



**AAUW WASHINGTON STATE
TECH TREK 2015-2019**

EVALUATION REPORT

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EXECUTIVE SUMMARY

Highlights of the evaluation report are listed here, in the executive summary.

1. The attendance at Tech Trek camps increased 27% from 2015-2019. The increase reflects the growing interest of girls wanting to attend. Funding and volunteer staffing have limited the capacity to accept additional participants.
2. AAUW Washington has consistently provided high-quality activities for participants. Core classes, workshops/labs, evening activities and Professional Women's Night, averaged 91.3% excellent/good ratings.
3. The location of Tech Trek at university campuses provides the girls the opportunity to become familiar with navigating a college campus. Not only is this opportunity strategic, but AAUW simultaneously provides them with a high quality campus experience. Classrooms, teachers, food, and interactions with staff scored consistently scored above 92% excellent/good ratings.
4. In general, the analysis of variance (ANOVA) results show no differences in responses between years or locations signifying that AAUW Washington is providing a consistent experience for girls attending Tech Trek.
5. The use of a validated survey to assess Pre/Post gains in psychometric traits has the potential to contribute to the literature on the relationship between factors that influence middle school girls' career choices in STEM careers. Paired-samples t-Tests showed statistically significant gains in PRE/POST responses for Knowledge, Interest, and Confidence in STEM.
6. The gains in knowledge about STEM careers were particularly strong indicating that the girls benefit the most from information about STEM careers. AAUW might consider broadening their curriculum to include more information on STEM careers and how to make them appealing to middle school girls.
7. Perceptions of Women in STEM was statistically significant but had a small effect size indicating that there was no meaningful change in PRE/POST responses and that the girls were already in a favorable state of mind at the beginning of the program.
8. As a result of attending Tech Trek in Washington, 44% of the girls are interested in STEM careers that are currently underrepresented by females. The remaining 56% of girls chose traditional careers for women such as allied health, biology, or non-STEM careers. While the core classes in STEM were well attended, it did not translate into the intention to enter career that are underrepresented by females.

INTRODUCTION

Tech Trek is an exciting and engaging one-week summer camp for girls featuring hands-on science and technology classes, a fun and educational field trip, opportunities to meet inspiring women role models, and a unique college campus experience ([AAUW Washington website](#)). The AAUW Washington organization has been conducting successful Tech Trek camps for at least seven years (2013-2019) at Pacific Lutheran and Eastern Washington Universities.

AAUW Tech Trek camps are designed to increase the knowledge, interest, confidence and perceptions of women in STEM. Participants are middle school girls ages 12-13 years old and entering the 8th grade in the fall. Research has shown that increasing girls' participation in science-related activities outside of school (e.g., after school programs, summer programs, and field trips) is a promising approach for increasing girls' interest, aspirations, and STEM identities (National Research Council, 2015; Tan et al., 2013). Furthermore, girls' experiences with science outside of school are directly associated with their identification with STEM-related careers (Kang, Barton, Tan, Simpkins, and Turner, 2019). Although the factors that influence a middle school girl's decision to pursue a STEM education and career are complex, it is also an exciting area of research to which AAUW is making a contribution. The Allison Group provided an excellent assessment tool that includes a validated survey for measuring the psychometric traits and it is this data which is a rich source of information about the growth in important psychological traits as a result of Tech Trek.

AAUW WA has requested this external evaluation to produce a report of findings and conclusions for the 2015-2019 camps that will be used for funding and recruiting outreach. This report includes an analyses of participant survey data of the (1) quality of the camp activities, (2) quality of the campus experience, (3) pre/post analysis of psychometric traits such as interest, knowledge, confidence, and perceptions of women in STEM, and (4) overall impact of camps such as future behaviors, intentions, and career choices as a result of attending Tech Trek. This rich source of information is both welcomed and valued for comprehensive evaluation of the program in Washington. Since AAUW Washington is seeking to use the findings of this evaluation to attract funders, the author has made suggestions for future programming based on the results.

AAUW Tech Trek Attendance in Washington State

Tech Trek camps were held at Pacific Lutheran University (PLU) and Eastern Washington University (EWU). From 2017 to 2019 camps were expanded to offer the program at three sites; Eastern Washington University and two sessions at Pacific Lutheran University (Dunbar and McClintock).

