- ❍ Life Science (e.g., biology, animal science, ecology, etc.)
- ❍ Medicine / Health (e.g., behavioral science, medicine, public health, etc.)
- ❍ Mathematics / Computer Science
- ❍ Social Science (e.g., sociology, psychology, economics, etc.)
- ❍ Other STEM field
- ❍ A field unrelated to STEM

Appendix F:
2013 JSHS National Symposium Student Questionnaire and Data Summary

Thinking about your educational goals, use the scale provided to tell us how certain you are that you will be able to do each of the following?

	Not at all Certain	Uncertain	Relatively Uncertain	Relatively Certain	Certain	Very Certain
I will be admitted to my college and program of choice	❍	❍	❍	❍	❍	❍
I will attend college to pursue this educational degree	❍	❍	❍	❍	❍	❍
I will get good grades in my classes	❍	❍	❍	❍	❍	❍
I will be able to overcome any obstacle between me and this educational degree	❍	❍	❍	❍	❍	❍
I will finish this degree	❍	❍	❍	❍	❍	❍

Use the scale provided to tell us how certain you are that you will do the following activities in the future?

	Not at all Certain	Uncertain	Relatively Uncertain	Relatively Certain	Certain	Very Certain
I will apply for jobs in a STEM-related field	❍	❍	❍	❍	❍	❍
I will get a job in a STEM field	❍	❍	❍	❍	❍	❍
I will build a career around my STEM skills	❍	❍	❍	❍	❍	❍
I will pursue STEM jobs within the Army	❍	❍	❍	❍	❍	❍
I will build a STEM career within the Army	❍	❍	❍	❍	❍	❍

Why did you decide to participate in a science competition this year?

Why, specifically, did you choose JSHS?

Appendix F:
2013 JSHS National Symposium Student Questionnaire and Data Summary

Have you ever participated in or heard about any of the following programs that are sponsored by the U.S. Army?

	Yes, I participated	I would have participated but it was not available in my area	I have never heard about this program
JSS: Junior Solar Sprint	❍	❍	❍
GEMS: Gains in the Education of Math and Science	❍	❍	❍
The West Point Bridge Contest	❍	❍	❍
eCYBERMISSION	❍	❍	❍

Have you been provided with information about the following programs that are sponsored by the U.S. Army? Do you want to participate?

	I already participated in this program	Yes - I want to participate	Yes - I would participate but it is not available in my area	Yes - but I do not want to participate	I have not heard about this program
HSAP: High School Apprenticeship Program	❍	❍	❍	❍	❍
REAP: Research and Engineering Apprenticeship Program	❍	❍	❍	❍	❍
SEAP: Science and Engineering Apprenticeship Program	❍	❍	❍	❍	❍
URAP: Undergraduate Research Apprenticeship Program	❍	❍	❍	❍	❍
CQL: College Qualified Leaders	❍	❍	❍	❍	❍

Appendix F:

2013 JSHS National Symposium Student Questionnaire and Data Summary

Please indicate your level of satisfaction with each portion of the 2013 National JSHS event.

	Very Dissatisfied	Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Satisfied	Very Satisfied
Students. Oral Research presentation session(s)	❍	❍	❍	❍	❍	❍
The invited speakers (e.g., Randall Hill - Institute for Creative Technologies & Neville Hogan, MIT)	❍	❍	❍	❍	❍	❍
Competitive research poster presentation session	❍	❍	❍	❍	❍	❍
Non-competitive research poster presentation session	❍	❍	❍	❍	❍	❍
The ceremonies (e.g., Opening Ceremony, Award Ceremony, etc.)	❍	❍	❍	❍	❍	❍
The overall Department of Defense STEM Showcase at the Dayton Convention Center	❍	❍	❍	❍	❍	❍

At National JSHS, which activity do you think was the MOST VALUABLE? Why?

At National JSHS, which activity or speaker was the MOST INSPIRATIONAL/MOTIVATIONAL? Why?

Appendix F:
2013 JSHS National Symposium Student Questionnaire and Data Summary

Think back on your ORAL PRESENTATION experience at National JSHS and indicate your level of agreement with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Presenting at National JSHS has helped me become a better speaker and presenter of scientific research.	❍	❍	❍	❍	❍	❍
I am more confident in my ability to effectively communicate scientific ideas after presenting at National JSHS.	❍	❍	❍	❍	❍	❍
Presenting at National JSHS has helped me become a better writer.	❍	❍	❍	❍	❍	❍
Overall, I enjoyed presenting my research at National JSHS.	❍	❍	❍	❍	❍	❍

What type of feedback did you receive on your oral presentation at the National JSHS event?

- ❍ Written feedback at the event
- ❍ Oral feedback at the event
- ❍ Written feedback (either in paper or over email) after the event
- ❍ No feedback
- ❍ Other (specify): _____

Please indicate your level of agreement with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	Not Applicable
I will improve my research in the future as a result of undergoing the National JSHS judging process.	❍	❍	❍	❍	❍	❍	❍
The Judges at National JSHS provided me with feedback that will be useful for my research in the future.	❍	❍	❍	❍	❍	❍	❍

How would you improve the judging process for oral presentations at National JSHS?

Appendix F:

2013 JSHS National Symposium Student Questionnaire and Data Summary

Think back on your POSTER PRESENTATION experience at National JSHS and indicate your level of agreement with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
National JSHS has helped me become a better presenter of scientific research.	❍	❍	❍	❍	❍	❍
I am more confident in my ability to effectively communicate scientific ideas after presenting my poster at National JSHS.	❍	❍	❍	❍	❍	❍
Presenting my poster at National JSHS has helped me become a better writer.	❍	❍	❍	❍	❍	❍
Overall, I enjoyed presenting my research poster at National JSHS.	❍	❍	❍	❍	❍	❍

What type of feedback did you receive on your poster presentation at the National JSHS event?

- ❍ Written feedback at the event
- ❍ Oral feedback at the event
- ❍ Written feedback (either in paper or over email) after the event
- ❍ No feedback
- ❍ Other (specify): _____

Think back on your POSTER PRESENTATION experience at National JSHS and indicate your level of agreement with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I will improve my research in the future as a result of the feedback I received from judges.	❍	❍	❍	❍	❍	❍
Poster judges at Regional JSHS provided me with feedback that is useful for my research in the future.	❍	❍	❍	❍	❍	❍

How would you improve the judging process for research posters at National JSHS?

Appendix F:

2013 JSHS National Symposium Student Questionnaire and Data Summary

Think back to the ORAL research presentations made by students at National JSHS and indicate the extent to which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
The presenters challenged my previous thinking and/or assumptions	❍	❍	❍	❍	❍	❍
The presenters motivated me to achieve more in STEM-related fields	❍	❍	❍	❍	❍	❍
The presenters increased my interest in STEM-related subjects	❍	❍	❍	❍	❍	❍
The presenters exposed me to new information/knowledge in STEM	❍	❍	❍	❍	❍	❍

Think back on the invited speakers at National JSHS and indicate the extent to which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
The speakers challenged my previous thinking and/or assumptions	❍	❍	❍	❍	❍	❍
The speakers motivated me to achieve more in STEM-related fields	❍	❍	❍	❍	❍	❍
The speakers presented me with new information or knowledge in STEM	❍	❍	❍	❍	❍	❍
The speakers inspired me to pursue DoD or government service/careers	❍	❍	❍	❍	❍	❍

Think back to the research POSTER presentations made by students at National JSHS and indicate the extent to which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Research posters challenged my previous thinking and/or assumptions	❍	❍	❍	❍	❍	❍
Research posters expanded my academic horizons	❍	❍	❍	❍	❍	❍
Research posters motivated me to achieve more in STEM-related fields	❍	❍	❍	❍	❍	❍
Research posters exposed me to new information and knowledge in STEM	❍	❍	❍	❍	❍	❍

Appendix F:
2013 JSHS National Symposium Student Questionnaire and Data Summary

Think back to the Department of Defense STEM showcase EXHIBITS. Tell us the extent to which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	Not applicable / did not participate
The exhibits challenged my previous assumptions about the work done by the DoD	❍	❍	❍	❍	❍	❍	❍
The exhibits taught me about new and exciting career options	❍	❍	❍	❍	❍	❍	❍
The exhibits motivated me to explore DoD and Government career options	❍	❍	❍	❍	❍	❍	❍
The exhibits educated me about educational opportunities offered by the DoD (e.g., other AEOP programs)	❍	❍	❍	❍	❍	❍	❍

Please take a moment to reflect about your peers at National JSHS then use the scale provided to indicate the extent to which you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I made new friends at National JSHS	❍	❍	❍	❍	❍	❍
Me and my peers regularly exchanged research ideas at National JSHS	❍	❍	❍	❍	❍	❍
Exchanging ideas with my peers motivated me to continue STEM research	❍	❍	❍	❍	❍	❍
I found it easier to relate to my peers at National JSHS than my peers at school	❍	❍	❍	❍	❍	❍
I was inspired by my peers at National JSHS	❍	❍	❍	❍	❍	❍
I felt a sense of camaraderie with my peers at National JSHS	❍	❍	❍	❍	❍	❍
My peers at National JSHS helped me become a better scientist or engineer	❍	❍	❍	❍	❍	❍
I have and will maintain contact with my peers from National JSHS	❍	❍	❍	❍	❍	❍

What do you think are the benefits of meeting new peers at National JSHS? Is there any downside?

Appendix F:
2013 JSHS National Symposium Student Questionnaire and Data Summary

Who helped you perform your research project for JSHS in 2013?

- ❍ My parent(s) served as my research mentor
- ❍ My teacher was my mentor
- ❍ An Army, Navy, or Air Force researcher
- ❍ A university-affiliated professor
- ❍ A university-affiliated graduate student
- ❍ An industry researcher (e.g., medical, pharmaceutical, engineering, or independent laboratory researcher, etc.)
- ❍ I did not have a research mentor
- ❍ Other, (specify): _____

How did you find and begin to work with your mentor?