Attendance at Tech Trek Camps			
Attendance Year	PLU	EWU	Totals
2019	132	54	186
2018	128	34	162
2017	100	62	162
2016	96	49	145
2015	95	51	146

Table 1: Attendance at Tech Trek Camps in Washington State

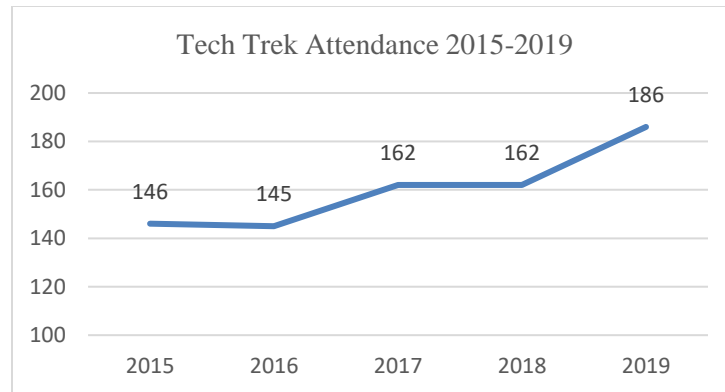


Figure 1: Attendance at Tech Trek Camps in Washington State by Year

There is a potential for more Tech Trek camps in Washington State. Attendance increased 27% from 2015 to 2019, because AAUW Washington was able to add additional campuses or run camps simultaneously at Pacific Lutheran and Eastern Washington Universities. Table 1 and Figure 1 show the growth in attendance. The increases reflect the growing interest of girls wanting to attend. Funding and volunteer staffing have limited the capacity to accept more participants.

DATA ANALYSIS AND METHODS

To evaluate the effectiveness of the Tech Trek camps, participants were surveyed before and after completing the camps. Pre-and-post-camp surveys contained questions to evaluate (1) the quality of the camps, (2) the impact of the camps and (3) a change in psychometric traits such as interest, knowledge, confidence, and perceptions of women in STEM. Questions were adapted from a bank of validated questions for middle school students. Post-camp surveys also asked participants to provide open-response feedback on aspects of the camps, including the staff and teachers, facilities and activities. Responses were collected using Survey Monkey.

Since AAUW was interested in statistical measures of change, participants' pre/post responses were matched using either an identification number (2015 and 2016) or first and last names (2017-2019). The final data set represents 585 matched pairs of girls who attended the camps from 2015-2019. The following table summarizes the data sets used in the statistical analyses.

Year	Campus	original Pre (N)	original Post (N)	Match Pairs by:	# after pre/post matching
2015	PLU	95	92	ID #	88
2016	EWU	49	47	ID #	43
2017	PLU & EWU	161	162	name	148
2018	PLU & EWU	164	183	name	133
2019	PLU & EWU	184	186	name	173
				TOTAL	585

Table 2. Data sets used for statistical analyses.

The number of survey questions evolved over the years in which the camps were assessed. The data sets contained up to thirty-one pre/post questions designed to measure the interest, knowledge, confidence, and perceptions of women in STEM. The following Likert scale was used for these questions:

- 5 = Strongly Agree
- 4 = Agree
- 3 = Neutral
- 2 = Disagree
- 1 = Strongly Disagree

Some of the questions from 2015 and 2016 surveys were slightly different from those asked in 2017-2019. Questions were matched with those from 2017-2019 where possible. A summary of all questions used in the analyses are summarized in Appendix A.

Responses about the quality and the impact of the camps are reported as both the mean (weighted average) and the percent of “Strongly Agree” and “Agree” or “Excellent” and “Good” responses from the POST data.

The percentage of “Strongly Agree” and “Agree” responses from the pre and post data were used to calculate the percent change. Percent change was calculated by subtracting the pre data (x_1) from the post data (x_2), dividing by the pre data (x_1) and multiplying that number by 100 to obtain the percentage:

$$[(x_2 - x_1) / x_1] * 100 = \% \text{ Change}$$

The statistical analyses were performed using SPSS for Macintosh version 26. Paired-samples t-tests were used to measure the statistical significance of pre/post responses. While a significant p-value ($p < 0.05$) tells us that the camps had an effect, the large sample size warranted the calculation of the effect size (Cohen’s d) which tells us the how big the effect was. Cohen’s d was calculated by subtracting the PRE mean (\bar{x}_1) from the post mean (\bar{x}_2) and dividing by the difference in PRE/POST standard deviations:

$$\text{Cohen's } d = (\bar{x}_2 - \bar{x}_1) / (s_2 - s_1)$$

Cohen’s d = 0.2 is considered a 'small' effect size, 0.5 represents a 'medium' effect size and 0.8 a 'large' effect size. This means that if two groups' means don't differ by 0.2 standard deviations or more, the difference is trivial, even if it is statistically significant.