- ❍ My parent(s) connected me with my research mentor
- ❍ My teacher connected me with my research mentor
- ❍ I actively searched and found my research mentor
- ❍ Other (please specify): _____

Please take a moment to reflect on your relationship with your research mentor. To what extent do you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I learned more from my mentor than I did from my regular high-school experience	❍	❍	❍	❍	❍	❍
My mentor has helped motivated me to pursue STEM-research	❍	❍	❍	❍	❍	❍
My mentor was critical to my success in JSHS	❍	❍	❍	❍	❍	❍
I have a better understanding of the scientific method due to my mentor	❍	❍	❍	❍	❍	❍
My mentor supplied a laboratory space for me to work	❍	❍	❍	❍	❍	❍
My mentor supplied lab equipment for me to use	❍	❍	❍	❍	❍	❍

In what other ways has your mentor helped you succeed in JSHS and in your other STEM pursuits?

Appendix F:
2013 JSHS National Symposium Student Questionnaire and Data Summary

Is there anything else that you would like to tell us about your National JSHS experience this year?

Thank you for your input and remember that your responses are completely confidential.

If you have any questions or concerns, please email:
Rebecca Kruse – rkruse75@vt.edu or Tanner Bateman – tbateman@vt.edu

Appendix F:
2013 JSHS National Student Questionnaire and Data Summary

Age (in years):		
	Freq.	**%**
14	2	2%
15	12	12%
16	23	23%
17	41	41%
18	22	22%
19	1	1%
Total	**101**	**100%**

Note. Average age = 16.7 years

Grade level you are currently in or have just completed (e.g., 9, 10, 11, or 12):		
	Freq.	**%**
9	6	6%
10	18	18%
11	34	34%
12	43	43%
Total	**101**	**100%**

What was your role at the 2013 National JSHS?		
	Freq.	**%**
Oral Presenter	51	45%
Poster Presenter: Competitive	26	23%
Poster Presenter: Non-Competitive	26	23%
Student Delegate	10	9%
Other, please specify:	1	1%
Total	**114**	**100%**

Note. Other = "*My partner presented as only one of us from our group could present. I was a finalist though.*"

Which of the following best describes you?		
	Freq.	**%**
Male	49	43%
Female	64	56%
Choose not to report	1	1%
Total	**114**	**100%**

Which of the following best describes your race/ethnicity?		
	Freq.	**%**
American Indian or Alaskan Native	2	2%
Asian or Pacific Islander	41	36%
Black or African American	5	4%
Hispanic or Latino	2	2%
White/Caucasian	57	50%
Some other ethnicity/race:	3	3%
Choose not to report	4	4%
Total	**114**	**100%**

Note. Other = *"Asian and White"; "Mixed race (white/Caucasian and Asian or pacific islander)"; "Asian American"*

Which of the following best describes your REGULAR SCHOOL?		
	Freq.	**%**
Public	98	86%
Private	12	11%
Home School	1	1%
Other (Please Specify)	3	3%
Total	**114**	**100%**

Note. Other = *"DoDEA school"; "Department of Defense"; "charter"*

Which of the following best describes your REGULAR SCHOOL?		
	Freq.	**%**
It is in a RURAL setting	15	13%
It is in a SUBURBAN setting	73	64%
It is in an URBAN setting	25	22%
Other (Please Specify)	1	1%
Total	**114**	**100%**

Note. Other = *"Military Base"*

Appendix F:
2013 JSHS National Student Questionnaire and Data Summary

Do you qualify for free/reduced lunch at school?		
	Freq.	**%**
Yes	11	10%
No	97	85%
I don't know / choose not to answer	6	5%
Total	**114**	**100%**

How did you hear about JSHS? (n = 101)			
Broad Theme	**Narrow Theme(s)**	**Freq.**	**Example Response(s)**
School association		**72**	
	Teacher recommended	47	• "My chemistry teacher told me about [JSHS]!"
	Academic requirement	14	• "I am in a research class at my school and we have submitted papers to the state level before."
	School/Nomination	8	• "My district and school have participated in our regional JSHS competition for years."
	Science Department	3	• "The science department at my school"
Individuals not at school		**12**	
	Peers	8	• "Through classmates"
	Family members	4	• "My older sisters participated at JSHS."
Non-AEOP Programs		**6**	
	Fairs	4	• "From being a part of Science Fair for many years"
	SMART	2	• "Through the Science and Medicine Academic Research Training program"
AEOP Programs		**1**	
	eCYBERMISSION	1	• "I participated in e-cybermission (middle school competition), and they advertised JSHS."
Website/Internet		**6**	• "Internet search of high school science competitions"
Repeat Participant		**1**	• "[I] Have presented once before"

Aside from regional and national JSHS, what other science competitions did you participate in this year? (n = 101)						
List	**Freq.**	**%**		**List**	**Freq.**	**%**
Intel International Science and Engineering Fair	50	21%		Genius Olympiad	2	1%
Intel Science Talent Search	17	7%		Indiana Academy of Science Junior Scientist Competition	2	1%
Regional Science Fair (unspecified)	17	7%		Indiana Regional Science Olympiad	2	1%
Siemens	15	6%		Junior Academy of Science	2	1%
Science Olympiad	12	5%		Long Island Science and Engineering Fair	2	1%
State Science Fair (unspecified)	12	5%		Maine State Science Fair	2	1%
Google Science Fair	11	5%		National Science Olympiad	2	1%
Science Fair (unspecified)	9	4%		Sigma Xi Scientific Research Society Student Research Showcase	2	1%
New York State Science and Engineering Fair	4	2%		South Carolina Junior Academy of Science	2	1%
Florida State Science Fair	3	1%		U.S. Stockholm Junior Water Prize	2	1%
ISWEEEP	3	1%		West Virginia State Science Fair	2	1%
Westchester Science and Engineering Fair	3	1%		Academic Decathlon	1	0.4%
Arizona Science and Engineering Fair	2	1%		Academy of Science	1	0.4%
American Samoa Islandwide high school science fair	1	0.4%		Mississippi Academy of Sciences	1	0.4%
BioGENEius	1	0.4%		Montana State Science Fair	1	0.4%
California State Science Fair	1	0.4%		Montana Tech Science and Engineering Fair	1	0.4%
Chemathon	1	0.4%		National FFA Agriscience Fair	1	0.4%
Conrad Spirit of Innovation	1	0.4%		Native American State Science & Engineering Fair	1	0.4%
Dallas Regional	1	0.4%		New Jersey Regional Science Fair	1	0.4%
Davidson Fellows	1	0.4%		North Carolina Junior Academy of Science	1	0.4%
Delaware Valley Science Council Exams	1	0.4%		Northern Kentucky Science and Engineering Fair	1	0.4%
DuPont Science Essay Challenge	1	0.4%		Northwest Science Expo	1	0.4%
Eastern Iowa science and engineering fair	1	0.4%		OES Symposium	1	0.4%
Envirothon	1	0.4%		Ohio state science day	1	0.4%
Florida Junior Academy of Science	1	0.4%		Oklahoma State Science and Engineering Fair	1	0.4%
global environmental science fair.	1	0.4%		Pennsylvania Junior Academy of Science	1	0.4%
Gorgas Scholarship	1	0.4%		Physics Bowl	1	0.4%
Greater Kansas City Science Fair	1	0.4%		Pittsburgh regional science and engineering fair	1	0.4%
Hoosier Science and Engineering Fair	1	0.4%		Plano district	1	0.4%
Indiana Regional Science Fair	1	0.4%		Regional and National Science Bowl	1	0.4%

Indiana State Science Fair	1	0.4%		SCACS	1	0.4%
Iowa state science and technology fair	1	0.4%		School of Health Related Professions	1	0.4%
Junior Engineering Technical Society	1	0.4%		SeaPerch	1	0.4%
Kansas Biogenius	1	0.4%		Southern Arizona Regional Science and Engineering Fair	1	0.4%
Kansas State Science Fair	1	0.4%		Technology Competition	1	0.4%
Kentucky Junior Academy of Science.	1	0.4%		Texas Junior Academy of Science	1	0.4%
Kentucky Science and Engineering Fair	1	0.4%		Tricounty	1	0.4%
Minnesota State Science and Engineering Fair	1	0.4%		Twin Cities Regional Science Fair	1	0.4%

What is the highest level of education that you plan to pursue?

	Freq.	%
I plan to enter college and complete a 2-year/Associate's degree in a science, technology, engineering, and/or mathematics (STEM) related field.	1	1%
I plan to enter college and complete a 2-year/Associate's degree in something other than a STEM-related field.	0	0%
I plan to enter college and complete a bachelor's degree in a science, technology, engineering, and/or mathematics (STEM) related field.	8	7%
I plan to enter college and complete a bachelor's degree in something other than a STEM-related field.	4	4%
I plan to pursue a master's degree in a STEM-related field.	15	14%
I plan to pursue a master's degree in something other than a STEM-related field.	5	5%
I plan to pursue a doctoral degree in a STEM-related field.	72	65%
I plan to pursue a doctoral degree in something other than a STEM-related field.	6	5%
I do not plan to attend college.	0	0%
Total	**111**	**100%**

Which of the following categories best describes the STEM field you want to pursue?

	Freq.	%
Engineering (e.g., technology, robotics, computers, etc.)	0	0%
Environmental Science (e.g., pollution, ecosystems, bioremediation, climatology, meteorology, etc.)	0	0%
Physical Science (e.g., physics, astronomy, etc.)	0	0%
Chemistry (e.g., geochemistry, material science, alternative fuels, etc.)	0	0%
Life Science (e.g., biology, animal science, ecology, etc.)	0	0%
Medicine / Health (e.g., behavioral science, medicine, public health, etc.)	0	0%
Mathematics / Computer Science	0	0%
Social Science (e.g., sociology, psychology, economics, etc.)	0	0%
Other STEM field	0	0%
A field unrelated to STEM	0	0%
Total	**0**	**0%**

Thinking about your educational goals, use the scale provided to tell us how certain you are that you will be able to do each of the following?									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I will be admitted to my college and program of choice	0 (0%)	3 (3%)	12 (11%)	26 (24%)	25 (23%)	43 (39%)	109	**4.85**	1.15
I will attend college to pursue this educational degree	0 (0%)	0 (0%)	3 (3%)	8 (7%)	22 (20%)	76 (70%)	109	**5.57**	0.75
I will get good grades in my classes	0 (0%)	0 (0%)	1 (1%)	16 (15%)	38 (35%)	53 (49%)	109	**5.32**	0.76
I will be able to overcome any obstacle between me and this educational degree	0 (0%)	0 (0%)	0 (0%)	16 (15%)	37 (34%)	56 (51%)	109	**5.37**	0.73
I will finish this degree	0 (0%)	0 (0%)	0 (0%)	7 (6%)	31 (28%)	71 (65%)	109	**5.59**	0.61

Note. Response scale: **1** = "*Not at all Certain,*" **2** = "*Uncertain,*" **3** = *"Relatively Uncertain,*" **4** = "*Relatively Certain,*" **5** = "*Certain*," **6** = "*Very Certain*".

Use the scale provided to tell us how certain you are that you will do the following activities in the future?									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I will apply for jobs in a STEM-related field	2 (2%)	1 (1%)	10 (9%)	15 (14%)	33 (30%)	48 (44%)	109	**5.02**	1.15
I will get a job in a STEM field	1 (1%)	1 (1%)	15 (14%)	25 (23%)	28 (26%)	39 (36%)	109	**4.79**	1.16
I will build a career around my STEM skills	1 (1%)	1 (1%)	9 (8%)	23 (21%)	30 (28%)	45 (41%)	109	**4.97**	1.09
I will pursue STEM jobs within the Army	33 (31%)	33 (31%)	30 (28%)	8 (7%)	3 (3%)	1 (1%)	108	**2.24**	1.11
I will build a STEM career within the Army	37 (34%)	34 (31%)	31 (29%)	6 (6%)	0 (0%)	0 (0%)	108	**2.06**	0.93

Note. Response scale: **1** = "*Not at all Certain,*" **2** = "*Uncertain,*" **3** = *"Relatively Uncertain,*" **4** = "*Relatively Certain,*" **5** = "*Certain*," **6** = "*Very Certain*".

Why did you decide to participate in a science competition this year? (n = 99)			
Broad Theme	**Narrow Theme**	**Freq.**	**Example Response(s)**
Academic Research Activities		**96**	
	Presenting/sharing research	31	• "I decided to participate in a science competition this year because I wanted to show others the exciting discoveries I had made." • "JSHS enabled me an opportunity to share my passion for science research with others."
	Improving scientific research and communication skills	17	• "I also used it as a way of improving my technical writing skills, communication/presentation skills, and as a learning experience that will benefit me in my future career."
	Engaging in scientific community of peers	16	• "Science competitions are a great way to […] learn about the work that other students are doing." • "To gain more insight about other research projects around the country and to also speak with others interested in STEM fields."
	Learning STEM through research is effective	12	• "Because I love science, and conducting a research project taught me so much last year."
	Networking	10	• "I wanted to see where different competitions could take me in terms of networking, etc."
	Receiving feedback on research	6	• "I thought participating in a science competition would be a great way to receive feedback from specialists in the field of my research in order to improve my research."
	Personal Challenge	4	• "I decided to participate in a science competition this year because I was looking to be challenged academically." • "It was mostly to prove myself to my teachers and myself."
STEM Pathway		**25**	
	Scholarship opportunities	11	• "I decided to participate in a science competition this year because I needed money for colleges so I wanted to win a scholarship."
	Next step after completing research	7	• "I wanted to see what I could do with my work because I put in a lot of effort.
	Resume/application builder	4	• "Competitions also are a useful way to strengthen my resume."
	Clarify a STEM pathway	2	• "In order to gain experience of whether I wanted to do a science related career."
	Fit with military	1	• "I felt that my project applied well to the aims of the Army, Navy, and Air Force."
School association		**18**	
	Academic requirement	9	• "Part of the academic program I participate in at my school requires us to complete two science research projects."

	Teacher recommended	9	• "I had written a research paper to present it in my school extended program. My teacher liked it and suggested I present it in science fairs."
Mentor		**1**	"[I] enjoy science and working with my mentor."
Other		**22**	
	Competition is habit	9	• "I have participated in science fairs since it was an assigned project in the sixth grade, and I have always loved it. JSHS was a great continuation of that process."

Why, specifically, did you choose JSHS? (n = 96)			
Broad Theme	**Narrow Theme(s)**	**Freq.**	**Example Response(s)**
Characteristics of JSHS		**41**	
	Presentation format	22	• "I liked how JSHS had an oral option rather than just posters and that the judges actually read our papers. This allowed me to have more time and more ways to present my findings." • "…I liked the experience of preparing a talk as well."
	JSHS is different than regular science fairs	8	• "I had experience with science fairs but never with symposia so I thought that JSHS would be a refreshing and new experience for me."
	Scholarships and prize money available	5	• "JSHS gives scholarships to college and I desperately need money for college."
	Broad research topics	3	• "I chose JSHS because it is a national opportunity to see research others are doing across the country rather than just around where I live."
	Prestigious national competition	3	• "JSHS is a nationally recognized competition and provides opportunities to network and exchange ideas with people outside of my general region" • "Because it allows competition at the national and international level"
Academic Research Activities		**22**	
	Networking opportunities	10	• "JSHS provides a small environment to network with the nation's best students and also offers great scholarships."
	Improve scientific research and communication skills	4	• "It was a good opportunity to write a quality research paper and practice my oral presentation skills."
	Exposure to new ideas/fields/technologies	5	• "I have always been interested in an army based career so I thought it would be cool to check it out." • "…there is a larger emphasis on learning and expanding our minds and our horizons."
	Receiving feedback on research	3	• "JSHS is a great way to present research to knowledgeable judges and receive helpful criticism."
School association		**20**	
	Teacher recommended	11	• "My teacher suggested I apply, and I will take almost any opportunity to meet other students and present my research."
	Academic requirement	5	• "The research program I am enrolled in at my school requires it."
	School tradition	3	• "Our school's research program has always been involved in the JSHS regional symposiums."
	School/Nomination	1	• "[I was] Chosen by [a] teacher"
Logistics		**14**	

	Only one available to participate in	4	• "It was the only contest that I knew about that was available to the students in my school system.
	Location was favorable	5	• "I specifically chose JSHS because it is one of the competitions easily accessible in my state"
	Lack of scheduling conflicts	2	• "It was the only one I could make it to."
	Work was already completed	2	• "I found out about JSHS through my school, and decided to participate as I had done the research necessary to enter."
	Less paperwork than others	1	• "I wanted to enter a competition but didn't want to fill out the paperwork, so I chose JSHS."
Previous experience with JSHS		**2**	• "I participated in JSHS last year as an observer. I learned so much about science even outside if my field if interest."
Other		**11**	
	Competition is habit	6	• "I participated in every competition available to me"
	Recommended by others	5	• "A past participant informed me about how enjoyable and informative the experience is"

Appendix F:
2013 JSHS National Student Questionnaire and Data Summary

Have you ever participated in or heard about any of the following programs that are sponsored by the U.S. Army?				
	Yes, I participated	I would have participated but it was not available in my area	I have never heard about this program	n
JSS: Junior Solar Sprint	2 (2%)	4 (4%)	100 (94%)	106
GEMS: Gains in the Education of Math and Science	1 (1%)	7 (7%)	98 (92%)	106
The West Point Bridge Contest	1 (1%)	10 (9%)	95 (90%)	106
eCYBERMISSION	1 (1%)	7 (7%)	97 (92%)	105

Have you ever participated in or heard about any of the following programs that are sponsored by the U.S. Army?						
	I already participated in this program	Yes - I want to participate	Yes - I would participate but it is not available in my area	Yes - but I do not want to participate	I have not heard about this program	n
HSAP: High School Apprenticeship Program	0 (0%)	5 (5%)	5 (5%)	5 (5%)	91 (86%)	106
REAP: Research and Engineering Apprenticeship Program	1 (1%)	8 (8%)	7 (7%)	6 (6%)	84 (79%)	106
SEAP: Science and Engineering Apprenticeship Program	0 (0%)	10 (9%)	9 (8%)	7 (7%)	80 (75%)	106
URAP: Undergraduate Research Apprenticeship Program	0 (0%)	9 (9%)	7 (7%)	5 (5%)	84 (80%)	105
CQL: College Qualified Leaders	0 (0%)	8 (8%)	5 (5%)	5 (5%)	88 (83%)	106

Please indicate your level of satisfaction with each portion of the 2013 National JSHS event.									
	1	2	3	4	5	6	n	Avg.	SD
Students' Oral Research presentation session(s)	0 (0%)	1 (1%)	0 (0%)	8 (8%)	39 (37%)	57 (54%)	105	**5.44**	0.72
The invited speakers (e.g., Randall Hill - Institute for Creative Technologies & Neville Hogan, MIT)	0 (0%)	1 (1%)	2 (2%)	21 (20%)	44 (42%)	37 (35%)	105	**5.09**	0.84
Competitive research poster presentation session	3 (3%)	3 (3%)	10 (10%)	23 (22%)	46 (45%)	18 (17%)	103	**4.55**	1.15
Non-competitive research poster presentation session	2 (2%)	3 (3%)	15 (14%)	26 (25%)	40 (38%)	19 (18%)	105	**4.49**	1.14
The ceremonies (e.g., Opening Ceremony, Award Ceremony, etc.)	1 (1%)	1 (1%)	6 (6%)	22 (21%)	45 (43%)	30 (29%)	105	**4.9**	0.98
The overall Department of Defense STEM Showcase at the Dayton Convention Center	1 (1%)	3 (3%)	7 (7%)	28 (27%)	31 (30%)	35 (33%)	105	**4.81**	1.12

Note. Response scale: **1** = "*Very Dissatisfied,*" **2** = "*Dissatisfied,*" **3** = "*Somewhat Dissatisfied,*" **4** = "*Somewhat Satisfied*," **5** = "*Satisfied*," **6** = "*Very Satisfied*".