Composite scales for psychometric traits were created to better assess the overall impact of the camp on knowledge, interest, confidence, and perceptions of women and girls in STEM.

A one-way analysis of variance (ANOVA) was conducted to evaluate whether there were any differences due to the location and/or year the camps were offered.

Qualitative data was gathered from the participants using open-ended questions. Participant responses to the open-ended questions were further analyzed with ATLAS.ti version 8.4.4 to identify major themes that emerged for the girls. Representative comments were selected to illustrate these themes and are highlighted in the report narrative. For clarification, the grammar and spelling were corrected in some of the quotes. The full sets of comments are available upon request.

QUALITY OF TECH TREK CAMPS

The survey asked several questions regarding the quality of the Tech Trek camps. Activities that were offered as part of Tech Trek included daily core classes, evening activities, workshops and labs, fieldtrips and AAUW's signature Professional Women's Night. Participants were also asked to rate their campus experiences such as the quality of teachers, classrooms, food and dorm life.

Core Classes.

The girls attended daily core classes during their week-long stay at the PLU or EWU college campuses. The girls were asked to give their top two choices of core class. Participants were usually admitted to one of their top two choices and so their choices in core class reflect their interests.

Core Class	2016	2017	2018	2019
Number of participants	49	162	162	186
Astronomy			9%	16%
Biology		12%	25%	21%
Chemistry		9%	16%	10%
Earth Science	23%	6%		
Engineering	27%	7%		
Information Technology / Computer Science / Cyber Security	50%	27%	27%	32%
Physics		19%	10%	4%
Robotics		16%	13%	16%

Table 3. Core Class attendance by Subject and Year.

Table 3 shows the attendance in the core classes by subject and year that it was offered. Gray boxes indicate the core class was not offered in that year. There was no core class data for 2015. Core classes in Information Technology / Computer Science / Cyber Security were offered every year and consistently showed the highest interest/attendance. The girls often referred to these courses as App development or Coding.

Quality of Tech Trek: Average Responses, Post Class Surveys 2016-2019		
Statement: What was the topic of your core class?	Response Count	Response %
Information Technology / Computer Science / Cyber Security	170	31%
Biology	100	18%
Robotics	77	14%
Chemistry	60	11%
Physics	56	10%
Engineering	25	5%
Earth Science	21	4%

Table 4: Core Classes Attended by the Participants 2016-2019

Table 4 shows the combined attendance in core classes from 2016-2019. Information Technology/Computer Science/ Cyber security was the most attended (31%) and Earth Science was the least (4%). Except for Information Technology / Computer Science / Cyber Security which was offered every year, the attendance in Table 4 does not necessarily reflect interest because not all classes were offered every year.

Offering core classes in subjects that lead to careers that are underrepresented by females is one of the most important opportunities that the Tech Trek camps can offer these middle school girls and AAUW is commended for its role in promoting interest in these careers.

Quality of Camp Activities.

Participants were then asked to rank their camp activities and their campus experiences using the following four-point Likert scale:

Excellent = 4
 Good = 3
 Fair = 2
 Poor = 1

Quality of Tech Trek: Average Responses, Post Class Survey			
Statement: Please rate the quality of the following activities	N	Mean or Level of Agreement	% Excellent/ Good
Core Class	585	3.76	96.6%
Workshops/Labs	582	3.49	94.3%
Field Trip(s)	582	3.62	91.6%
Professional Women's Night	582	3.45	88.3%
Evening Activities	581	3.35	85.4%

Table 5. Participant ratings of camp activities.

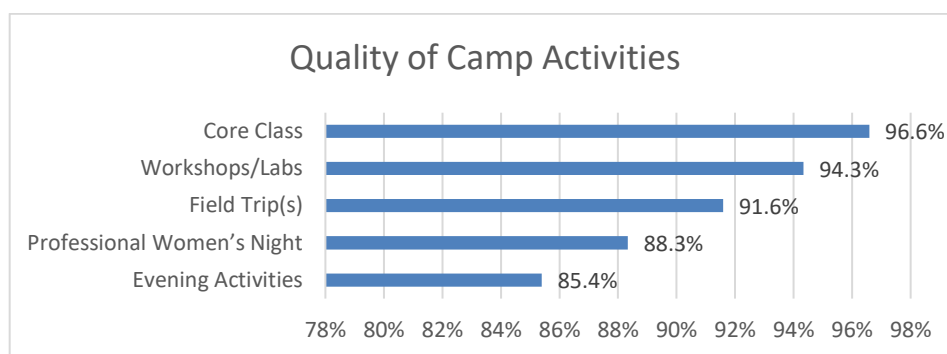


Figure 2. Ratings of Camp Activities.