At National JSHS, which activity do you think was the most valuable? Why? (n = 100)			
List	**"Why?"**	**Freq.**	**Example Response(s)**
Students' Research Presentations		**49**	
	Student contributions to science	16	• "Oral Speaker Presentations provided a great experience to share research and hear about what peers are doing at the forefront of research." • "The poster season because it was nice to be able to see all the research everyone was able to do."
	Exposure to new ideas/fields/technologies	12	• "I really feel like I gained information about numerous fields that I would not have learned about otherwise.' • "[poster presentations] exposed me to new and interesting areas of science…"
	Unspecified	11	• "Watching the oral presentations."
	Others inspired my personal achievement	6	• "It provides good influence and allows us to improve upon our skills. It also lets us follow the examples of exceptional students."
	Networking	4	• "The most valuable experience was being able to listen to other student's presentations and network with them."
Peer interactions		**17**	
	Opportunity to share interests / bond	6	• "We all have a common bond and interest in science, and to be able to meet others who share your same interests is priceless."
	Meeting new and different people	6	• "I liked spending time with others from around the country."
	Networking	5	• "I got to network with the future's scientists and engineers. […]Some people I met will be going to the same college as me in the fall so I can rest assured that I will recognize some familiar faces on the first day of classes."
Invited Speakers		**14**	
	Provided a unique and inspiring learning opportunity	5	• "The multiple speakers presenting throughout the program were very interesting and enlightening."
	Provided information about working in STEM	3	• "…high schoolers usually do not have the opportunity to hear from real scientists about scientific research."
	Opportunity to learn about current STEM developments	3	• "…you get to listen about different developments in each STEM area."
	Unspecified	2	• "I enjoyed the keynote speakers a lot, but I just wish that there were more time for questions, it would have been fun to pick some of the presenters' brains."

	Prompted a search for lectures in home area	1	• "…prompted me to want to reach out to different lectures in my area."
STEM showcase		**12**	
	Exposure to new ideas/fields/technologies	9	• "…it showcased some of the professional aspects of STEM careers." • "…I was able to go around and learn of the different fields in STEM and what they do."
	Offered a networking opportunity	1	• "The stem showcase I felt was the most valuable because it allowed you to see all the different work that is going on all over the US and it allowed you to make contacts."
	Learned about military research	1	• "I think that the STEM Showcase was most valuable because I learned a lot about the military research while having fun."
	It was inspirational	1	• "The Expo. It was inspiring"
Facility Tours-Museum		**4**	
	Learned a lot about U.S. History	3	• "I think this because it allowed us students to be able to learn about the history of the U.S. military's involvement in wars."
	Unspecified	1	• "The Air Force Museum was also very valuable, however I would have enjoyed it a lot more if we had had more time to walk around and spend time."
Concurrent Sessions		**4**	
	Was very engaging	2	• "My "Think Like an Inventor" session was enormously valuable. My friends from my state and I heard from two men on the BATMAN team of the US military, and it was amazing. Every aspect of their presentation was amazing. And their energy and engagement with us was unbeatable."
	Connecting with personal research interests	1	• "It was cool to talk to an inventor. His job was interesting and I was able to connect it to my project."
	Unspecified	1	• The sit-ins (think like an inventor etc.)"

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At National JSHS, which activity or speaker was the MOST INSPIRATIONAL/MOTIVATIONAL? Why? (n = 77)			
List	**"Why?"**	**Freq.**	**Example Response(s)**
Invited Speakers		**44**	
	Interesting/Engaging	15	• "The speaker talking about prosthetics because it was the most engaging and impactful." • "…the professor who dealt with artificial intelligence was the most interesting. I have a real interest with AI technology. • "He was very interesting and had great enthusiasm for his work."
	Unspecified	13	• "Randall Hill and Neville Hogan." • "The virtual person presentation."
	Exposure to new ideas/fields/technologies	4	• "…he showed off a lot of technology which seemed futuristic."
	Illuminated possibilities for future impact	4	• "Randall Hill, as his presentation applied most directly to our future, and was inspiring in how futuristic yet within reach these technologies are."
	Others inspired my personal achievement-STEM Pathway	6	• "Randall Hill and Neville Hogan. I simply found both their research to be fascinating, and made me consider a career similar to theirs."
	Speakers spoke of important life lessons	2	• "The robotics professor from MIT, since he mentions life lessons, and dealt with a touching issue of prosthetics."
Students' Research Presentations		**19**	
	Student contributions to science	12	• "…the students' oral research presentation sessions because I think it was inspiring to think that these people that I'm sitting next to and hearing speak are going to be the brainpower of the future." • "I love learning about the amazing work students are doing every year."
	Unspecified	4	• "Oral presentations, competitive and noncompetitive posters."
	Others inspired my personal achievement	3	• "…they demonstrated the depth of passion and intellect that some fellow teenagers possess and thus gave me a goal and a purpose for my future work."
Concurrent Presentations		**6**	
	Unique Perspective	2	• "I chose a discussion on nanoparticles which is something I have absolutely no experience in, so I found it very interesting to learn about another side of science I've never looked into."
	General	2	• "The "Think Like an Inventor" Session I attended was very inspirational."

	Others inspired my personal achievement	1	• "The most inspirational was the inventor from BATMAN. His journey through his inventions and jobs really inspired me to take action on my own project."
	Applications of research	1	• "…they conceptualized simple ideas into real life, and walked us through that process."
Facility Tours-Museum		**4**	
	General	2	• "Tour of National Air Force Museum."
	Opportunity to meet scientists and professionals	1	• "…the lady who spoke at the museum about her role as a female astronaut. It's very inspiring to hear about a job that takes years to achieve and goes farther than Earth."
	Exposure to new ideas/fields/technologies	1	• "I had the opportunity to ask questions about the engineering and mathematics behind airplanes while I was there."
Awards Ceremony		**2**	
	Winners	1	• "…just seeing the winners of the oral presentations at the awards banquet."
	Opportunity to meet scientists and professionals	1	• "To be surrounded by people from all branches of the military as well as scientists who are high up in their field was very encouraging."
STEM Showcase		**2**	
	STEM Pathway	2	• "The STEM Showcase because it gave me insight into what the military studies." • "…it allowed you to talk to the people who are doing this frontline research and learn how they got to where they are and aspire to make a similar journey of your own."

Think back on your ORAL PRESENTATION experience at National JSHS and indicate your level of agreement with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg**	**SD**
Presenting at National JSHS has helped me become a better speaker and presenter of scientific research.	0 (0%)	0 (0%)	1 (2%)	3 (7%)	13 (28%)	29 (63%)	46	**5.52**	0.72
I am more confident in my ability to effectively communicate scientific ideas after presenting at National JSHS.	0 (0%)	0 (0%)	1 (2%)	3 (7%)	13 (28%)	29 (63%)	46	**5.52**	0.72
Presenting at National JSHS has helped me become a better writer.	0 (0%)	1 (2%)	5 (11%)	11 (24%)	16 (35%)	13 (28%)	46	**4.76**	1.06
Overall, I enjoyed presenting my research at National JSHS.	0 (0%)	1 (2%)	1 (2%)	2 (4%)	11 (24%)	31 (67%)	46	**5.52**	0.86

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

What type of feedback did you receive on your oral presentation at the National JSHS event?		
	Freq.	**%**
Written feedback at the event	0	0%
Oral feedback at the event	11	24%
Written feedback (either in paper or over email) after the event	0	0%
No feedback	34	76%
Other (specify):	0	0%
Total	**45**	**100%**

Please indicate your level of agreement with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I will improve my research in the future as a result of undergoing the National JSHS judging process.	1 (3%)	2 (5%)	2 (5%)	9 (23%)	10 (25%)	16 (40%)	40	**4.83**	1.30
The Judges at National JSHS provided me with feedback that will be useful for my research in the future.	12 (32%)	11 (29%)	4 (11%)	4 (11%)	3 (8%)	4 (11%)	38	**2.66**	1.70

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

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How would you improve the judging process for oral presentations at National JSHS? (n = 34)			
Broad Theme	**Narrow Theme(s)**	**Freq.**	**Example Response(s)**
Judge Participation		**29**	
	Formal Feedback	25	• I never received feedback on my project, so I was left completely unaware as to why I did not place. • Also, at our regional JSHS, we received feedback forms which were very helpful for making changes to my presentation for the national competition.
	Knowledgeable Judges	3	• "The judges should be more qualified or at least understand the research by reading the students' papers and related papers in the field." • "…the judges didn't seem to really understand my experiment, so I would try to get judges with more of a general knowledge of different research fields."
	Judge questioning for student contribution	1	• "Looking more carefully at what students have actually done as compared to what their mentors may have done."
	Fair judging	1	• "…when I sat in on some [presentations], the judges made overly critical comments about a student's entire project with no chance for the student to respond."
Competition event rules and regulations		**11**	
	More time for the presentation and questions	4	• "Allow for longer presentation periods instead of only 12 minutes." • "I would allow for more time for the judges to ask questions."
	Categories are unfair for participants	4	• "I was very upset to find that Behavioral Sciences had been grouped with Medicine and Health due to a lack of interest/funding. They are truly two separate categories, and I feel that they are not comparable in the judging process."
	Separate processes for scoring oral presentation and research paper	1	• "I would have a process in which the paper is scored prior to the presentation and a separate score for the presentation itself."
	Increased opportunities for winning awards	1	• "I would have more award opportunities"
	Distinguishing judges from observers	1	• I wish that it had been more clear who the judges were in the audience
	Time signal	1	• "[Have a] more obvious 10 minutes signal"

Think back on your POSTER PRESENTATION experience at National JSHS and indicate your level of agreement with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
National JSHS has helped me become a better presenter of scientific research.	0 (0%)	2 (9%)	2 (9%)	7 (30%)	6 (26%)	6 (26%)	23	**4.52**	1.24
I am more confident in my ability to effectively communicate scientific ideas after presenting my poster at National JSHS.	0 (0%)	2 (9%)	1 (4%)	5 (22%)	7 (30%)	8 (35%)	23	**4.78**	1.24
Presenting my poster at National JSHS has helped me become a better writer.	1 (4%)	3 (13%)	4 (17%)	9 (39%)	1 (4%)	5 (22%)	23	**3.91**	1.44
Overall, I enjoyed presenting my research poster at National JSHS.	1 (4%)	1 (4%)	4 (17%)	2 (9%)	4 (17%)	11 (48%)	23	**4.74**	1.54

Note. Response scale: **1** = "*Strongly Disagree*," **2** = "*Disagree*," **3** = "*Somewhat Disagree*," **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

What type of feedback did you receive on your poster presentation at the National JSHS event?		
	Freq.	**%**
Written feedback at the event	0	0%
Oral feedback at the event	6	26%
Written feedback (either in paper or over email) after the event	0	0%
No feedback	17	74%
Total	23	100%

Think back on your POSTER PRESENTATION experience at National JSHS and indicate your level of agreement with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
I will improve my research in the future as a result of the feedback I received from judges.	6 (26%)	3 (13%)	3 (13%)	6 (26%)	3 (13%)	2 (9%)	23	**3.13**	1.69
Poster judges at Regional JSHS provided me with feedback that is useful for my research in the future.	7 (30%)	7 (30%)	1 (4%)	4 (17%)	1 (4%)	3 (13%)	23	**2.74**	1.76

Note. Response scale: **1** = "*Strongly Disagree*," **2** = "*Disagree*," **3** = "*Somewhat Disagree*," **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

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How would you improve the judging process for research posters at National JSHS? (n = 20)			
Broad Theme	**Narrow Theme(s)**	**Freq.**	**Example Response(s)**
Competition event rules and regulations		**12**	
	More time for the presentation and questions	10	• "Allow a longer allotted time period for judging or include a "pre-viewing" process where judges can individually look over the project without the student present. I felt that the amount of time given for each judge was not sufficient to completely explain my project."
	Criteria for entry categories	1	• "…split into categories like oral presentations…"
	Ensure participants are aware of rules	1	• "Have an orientation ahead of time to go over all rules. Make sure everyone is present and can hear the rules.'
Judge Participation		**10**	
	Formal feedback	7	• "The judging process was rather obfuscated and I never really received any type of feedback on my research, other than a few pointed questions and criticisms of the research."
	Fair judging	3	• "…the judges seemed completely disinterested in all poster presentations other than the ones chosen to win. The judges never came to see any posters other than the winners…" • "I was incredibly disappointed that I had to stand around for two hours to get interviewed by two judges who didn't even show a remote interest in being there." • "Provide a better opportunity for the DODDS dependent school students to have an opportunity to place, since they do not have access to University or Medical laboratories due to language barriers and other problems."
	Increase the number of judges	2	• "Get more judges."
	Judge questioning for student contribution	1	• "Make it more question oriented than a complete presentation of what they could have read."

Appendix F:
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Think back to the ORAL research presentations made by students at National JSHS and indicate the extent to which you agree or disagree with the following statements.

	1	2	3	4	5	6	n	Avg.	SD
The presenters challenged my previous thinking and/or assumptions	0 (0%)	2 (2%)	2 (2%)	41 (40%)	38 (37%)	20 (19%)	103	**4.70**	0.87
The presenters motivated me to achieve more in STEM-related fields	0 (0%)	1 (1%)	2 (2%)	17 (17%)	32 (31%)	51 (50%)	103	**5.26**	0.87
The presenters increased my interest in STEM-related subjects	0 (0%)	2 (2%)	1 (1%)	20 (19%)	37 (36%)	43 (42%)	103	**5.15**	0.90
The presenters exposed me to new information/knowledge in STEM	0 (0%)	0 (0%)	2 (2%)	8 (8%)	34 (33%)	59 (57%)	103	**5.46**	0.72

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Think back on the invited speakers at National JSHS and indicate the extent to which you agree or disagree with the following statements.

	1	2	3	4	5	6	n	Avg.	SD
The speakers challenged my previous thinking and/or assumptions	2 (2%)	2 (2%)	6 (6%)	35 (34%)	41 (39%)	18 (17%)	104	**4.59**	1.03
The speakers motivated me to achieve more in STEM-related fields	2 (2%)	1 (1%)	7 (7%)	17 (16%)	44 (42%)	33 (32%)	104	**4.91**	1.07
The speakers presented me with new information or knowledge in STEM	2 (2%)	0 (0%)	3 (3%)	14 (13%)	44 (42%)	41 (39%)	104	**5.13**	0.97
The speakers inspired me to pursue DoD or government service/careers	7 (7%)	9 (9%)	27 (26%)	22 (21%)	22 (21%)	17 (16%)	104	**3.90**	1.44

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Think back to the research POSTER presentations made by students at National JSHS and indicate the extent to which you agree or disagree with the following statements.

	1	2	3	4	5	6	n	Avg.	SD
Research posters challenged my previous thinking and/or assumptions	2 (2%)	5 (5%)	15 (14%)	47 (45%)	24 (23%)	11 (11%)	104	**4.14**	1.07
Research posters expanded my academic horizons	2 (2%)	6 (6%)	12 (12%)	32 (31%)	36 (35%)	16 (15%)	104	**4.37**	1.17
Research posters motivated me to achieve more in STEM-related fields	2 (2%)	5 (5%)	11 (11%)	35 (34%)	34 (33%)	17 (16%)	104	**4.39**	1.14
Research posters exposed me to new information and knowledge in STEM	2 (2%)	1 (1%)	7 (7%)	25 (24%)	45 (43%)	24 (23%)	104	**4.75**	1.04

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

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Think back to the Department of Defense STEM showcase EXHIBITS. Tell us the extent to which you agree or disagree with the following statements.

	1	2	3	4	5	6	N/A	n	Avg.	SD
The exhibits challenged my previous assumptions about the work done by the DoD	3 (3%)	3 (3%)	8 (8%)	24 (23%)	44 (43%)	17 (17%)	4 (4%)	103	**4.56**	1.14
The exhibits taught me about new and exciting career options	3 (3%)	2 (2%)	12 (12%)	15 (15%)	45 (44%)	21 (20%)	5 (5%)	103	**4.63**	1.19
The exhibits motivated me to explore DoD and Government career options	5 (5%)	11 (11%)	18 (18%)	26 (25%)	27 (26%)	11 (11%)	4 (4%)	102	**3.94**	1.35
The exhibits educated me about educational opportunities offered by the DoD (e.g., other AEOP programs)	4 (4%)	5 (5%)	14 (14%)	23 (22%)	34 (33%)	17 (17%)	6 (6%)	103	**4.33**	1.30

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*", **"N/A"** is excluded from analysis.

Please take a moment to reflect about your peers at National JSHS then use the scale provided to indicate the extent to which you agree or disagree with the following statements:

	1	2	3	4	5	6	n	Avg.	SD
I made new friends at National JSHS	0 (0%)	2 (2%)	0 (0%)	6 (6%)	29 (28%)	67 (64%)	104	**5.53**	0.78
Me and my peers regularly exchanged research ideas at National JSHS	0 (0%)	4 (4%)	6 (6%)	28 (27%)	33 (32%)	33 (32%)	104	**4.82**	1.07
Exchanging ideas with my peers motivated me to continue STEM research	0 (0%)	3 (3%)	6 (6%)	19 (18%)	34 (33%)	42 (40%)	104	**5.02**	1.04
I found it easier to relate to my peers at National JSHS than my peers at school	1 (1%)	7 (7%)	13 (13%)	23 (22%)	20 (19%)	40 (38%)	104	**4.67**	1.33
I was inspired by my peers at National JSHS	0 (0%)	1 (1%)	1 (1%)	10 (10%)	34 (33%)	58 (56%)	104	**5.41**	0.78
I felt a sense of camaraderie with my peers at National JSHS	0 (0%)	1 (1%)	1 (1%)	26 (25%)	29 (28%)	47 (45%)	104	**5.15**	0.90
My peers at National JSHS helped me become a better scientist or engineer	1 (1%)	1 (1%)	7 (7%)	28 (27%)	30 (29%)	37 (36%)	104	**4.88**	1.06
I have and will maintain contact with my peers from National JSHS	0 (0%)	4 (4%)	7 (7%)	21 (20%)	24 (23%)	48 (46%)	104	**5.01**	1.14

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

What do you think are the benefits of meeting new peers at National JSHS? Is there any downside? (n = 80)			
Broad Theme	**Narrow Theme(s)**	**Freq.**	**Example Response(s)**
Academic Research Activities		**82**	
	Similar interests in science	19	• "Because the students at JSHS are equally motivated and passionate about science and engineering, it is very easy to relate to the types of research that we do."
	Networking	19	• "…if I need help or ideas, the kids who attended National JSHS are at my fingertips- on Facebook and other social media sites."
	Make new friends	15	• "…making friends with people that understand what it's like to do research, which is a big part of my life."
	Sharing, learning, generating new ideas	10	• "We were able to collaborate to suggest new ideas for research and learned a lot from each other."
	Others inspired my personal achievement	7	• "…you become even more motivated to do science because you learn from others the ground breaking research they are doing."
	Student contributions to science	6	• "My new peers at National JSHS have done nothing but inspire me."
	Experience different perspectives	6	• "Every place has a different learning system and it was great learning from what they had to go through to get to where they were that day."
Downsides		**17**	
	Live too far away to see them again	6	• "…you will most likely never see these people again and only keep in contact over a technological medium."
	Some peers are arrogant or conceited	3	• "…some of these peers were very conceited individuals who treated others condescendingly."
	Returning to high school	3	• "…it makes me a little restless in high school, knowing that there is so much more to come in college."
	Cliques were present	2	• "…people are very cliquey and a lot of "status" and friend groups depend on what science competitions you have participated in and won before."
	Peer accomplishment downplay self-achievements	2	• "…being surrounded by such intelligent people made me lose a good deal of confidence in my own achievements."
	Competitive environment	1	• "…the students exposed me to the darker, competitive side of science."
Other comments		**3**	
	Randomly assigned roommates unnecessary	1	• "It was somewhat odd that we were placed with roommates completely at random, as opposed to other delegates from our own state."
	No time left to interact with speaker(s)	1	• "…there wasn't as much time to interact with the speakers as I would have liked."