As shown in Table 5 and Figure 2, the girls consistently found the camp's activities to be of high quality with the core classes and workshops/labs rating the highest. The ratings ranged from 85.4% to 96.6% excellent or good. Across all activities for all five years, the average rating was 91.3% establishing that the girls perceived that AAUW has consistently provided high-quality camp activities for the girls.

Professional Women's Night

The academic literature is consistent about exposing young women and girls to role models of the same gender as a factor in influencing their decisions to continue in STEM programs and careers. Studies have shown that girls' interests can be sustained if they are exposed to the careers available to women in science today (Gonzalez, S., Mateos de Cabo, R. & Sáinz, M, 2020). Professional women's night provides some of that exposure. This evening activity, where the girls mingled with young women employed in STEM careers, was offered every year and consistently received high excellent/good ratings averaging 86.4% across all years.

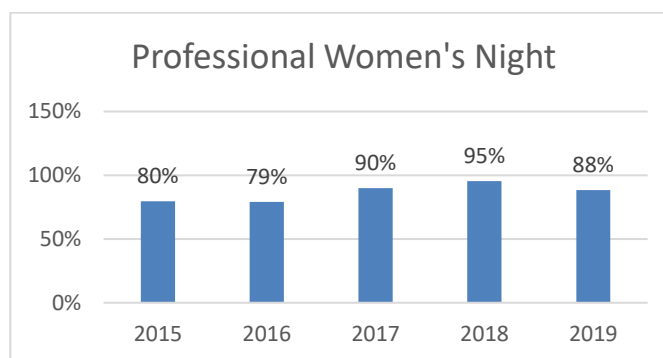


Figure 3. Professional Women's Night % Excellent/Good Ratings by Year.

The percentage of respondents that gave the Professional Women's Night excellent/good ratings each year is shown in Figure 3. There was an almost 10% improvement between 2016 and 2017. The approval rating was sustained from 2017-2019. Although a 79%-80% rating for 2015 and 2016 is also very good, it is impressive that lowest score was 88% excellent/good from 2017-

2019! This shows that AAUW Washington has a successful formula for hosting Professional Women’s Night and the girls truly appreciate being able to engage with female role models.

Quality of the Campus Experience

Hosting Tech Trek camps at college campuses is a strategic choice that allows the girls to experience a college campus for the first time. Familiarizing students with college campuses has shown to play an important part in their choice to attend college. Research has shown that taking middle school students to college offers them authentic experiences that facilitate college readiness (Schaffer, 2014). Therefore, a positive campus experience is important and AAUW has excelled in providing that experience. Across all elements, the percent of excellent/good responses was again very strong at 91.9%.

Quality of Tech Trek: Average Responses, Post Class Survey			
Statement: Please rate the quality of the following elements	N	Mean or Level of Agreement	% Excellent/ Good
The quality of the classrooms.	585	3.76	97.9%
The quality of the teachers.	580	3.71	96.0%
The quality of the food.	581	3.60	94.0%
The quality of interactions with staff and volunteers.	584	3.56	92.8%
The quality of the dorm rooms.	584	3.05	78.9%

Table 6. Participant ratings of their campus experience 2015-2019.