	More social activities	1	• "I would maybe have wanted National JSHS to incorporate more bonding activities with my peers, so I could meet more people in different settings."

Who helped you perform your research project for JSHS in 2013?		
	Freq.	**%**
My parent(s) served as my research mentor	7	7%
My teacher was my mentor	20	19%
An Army, Navy, or Air Force researcher	0	0%
A university-affiliated professor	41	39%
A university-affiliated graduate student	12	12%
An industry researcher (e.g., medical, pharmaceutical, engineering, or independent laboratory researcher, etc.)	9	9%
I did not have a research mentor	11	11%
Other, (specify): • *"A university-affiliated post-doc"* • *"My teacher was my mentor; A university-affiliated graduate student"* • *"My teacher is also my parent"* • *"Lab director"*	4	4%
Total	104	100%

How did you find and begin to work with your mentor?		
	Freq.	**%**
My parent(s) connected me with my research mentor	0	0
My teacher connected me with my research mentor	0	0
I actively searched and found my research mentor	0	0
Other (please specify): _____	0	0

Appendix F:
2013 JSHS National Student Questionnaire and Data Summary

Please take a moment to reflect on your relationship with your research mentor. To what extent do you agree or disagree with the following statements:

	1	2	3	4	5	6	n	Avg.	SD
I learned more from my mentor than I did from my regular high-school experience	0	0	0	0	0	0	0	-	-
My mentor has helped motivated me to pursue STEM-research	0	0	0	0	0	0	0	-	-
My mentor was critical to my success in JSHS	0	0	0	0	0	0	0	-	-
I have a better understanding of the scientific method due to my mentor	0	0	0	0	0	0	0	-	-
My mentor supplied a laboratory space for me to work	0	0	0	0	0	0	0	-	-
My mentor supplied lab equipment for me to use	0	0	0	0	0	0	0	-	-

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = *"Somewhat Disagree,"* **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Appendix F:
2013 JSHS National Student Questionnaire and Data Summary

In what other ways has your mentor helped you succeed in JSHS and in your other STEM pursuits? (n = 77)			
Broad Theme	**Narrow Theme(s)**	**Freq.**	**Example Response(s)**
Academic Research Skills		**56**	
	Fundamentals of research	22	• "My mentor has been instrumental in guiding me through essential scientific research processes of doing and of thinking and thus has laid a foundation for future research that I plan to build upon."
	Exposure to new ideas	20	• "My mentor really helped us look at different avenues to overcome various challenges which were critical to our success at the JSHS."
	Development of laboratory skills	10	• "Answered questions about protocols I used in my project and suggested methodology." • "He taught me most of the laboratory technique that I know."
	Writing / presenting skills	4	• "Opened my eyes to all that is out there to improve and to become a better speaker."
Effective Mentorship		**32**	
	Encouragement, motivation, and/or passion for science	23	• "Motivation and the drive to succeed in endeavors and scientific pursuits that I never thought I could excel at before." • "My mentor exposed me to a true love of science and encouraged me to work hard."
	Supported student achievement	6	• "My mentor was extremely supportive of all my scientific endeavors" • "My mentor has informed me of every possible science competition that I could compete in, and helped me prepare for those."
	Allowed participant to work independently	3	• "He has provided me to think for myself and let me push myself all the way to the national competition."
STEM Pathway		**12**	
	Careers in STEM	7	• "[My mentor] helped me apply and discover many academic opportunities such as those offered by the department of defense"
	Wrote letters of recommendation	2	• "He also wrote several letters of recommendation for my college and science competition applications."
	College readiness	2	• "[My mentor] helped me feel more prepared for the transition to college level research labs." • "She also suggests some colleges that might be worth looking into."
	Job/people skills	1	• "…my mentor really just taught me how to interact with an adult/colleague since my mentor treated me as not just a high school student"
Access to resources		**7**	

	Provided other materials necessary	4	• "My mentor provided me the materials needed."
	Provided lab space or a place to work	3	• "My mentor provided me a place to perform my research"
Did not have a mentor		**6**	

Appendix F:
2013 JSHS National Student Questionnaire and Data Summary

Is there anything else that you would like to tell us about your National JSHS experience this year? (n = 64)			
Broad Theme	**Narrow Theme(s)**	**Freq.**	**Example Response(s)**
It was an amazing experience		**38**	
	Very satisfied with the experience	26	• "It was a great experience." • "Winning first place at National JSHS this year changed my life." • "I had a very fun time at JSHS. I learned a lot about job opportunities in science." • "It was a great experience and I really enjoyed the symposium" • "For seniors like me, [National] JSHS is a great way to cap our high school careers."
	Expressions of gratitude	18	• "Thank you for supporting this program, especially for those of us who live overseas (DoDEA) and do not have the same number of educational opportunities as stateside students."
	Would return if provided the opportunity	7	• "It was a great experience. I would love to participate again."
Suggestions for future National JSHS		**27**	
	Better location	11	• "The location could have been improved - it was widely perceived as unsafe and uninteresting." • "Walking around Dayton also seemed somewhat dangerous and many of the buildings were empty."
	More social events	8	• "I do wish that there were more planned activities for participants" • "Please have more activities for kids to get to know each other after dinner. This year most socialization occurred by awkwardly moving between hotel rooms at night."
	Better time management with activities	2	• "I felt that there was a bit too much time dedicated to each activity; things that only took up about an hour were given three hours, for example."
	Retain certain activities	1	• "[I] hope that in future years, the program includes the speakers, posters, and non-competitive poster as it did this year."
	Alter the number of prizes in a category based on the number of individuals in the category	1	• "…modify your awards in the same format as the [ISEF] so that more prizes are given to categories with more people in them"
	More field trips	1	• "I would recommend […] having ice-breakers and more field trips."
	Receive feedback from judges	1	• "I would like to get the feedbacks from the judges. I would appreciate it in the future."

	Award certificates and scholarships to poster winners	1	• "I […] would like to recommend [giving] certificates and scholarships to poster winners which will be helpful to poster winners.
	Better opening ceremony	1	• "The opening ceremony was a bit of a let down."
	Better food	1	• "The food was so-so"
	Make it more professional	1	• "I was a little disappointed, actually. I thought it would be more professional and up-scale."
Concerns with rules/judging		**6**	
	Time limit for competitive poster session	2	• "I was disappointed about the time limit for competition poster presentation. We all should have been made aware of all the rules. I was only able to present half of my info."
	Improve quality of judging	2	• "The judging criteria was unclear at times, and felt like there were discrepancies across different rooms on "what was more valued for winning
	Students should be allowed to pick their own categories	1	• "Students should be able to pick their own categories, not the delegation's chaperone."
	Separate fields of research better	1	• "Behavioral science should not be combined with medicine."

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Dear National JSHS Judges,
Thank you for your participation in this study about the 2013 National Junior Science & Humanities Symposia (JSHS). This questionnaire is intended to collect information about you and your experiences with JSHS in 2013. The purpose of this study is to help guide program improvement and to report pertinent outcomes to our funders - The U.S. Army, the U.S. Navy, and the U.S. Air force. The results will be used to critically review the experience of judges at National JSHS and, by extension, the student experience in Science, Technology, Engineering, and Mathematics (STEM) related endeavors.

- While this survey is not anonymous, be assured that your responses are CONFIDENTIAL; when analyzing data and reporting results, your name will not be associated with any of the item responses or any comments you make.
- Additionally, the AEOP reserves the right to contact you at a later date in an effort to gauge your academic and career success.
- Responding to this survey is completely voluntary, you are not required to participate, although we hope you do because your responses will provide JSHS with valuable information for meaningful and continuous improvement.

*****By choosing to click the ">>" button below and completing this survey, you are providing consent for us to use your responses as part of this study*****

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

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

Donna Burnette, Virginia Tech
Director, AEOPCA
(540) 231-6120, donna.augustine@vt.edu

Doris Cousens, Academy of Applied Science, Inc.
Program Director, Junior Science and Humanities Symposium
(603) 228-4520, dcousens@aas-world.org

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Every year, science, technology, engineering, and mathematics (STEM) professionals with a wide range of expertise and in a variety of occupations volunteer to serve as judges for National JSHS. Which of the following best describes your occupation?

- ❍ Enlisted STEM professional with the Army, Navy, or Air Force
- ❍ Civilian STEM professional with the Army, Navy, or Air Force
- ❍ University faculty in a STEM field affiliated with a DoD funded laboratory
- ❍ University faculty in a STEM field
- ❍ Graduate student in a STEM field affiliated with a DoD funded laboratory
- ❍ Graduate student in a STEM field
- ❍ Other (specify): _____

Do you have prior experience serving as a judge for National JSHS?

- ❍ No
- ❍ Yes: for how many years? _____

Do you have prior experience serving as a judge for a JSHS regional symposium?

- ❍ No
- ❍ Yes: for how many years? _____

For what subject did you judge student presentations this year?

- ❍ Environmental science (pollution and impact upon ecosystems, environmental management, bioremediation, climatology, weather)
- ❍ Engineering; technology (including renewable energies, robotics)
- ❍ Physical sciences - physics; computational astronomy; theoretical mathematics
- ❍ Chemistry (including chemistry-physical, organic, inorganic; earth science-geochemistry; materials science, alternative fuels)
- ❍ Life sciences (general biology-animal sciences, plant sciences, ecology; cellular and molecular biology, genetics, immunology, biochemistry)
- ❍ Medicine and health; Behavioral and Social Sciences
- ❍ Mathematics and computer science/computer engineering; applied mathematics-theoretical computer science

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

You were provided with on-line access to the National JSHS student papers that you were assigned to judge. The online systems consisted of guidance for judges, access to abstracts & papers, as well as an on-line scoring system. Did you find the on-line guidance for judges to be useful for preparing you for the judging process at National JSHS?

- ❍ No
- ❍ Yes

Did you find the on-line access to abstracts & papers to be useful for preparing you for judging at National JSHS?

- ❍ No
- ❍ Yes

Did you find the on-line scoring system to be useful for preparing you for judging at National JSHS?

- ❍ No
- ❍ Yes

What additions or revisions would you make to the on-line system to better prepare judges for their duties at National JSHS?

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Did you receive the papers from the competitors in your sessions(s) prior to arriving at National JSHS?

❍ No
❍ Yes

Did you have adequate time to review the papers before the competition?

❍ No
❍ Yes

How many competitors were in your session / How many papers did you receive for judging?

Competitors/Papers: _____

In your estimation, how much time (in hours) did you spend reviewing papers prior to arriving at National JSHS?

# of hours: _____, hours.

Did you attend the judges training at the National JSHS event?

❍ No: Why not? _____
❍ Yes

Use the scale provided to indicate the extent to which you agree or disagree with each of the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
The judges training provided at national JSHS adequately prepared me for the judging experience.	❍	❍	❍	❍	❍	❍
All of the judges in my competition room were qualified to be judging National JSHS	❍	❍	❍	❍	❍	❍
All of the judges in my competition room shared an understanding of the judging process	❍	❍	❍	❍	❍	❍
I feel like the judging process in my competition room went smoothly	❍	❍	❍	❍	❍	❍
The judges training prepared the judges for the process of questioning presenters	❍	❍	❍	❍	❍	❍
The judges training prepared the judges for providing feedback to presenters	❍	❍	❍	❍	❍	❍
The judges training prepared the judges for the process of deliberating to select a winner.	❍	❍	❍	❍	❍	❍
The judges in my room agreed on the selection of award winners	❍	❍	❍	❍	❍	❍
The judges in my room had a shared understanding of the judging rubric	❍	❍	❍	❍	❍	❍
The moderator in my room kept presenters and judges on time	❍	❍	❍	❍	❍	❍

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

What improvements would you make to the judging process at National JSHS for the sake of the JUDGES?

Do you have any suggestions for improving the JUDGE TRAINING that is provided to National JSHS judges?

What improvements would you make to the judging process at National JSHS for the sake of the PRESENTERS?

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Presenters, whether they receive a prize or not, benefit from feedback from the judges and we are exploring new ways to formally incorporate this in future symposium. Given your experience as a National JSHS judge, to what extent would you recommend the following feedback opportunities at National JSHS?

	Definitely would not recommend	Would not recommend	Probably would not recommend	Probably would recommend	Would recommend	Definitely would recommend
Providing written feedback to participants based on their papers after the competition	❍	❍	❍	❍	❍	❍
Providing written feedback to participants based on their oral presentations after the competition	❍	❍	❍	❍	❍	❍
Being available for a period of time after the competition for participants to ask questions and solicit feedback	❍	❍	❍	❍	❍	❍

Do you have other suggestions or comments about providing feedback to presenters?

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Would you consider volunteering as a judge for National JSHS again (assuming that location and timing were not an issue)?

- ❍ No
- ❍ Yes

What was your favorite part about the National JSHS judging experience?

Is there anything else that you would like us to know about your judging experience at National JSHS?

Thank you for your input and remember that your responses are completely confidential.

If you have any questions or concerns, please email:
Rebecca Kruse – rkruse75@vt.edu or Tanner Bateman – tbateman@vt.edu

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Every year, science, technology, engineering, and mathematics (STEM) professionals with a wide range of expertise and in a variety of occupations volunteer to serve as judges for National JSHS. Which of the following best describes your occupation?		
	Freq.	**%**
Enlisted STEM professional with the Army, Navy, or Air Force	2	8%
Civilian STEM professional with the Army, Navy, or Air Force	11	46%
University faculty in a STEM field affiliated with a DoD funded laboratory	0	0%
University faculty in a STEM field	4	17%
Graduate student in a STEM field affiliated with a DoD funded laboratory	1	4%
Graduate student in a STEM field	2	8%
Other (specify):	4	17%
Total	**24**	**100%**

Note. Other = **"**Officer STEM professional with the Army", "Officer STEM professional with the Navy", "science writer", "semi-retired", "Military Officer University Faculty"

Do you have prior experience serving as a judge for National JSHS?		
	Freq.	**%**
No	21	88%
Yes: for how many years?	3	13%
Total	**24**	**100%**

Note. For how many years? = *"5", "I have judged ISEF for over 10 years", "2".*

Do you have prior experience serving as a judge for a JSHS regional symposium?		
	Freq.	**%**
No	24	100%
Yes: for how many years?	0	0%
Total	**24**	**100%**

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

For what subject did you judge student presentations this year?		
	Freq.	**%**
Environmental science (pollution and impact upon ecosystems, environmental management, bioremediation, climatology, weather)	2	8%
Engineering; technology (including renewable energies, robotics)	3	13%
Physical sciences - physics; computational astronomy; theoretical mathematics	1	4%
Chemistry (including chemistry-physical, organic, inorganic; earth science-geochemistry; materials science, alternative fuels)	4	17%
Life sciences (general biology-animal sciences, plant sciences, ecology; cellular and molecular biology, genetics, immunology, biochemistry)	9	38%
Medicine and health; Behavioral and Social Sciences	1	4%
Mathematics and computer science/computer engineering; applied mathematics-theoretical computer science	4	17%
Total	**24**	**100%**

You were provided with on-line access to the National JSHS student papers that you were assigned to judge. The online systems consisted of guidance for judges, access to abstracts & papers, as well as an on-line scoring system. Did you find the on-line guidance for judges to be useful for preparing you for the judging process at National JSHS?		
	Freq.	**%**
No	1	4%
Yes	22	96%
Total	**23**	**100%**

Did you find the on-line access to abstracts & papers to be useful for preparing you for judging at National JSHS?		
	Freq.	**%**
No	0	0%
Yes	24	100%
Total	**24**	**100%**

Did you find the on-line scoring system to be useful for preparing you for judging at National JSHS?		
	Freq.	**%**
No	15	65%
Yes	8	35%
Total	**23**	**100%**

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

What additions or revisions would you make to the on-line system to better prepare judges for their duties at National JSHS? (n = 14)		
List	**Freq.**	**Example Response(s)**
Clarify the programs' requirements/purpose for using the online system	6	• "Decide whether to require the scoring system - and if so, make it easier to use - and allow enough time between presentations to complete the forms" • "The scoring could probably be dropped, unless it is part of the overall analytics package."
No changes	3	• "Extremely well organized. Judging the projects was a pleasure."
Clarify the systems' relation to the event	2	• "A clearer itinerary and outline of the event." • "Availability of online information during the JSHS."
Difficulty with website	2	• "Web site was difficult to use -- especially moving from one paper to another." • "One of the browsers I was using wasn't able to download the full paper pdf. Once I switched to a different browser it worked. I would recommend a message saying what browsers were tested that worked."
Revise scoring criteria	1	• "I think it would be good if there was some part of the judging criteria that took into consideration the written report."

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Did you receive the papers from the competitors in your sessions(s) prior to arriving at National JSHS?		
	Freq.	**%**
No	6	25%
Yes	18	75%
Total	**24**	**100%**

Did you have adequate time to review the papers before the competition?		
	Freq.	**%**
No	5	22%
Yes	18	78%
Total	**23**	**100%**

How many competitors were in your session / How many papers did you receive for judging? (Avg. = 10.76 competitors/papers, SD = 2.26)		
# of Competitors/Papers:	**Freq.**	**%**
6 competitors/papers	1	4%
7 competitors/papers	0	0%
8 competitors/papers	5	20%
9 competitors/papers	1	4%
10 competitors/papers	4	16%
11 competitors/papers	3	12%
12 competitors/papers	6	24%
13 competitors/papers	1	4%
14 competitors/papers	4	16%
Total	**25**	**100%**

Note. 4 judges served in two sessions making the total # of sessions = 25.