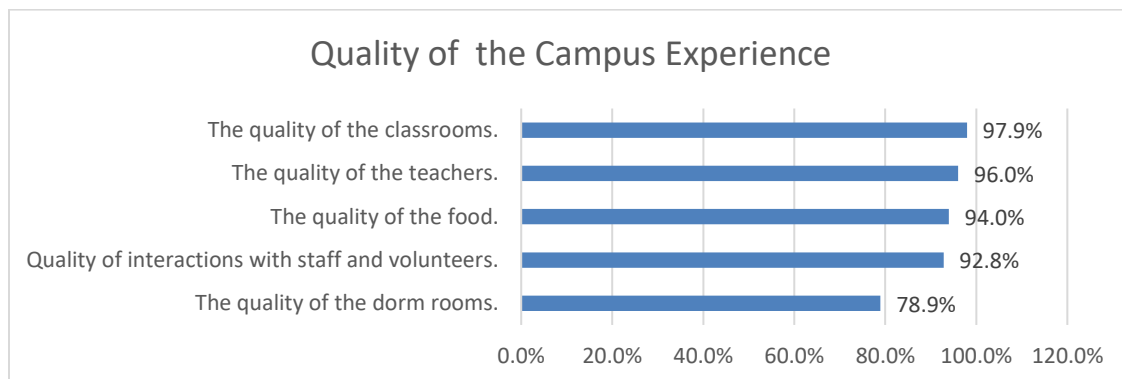


Figure 4. Quality of the Campus Experience During Tech Trek.

The quality of the classrooms, teachers, food, and interactions with staff scored consistently high above 92% as shown in Table 6 and Figure 4. The quality of the dorm rooms had the lowest score at 78.9% and differed slightly by campus. The percent excellent/good for PLU was 82% while EWU was nine percentage points lower at 73%. This is most likely a reflection of the age of the campus facilities. In general, it is recommended that AAUW continues doing what it is doing, as it is providing a positive campus experience that is also realistic.

IMPACT OF THE CAMPS

Interest, Knowledge, Confidence, and Perceptions of Women In STEM Careers.

The middle school years are a critical time in determining career aspirations. Middle school students' experiences in and with science relate to their identification with STEM-related careers and contribute to building a STEM identity. Things that a student knows about a career and whether or how she relates to science are cumulatively shaped by social encounters and interactions as well as access information. Girls' experiences with science outside of school have been directly associated with their identification with STEM-related careers (Kang, Barton, Tan, Simpkins, and Turner, 2019). AAUW Tech Trek camps bring these elements together to foster development of a STEM identity or strengthen a nascent one. Surveying participants on their knowledge, confidence, interest, and perceptions of women in STEM both allows for the determination of the impact the camp has on these psychometric traits and can inform decisions on how to enhance the Tech Trek curriculum to support the formation of strong STEM identities.

Participants were surveyed regarding their knowledge, confidence, interest, and perceptions of women in STEM. As before, respondents reported their level of agreement before and after the camp with a series of statements, using the same five-point Likert scale and numerical value assignments:

- Strongly Agree = 5
- Agree = 4
- Neutral = 3
- Disagree = 2
- Strongly Disagree = 1

The percent change, in the Strongly Agree and Agree responses in PRE/POST questions, was calculated for all 44 questions. The table below shows the results sorted by percent change from highest to lowest. The paired-samples t-Test indicates whether the difference in the PRE/POST mean (Mean Diff) was statistically significant for $p\text{-value} < .05$. The percent change is shown next to the t-Test results for comparison. All of the responses were statistically significant except for ten questions which are highlighted in gray (Table 7).

When the sample size is large, as in this data set ($N=585$), it is common for most of the t-Test results to be significant. The question is whether a statistically significant result has meaning or practical significance. For this reason, an additional statistic called the *effect size* was calculated. The larger the effect size (> 0.5), the more meaningful the result.

	Total N	% Change	Mean Diff	SD	t-Test p- value	Cohen's d	Effect Size
20. I know what a computer scientist or coder does.	586	70.4%	0.88	0.946	0.000	0.9	large
25. I am familiar with lots of high tech jobs.	496	59.4%	0.676	0.901	0.000	0.8	large
17. I know a woman who is in a STEM career.	454	36.3%	0.753	1.2	0.000	0.6	med
27. I know what an engineer does.	583	22.4%	0.478	0.798	0.000	0.6	med
30. I am confident that I can become a computer scientist or a coder.	585	19.8%	0.284	0.952	0.000	0.3	small
29. I am interested in taking classes that will help me get a high tech job when I finish school.	495	18.9%	0.16	0.868	0.000	0.2	small
17X. I plan to take technology-related classes in high school.	42	18.5%	0.293	0.716	0.012	0.4	med
23. I am interested in joining an after-school club such as robotics, coding or math or science based competition team.	454	16.4%	0.259	0.798	0.000	0.3	small
8. I am interested in a career that uses mathematics. (For example Statistician, Engineer)	498	15.6%	0.265	0.871	0.000	0.3	small
9. I am interested in a career in science.	584	14.4%	0.259	0.753	0.000	0.3	small
24. I am confident that I can learn to use coding to create apps.	453	13.1%	0.264	0.921	0.000	0.3	small
22. I am confident that I can become an engineer.	585	10.3%	0.22	0.836	0.000	0.3	small
4. I plan to take advanced science classes (such as Advanced Placement (AP) Physics, Chemistry or Biology) in high school.	585	10.2%	0.277	0.679	0.000	0.4	med
31X. I'm thinking of having a career in science or technology	88	10.0%	0.182	0.687	0.015	0.3	small
10. I plan to take advanced mathematics classes (such as pre- calculus and calculus) in high school.	585	8.2%	0.195	0.652	0.000	0.3	small
3. I would recommend that a girlfriend consider a job in math or science.	450	7.5%	0.285	0.668	0.000	0.4	med
11. I would suggest to a female relative (i.e. sister, cousin, aunt) that she consider engineering as a career choice.	454	6.3%	0.247	0.857	0.000	0.3	small
2. I am confident that I can learn mathematics.	585	5.9%	0.168	0.562	0.000	0.3	small