In your estimation, how much time (in hours) did you spend reviewing papers prior to arriving at National JSHS? (Avg. = 3.98 hours, SD = 4.01)		
# of Hours	**Freq.**	**%**
1 hour	3	14%
2 hours	4	19%
3 hours	5	24%
4 hours	5	24%
5 hours	2	10%
8 hours	1	5%
20 hours	1	5%
Total	21	100%

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Did you attend the judges training at the National JSHS event?		
	Freq.	**%**
No: Why not?	4	17%
Yes	20	83%
Total	24	100%

Note. Other = *"Not sure I knew about it", "The schedule e-mailed to my co-workers and me did not mention it", "No time", "I wasn't made aware of it".*

Use the scale provided to indicate the extent to which you agree or disagree with each of the following statements:									
	1	**2**	**3**	**4**	**5**	**6**	**n**	**Avg.**	**SD**
The judges training provided at national JSHS adequately prepared me for the judging experience.	1 (5%)	0 (0%)	1 (5%)	5 (25%)	11 (55%)	2 (10%)	20	**4.55**	1.10
All of the judges in my competition room were qualified to be judging National JSHS	1 (5%)	0 (0%)	3 (15%)	3 (15%)	7 (35%)	6 (30%)	20	**4.65**	1.35
All of the judges in my competition room shared an understanding of the judging process	0 (0%)	1 (5%)	1 (5%)	8 (40%)	5 (25%)	5 (25%)	20	**4.60**	1.10
I feel like the judging process in my competition room went smoothly	0 (0%)	1 (5%)	0 (0%)	1 (5%)	9 (45%)	9 (45%)	20	**5.25**	0.97
The judges training prepared the judges for the process of questioning presenters	1 (5%)	0 (0%)	2 (10%)	4 (20%)	10 (50%)	3 (15%)	20	**4.55**	1.19
The judges training prepared the judges for providing feedback to presenters	0 (0%)	2 (10%)	2 (10%)	5 (25%)	9 (45%)	2 (10%)	20	**4.35**	1.14
The judges training prepared the judges for the process of deliberating to select a winner.	1 (5%)	2 (10%)	2 (10%)	4 (20%)	9 (45%)	2 (10%)	20	**4.20**	1.36
The judges in my room agreed on the selection of award winners	0 (0%)	0 (0%)	1 (5%)	3 (16%)	8 (42%)	7 (37%)	19	**5.11**	0.88
The judges in my room had a shared understanding of the judging rubric	1 (5%)	0 (0%)	0 (0%)	7 (37%)	7 (37%)	4 (21%)	19	**4.63**	1.16
The moderator in my room kept presenters and judges on time	0 (0%)	0 (0%)	0 (0%)	2 (10%)	5 (25%)	13 (65%)	20	**5.55**	0.69

Note. Response scale: **1** = "*Strongly Disagree,*" **2** = "*Disagree,*" **3** = "*Somewhat Disagree,*" **4** = "*Somewhat Agree*," **5** = "*Agree*," **6** = "*Strongly Agree*".

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

What improvements would you make to the judging process at National JSHS for the sake of the JUDGES? (n = 17)			
List	***"Why?"***	**Freq.**	**Example Response(s)**
Nothing	Everything went well	6	• "It was run very smoothly."
Receive material in advance	One group did not receive their papers in advance	1	• "Our group did not receive papers in advance and therefore judged based only on the presentation / abstracts."
	Would like hard copy of research papers at least 10-14 days in advance	1	• "Suggest providing hard copy reports of the project at least 10-14 ahead of the judging"
More training for judges	New judges need more help and time to digest the process in action	1	• "New judges need some time to digest the process. Most are smart people and catch on quickly, even if new to the system."
	Guidance on how to handle highly technical projects and how to compare laboratory projects to "basement" projects	1	• "It was hard to compare a kid working in his basement doing/figuring things out on his own versus someone working in a university lab."
Be more selective about choosing judges	National JSHS should have highly experienced judges	1	• "Judges with more experience should serve at the national level."
	Some were not putting forth a great deal of effort	1	• "More meticulous judge selection. One of ours didn't seem to be paying attention. Asked the same questions as others."
Suggest changing the scoring system / sheet.	A single sheet for ranking the presenters	1	• "…one sheet with the names of the students on it and an overall score line next to the name… would have made the process simpler."
	Less weight on the polish of the presentation	1	• "A more concrete scoring system that is less weighted towards a polished presentation."
Too much emphasis on the "personal contribution" of the student	Presentations were not authentic	1	• "…it seemed like maybe they had been overly coached to emphasize their personal contribution…it sounded like an episode of the Apprentice."
	Spent too much time identifying this aspect of each project	1	• "I think we have to spend too much time identifying how much of the project was really done by the presenter."
Allow the caucus in the room where they judge	Too much moving around	1	• "Don't make us move back to the main room for caucus - let us caucus in the room where we judged."

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Do you have any suggestions for improving the judge training that is provided to National JSHS judges?(n = 15)			
Broad Theme	**Narrow Theme**	**Freq.**	**Example Response(s)**
Training needed more detailed information		**5**	
	Determine best weighting criteria	2	•"The weighting issue was very unclear and inconsistent between the training and the judging sheets. This needs to be explained much more clearly."
	Training was minimal	1	•"The training was very basic and left a lot of open questions for the judges."
	Detail best way to select winners	1	•"Possibly give suggestions about how to come up with a winner."
	Better train judges to ask questions	1	•"…the more junior judges tended to never ask questions of the competitors."
Training was sufficiently detailed		**2**	
	Training was adequate	2	•"The training was adequate."

What improvements would you make to the judging process at National JSHS for the sake of the PRESENTERS? (n = 15)		
List	**Freq.**	**Example Response(s)**
No improvements offered	6	• "None, those were some of the most impressive high schoolers I have ever run into."
Moderators prompt judges to interact with students	1	• "The moderators of sessions need to make sure their judging team is aware of their obligation to ask questions. Mostly, this is not a problem but I have been in a couple of sessions where I was the only one questioning."
Improve the student presentation – Q&A timing in sessions	3	• "I would make sure the presentation time and question time was equal between all of the presenters." • "Many were rushed when presenting more complicated material. This led to an advantage for 'simpler' ideas over 'deeper' ones." • "Have a clock where they can observe the time more clearly."
Additional material be made available to judges within the sessions	2	• "Complete project information be made available to the judges during the judging period." • "A list of sample questions for the judges so they didn't waste time trying to think of more good questions to ask."
Introduce judges to presenters prior to session	1	• "Might have been nice to introduce the judges to the presenters. Would have made us more like real people to them rather than this group of intimidating mysterious people."
Allow movement in hallways during presentations	1	• "I believe it would have been easier on presenters if they were not worrying about family / mentors getting into the room."
Judges were inexperienced	1	• "Despite the general inexperience of some judges, the process actually worked well."

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Presenters, whether they receive a prize or not, benefit from feedback from the judges and we are exploring new ways to formally incorporate this in future symposium. Given your experience as a National JSHS judge, to what extent would you recommend the following feedback opportunities at National JSHS?

	1	2	3	4	5	6	n	Avg.	SD
Providing written feedback to participants based on their papers after the competition	1 (4%)	3 (13%)	6 (25%)	4 (17%)	7 (29%)	3 (13%)	24	**3.92**	1.41
Providing written feedback to participants based on their oral presentations after the competition	1 (4%)	3 (13%)	5 (21%)	1 (4%)	8 (33%)	6 (25%)	24	**4.25**	1.57
Being available for a period of time after the competition for participants to ask questions and solicit feedback	0 (0%)	5 (21%)	2 (8%)	6 (25%)	7 (29%)	4 (17%)	24	**4.13**	1.39

Note. Response scale: **1** = "*Definitely would not recommend*," **2** = "*Would not recommend*," **3** = "*Probably would not recommend*," **4** = "*Probably would recommend*," **5** = "*Would recommend*," **6** = "*Definitely would recommend*".

Do you have other suggestions or comments about providing feedback to presenters? (n = 11)

Broad Theme	Narrow Theme	Freq.	Example Response(s)
Disadvantages		**5**	
	May detract from judging process	2	• "[Feedback could] perhaps cast doubt on results." • "[Feedback may] skew the competition in a way that was not intended."
	Difficult to handle	1	• "Feedback would need to be handled very carefully. I see the advantage, but am not sure how to pull it off."
	Would deter judges	1	• "A requirement to provide written feedback would tend to turn away judges."
	Time consuming	1	• "Such a process would be very time consuming for the judges."
Other		**3**	
	Anonymity would be required	2	• "Anonymity/separation of the judges is important given the monetary awards at stake."
	Would require extensive training	1	• "Feedback is a great idea but the judges need to be trained how to give feedback."
Advantages		**2**	
	Useful for participants	2	• "…it is always nice, win or lose to get feedback."

Appendix G:
2013 JSHS National Judge Questionnaire and Data Summary

Would you consider volunteering as a judge for National JSHS again (assuming that location and timing were not an issue)?		
	Freq.	**%**
No	0	0%
Yes	23	100%
Total	**23**	**100%**

What was your favorite part about the National JSHS judging experience? (n = 21)		
Suggestions	**Freq.**	**Example Response(s)**
Student presentations	14	• "Hearing the unbelievably talented students present their work."
Meeting/Interacting with other judges	3	• "Meeting other judges in my field."
Meeting/Interacting with the students	2	• "Meeting all those future scientists. Bright eyed and full of curiosity and passion."
Questioning student presenters	2	• "The chance to question the presenters about their research."
Breakfast	1	• "Breakfast was much appreciated."
Oral Presentation	1	• "I found the oral presentation format (akin to a professional conference) to be a nice change and generally very rewarding to both the judges and the students."

Is there anything else that you would like us to know about your judging experience at National JSHS? (n = 13)		
Suggestions	**Freq.**	**Example Response(s)**
National JSHS was a good experience	3	• "I find the experience personally satisfying […], and I hope to be able to participate in the future."
Provide better accommodations	2	• "Hotel room arrangement could have been better."
Change category classifications	1	• "Medicine & behavioral science much too broad for anyone to judge."
Provide more information before arrival	1	• "I didn't get enough information prior to arrival. I was not sure of where to go, how I would be reimbursed, etc."
Increase student and judge interaction	1	• "It would be good nice to interact with the students either before or after their presentations in a more informal manner."
Correct any training issues	1	• "…you really need to fix the training issue."

Appendix H:
Academy of Applied Science Response

From:	Doris Cousens
To:	Kruse, Rebecca; sheldonapsell@gmail.com
Cc:	Lopez, Louie R CIV (US); Carroll, Jennifer J CIV (US); Burnette, Donna; Weimer, Scott; Short, Susan
Subject:	RE: FY13 JSHS Evaluation Report
Date:	Monday, January 13, 2014 9:33:55 AM

Dear Rebecca,

We did receive the report and appreciate all the work that has gone into the compilation of this data. There were no surprises in this final report. The primary concern is the lack of reliable data from regional symposia participants. Some conclusions stated in the report are drawn from unreliable data and without any discussion. Additionally,

1. The students' field of science is greatly dependent upon what STEM courses they have taken. It is recommended that future reports acknowledge this.
2. Student awareness of other AEOP programs does need improvement.

Best wishes for the New Year!

Doris

Doris E. Cousens
National Junior Science & Humanities Symposium
http://www.jshs.org