	Total N	% Change	Mean Diff	SD	t-Test p- value	Cohen's d	Effect Size
14. I am interested in a career that builds or supports the use of technology in our daily lives.	582	5.0%	0.119	0.891	0.001	0.1	small
16X. Women can succeed in technology-related jobs.	43	4.9%	0.116	0.324	0.024	0.4	med
19. I can overcome setbacks to conquer an important challenge.	455	4.6%	0.2	0.633	0.000	0.3	small
30X. I expect to take physics in high school	88	3.9%	0.091	0.737	0.028	0.1	small
18. I like mathematics.	586	3.5%	0.108	0.62	0.000	0.2	small
1. I like science.	586	3.3%	0.199	0.516	0.000	0.4	med
26. I am interested in learning about computer science or how to code programs.	585	2.7%	0.197	0.967	0.000	0.2	small
28X. I want to develop my mathematical skills	88	2.4%	0.114	0.535	0.049	0.2	small
29X. High school math courses would be very helpful no matter what I decide to study.	88	2.4%	0.159	0.5	0.004	0.3	small
24X. I am interested in pursuing classes in engineering.	131	2.1%	0.16	0.84	0.031	0.2	small
12. I am confident I can learn to use new technology such as apps, digital textbooks, learning games and computer programs.	453	1.9%	0.073	0.664	0.020	0.1	small
4X. Women can succeed in scientific jobs.	131	1.6%	-0.008	0.34	0.797	0.0	small
13. My girlfriends do just as well as the boys in their math classes.	455	1.2%	0.051	0.613	0.079	0.1	small
21. Women can succeed in careers as computer scientists or coders.	497	1.2%	0.053	0.434	0.007	0.1	small
6. I am confident that I can learn what is needed to create new technology.	585	1.0%	0.11	0.764	0.001	0.1	small
15. I believe my girlfriends could be successful in science or math jobs.	454	0.7%	0.073	0.591	0.009	0.1	small
16. I am confident that I can learn science.	585	0.3%	0.104	0.466	0.000	0.2	small
13X. I like to use technology.	131	0.1%	0.046	0.541	0.332	0.1	small
28. Women can succeed in engineering careers.	583	0.0%	0	0.345	1.000	0.0	small
18X. Girls are as good as boys in technology-related courses.	131	0.0%	0.023	0.315	0.407	0.1	small

	Total N	% Change	Mean Diff	SD	t-Test p- value	Cohen's d	Effect Size
27X. Being nominated to go to Tech Trek camp means a lot to me.	88	0.0%	0.136	0.459	0.007	0.3	small
32X. I plan to attend college.	88	0.0%	0.011	0.239	0.657	0.0	small
5. Girls are as good as boys in mathematics.	585	-0.2%	0.017	0.366	0.258	0.0	small
7. Girls are as good as boys at science.	585	-0.2%	0.021	0.352	0.157	0.1	small
31. Women can be leaders in high tech companies.	583	-0.5%	0.002	0.273	0.879	0.0	small
10X. I'm thinking of having a career in science or technology	43	-2.3%	-0.071	0.513	0.372	-0.1	small

Table 7. Comparison of Percent Change, t-Test Results and Effect Size.

One of the most important and exciting outcomes was that the percent change was greatest for the statements regarding knowledge of STEM careers: “I know what computer scientist and coder does” (Q20, 70.4%), “I am familiar with lots of high tech jobs”(Q 25, 59.4%), “I know a woman in a STEM career” (Q17, 36.3%) and “I know what an engineer does (Q27, 22.4%). These four questions, which all pertain to knowledge about STEM careers, also had a large or medium effect size which means that the statistically significant results of the paired-sample t-Test are meaningful. What the girls take away from the camps are knowledge about what STEM careers entail and being able to meet women in STEM careers during Professional Women’s Nights. This is one of the most important outcomes of Tech Trek.

It is interesting that seven of the questions, that were not statistically significant, pertain to perceptions about girls/women in STEM. Statements like “Q7 Girls are as good as boys in mathematics” and “Q31 Women can be leaders in high tech companies” and suggest that the girls already have a positive attitude about themselves and women in STEM when they first attend Tech Trek. This does not mean there was not impact, but rather that the attendees were already in such a favorable state of mind at the beginning of the program, and that improving the response was challenging.

Since many of the questions pertaining to interest, confidence, and perceptions of women in STEM had either medium or small effect sizes, an additional technique was performed to better assess the gains in these psychometric traits. Questions were grouped together by interest, knowledge, confidence, and perceptions of women in STEM careers to create composite scales for these traits (APPENDIX D).

The paired-samples t-Tests showed statistically significant differences between PRE and POST responses for all four psychometric traits (Table 8). The knowledge scale showed a large effect size (1.1) meaning that the statistically significant results are meaningful and that the girls show the greatest gains in knowledge about STEM careers. The composite scales for confidence and

interest in STEM were also statistically significant with a medium effect size. This means that the results are meaningful and that the girls increased their confidence and interest in STEM during the camps.

	Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)	Cohens d	Effect Size
				Lower	Upper					
Knowledge Scale	0.67906	0.62629	0.02589	0.6282	0.72992	26.225	584	0.000	1.1	large
Confidence Scale	0.18536	0.3949	0.01633	0.1533	0.21743	11.353	584	0.000	0.5	med
Interest Scale	0.19879	0.40462	0.01673	0.16593	0.23165	11.883	584	0.000	0.5	med
Perceptions Scale	0.07147	0.24915	0.0103	0.05124	0.0917	6.938	584	0.000	0.3	small

Table 8. Results of the Statistical Tests for the Composite Scales.

The initial t-Test results showed us that seven of the questions that were not statistically significant were all about perceptions of women in STEM. While the composite scale for perceptions of women in STEM scale was statistically significant, there was also a small effect size. This means that there was no appreciable change in PRE/POST responses for questions in this group. This response is related to a statistical phrase called the ceiling effect in which the independent variable no longer has an effect on the dependent variable. One girl expressed this phenomenon beautifully when she said “I learned that girls can succeed at science too! (I actually already knew this since people don't treat girls as badly now and treat us as equals... I never thought I couldn't succeed in science or math. (2016)”. As cultural attitudes about gender shift, beliefs about women’s competencies have expanded, allowing girls to try new fields of study, including STEM-related careers. This is good news for AAUW and the workforce and indicates the success that AAUW’s strong support for women has had over the decades.

Effects of Year and Location of the Washington Tech Trek Camps.

A one-way analysis of variance (ANOVA) was conducted to evaluate whether there were any differences between the years the camps were offered and/or their locations (APPENDIX C). In general, the ANOVA results show that there were no differences in responses between years except for the 4 questions shown in Table 9. The differences for these 4 questions is most likely attributed to population of girls that attended the camps in those years and their interests in computer science or engineering.

Question Responses	Difference by Years
Q1 “I like science”	2015 compared to all other years
Q20 “I know what a computer scientist or coder does”	2019 compared to 2015 and 2018
Q27 “I know what an engineer does”	2019 compared to 2017 and 2018
Q30 “I am confident I can become a computer scientist or coder”	2016 compared to 2017 and 2019

Table 9. Questions that showed a statistically significant difference between years.

The ANOVA results also show that there were no differences in responses between girls who attended Pacific Lutheran University and Eastern Washington University. Only one question Q28 “Women can succeed in engineering careers” showed a statistically significant difference in responses between sites (data not shown). However since this was the exception there should be no concerns about where the girls attend camps in Washington State.

Overall Impact of Tech Trek Camps

Questions were asked of the participants in the post-camp survey that directly addressed the impact of the camp. These questions capture the growth the girls experienced in their awareness and importance of preparing for a STEM career and their resultant behaviors or choices. Not all of the questions were asked in all of the years, therefore the total number of responses (N) varies. In 2017-2019 the survey questions used the following five-point Likert scale:

- Strongly Agree = 5
- Agree = 4
- Neutral = 3
- Disagree = 2
- Strongly Disagree = 1

Impact of the Camps, POST camp responses.	N	Mean or Weighted Average	% Excellent/Good
As a result of attending Tech Trek, I am more aware of the many options for careers in STEM fields.	306	4.7	97.1%
I would recommend Tech Trek to others.	584	4.8	96.6%
As a result of attending Tech Trek, I am more aware of how useful and exciting STEM careers can be for me.	307	4.7	95.4%
As a result of attending Tech Trek, I am more confident in my ability to overcome any obstacle to pursue my career interests and/or passion even if others may not support me.	307	4.7	94.1%
As a result of attending Tech Trek, I am more aware of how STEM impacts my daily life.	307	4.6	93.8%
As a result of attending Tech Trek, I realize how important it is for women to pursue STEM careers.	455	4.7	93.2%
As a result of attending Tech Trek, I understand how important it is that girls take advanced classes in science and mathematics.	455	4.7	92.3%
As a result of attending Tech Trek, I will encourage my girlfriends to consider courses and careers in STEM.	305	4.6	92.1%
As a result of attending Tech Trek, I am more confident that I can succeed in science and math classes	454	4.6	92.1%
I am more interested in classes in science and math as a result of attending Tech Trek.	455	4.6	91.6%
I will participate more in my science and math classes as a result of attending Tech Trek.	586	4.5	89.8%
As a result of attending Tech Trek, I will take more advanced science and math classes.	586	4.5	88.1%
As a result of attending Tech Trek, I now plan to consider a degree in a science, technology, engineering or math field in college.	585	4.5	87.0%

Table 10. Impact of the Camps, POST Camp responses 2017-2019.

Table 10 shows that the girls' level of agreement or mean was 4.5 or above out of a possible 5.0, suggesting a strong impact on their awareness, interest, confidence and planning as a result of attending. These self-report questions provide an important insight into the girls' experience. From these statements, it can be inferred that the impact of the program was significant and can lead to measurable behavior shifts not only for the girls who attended, but also potentially for their friends. Note the highest impact was related to an increased awareness of STEM careers (97.1%). This is consistent with the results of the Knowledge Scale which showed statistically significant results with a large effect size. Taken together, the girls show the greatest gains in knowledge about STEM careers. Ninety-six percent (96.6%) of the girls would recommend Tech Trek to others. Across all thirteen questions, 92.6% of the girls agreed or strongly agreed with the statements.

The post-camp questions in 2015 and 2016 used a 4-point Likert scale and were analyzed separately:

- Excellent = 4
- Good = 3
- Fair = 2
- Poor = 1

2015-2016 Questions and Responses	N	Mean or Weighted Average	% Excellent/Good
Opportunities to build your skills working together with teams.	125	3.6	95.4%
Opportunities to learn about science, technology, mathematics and/or engineering fields.	124	3.7	94.7%
Opportunities to learn about real world applications of STEM.	124	3.6	94.7%
Opportunities to build your skills in critical thinking, problem solving and creativity.	118	3.5	90.8%

Table 11. Impact of the Camps, POST Camp responses 2015 and 2016.

Table 11 shows that the girls' level of agreement or mean was 3.5 or above out of a possible 4.0, suggesting a strong impact on their capacity for team work and awareness of STEM careers as a result of attending. Although the questions are slightly different than those asked in 2017-2019, the results show the same strong impact with an average score of 93.9% of excellent/good ratings.

Impact on Career Choices.

The girls were asked list their top 3 career choices based on their experience at Tech Trek (2018 and 2019). Figure 5 shows that the majority of girls chose some kind medical career (28%) as their first choice. However, it is noteworthy that the majority of participants in this group aspire to attain post-graduate professional degrees like an M.D, pharmacologist, veterinarian, or careers that require a Ph.D. such as a toxicologist or epidemiologist. The second highest career choice was biologist (14-16%) which includes marine and wildlife biologist, zoologist, geneticist, and environmental scientist. Engineering careers (13%) was only slightly lower than biologist and included architect, civil and robotics engineering.

A full 44% of the girls are interested in STEM careers that are currently underrepresented by females. Many of the girls who chose Astronomy or Aerospace indicated that they wanted to work at NASA. Many of the girls who chose aviation were very specific about being a pilot in the military! Although core classes in Information Technology/ Computer Science/ Cyber Security had the highest enrollment at 32% (Figure 6), only 10% of the girls chose this as a future career.

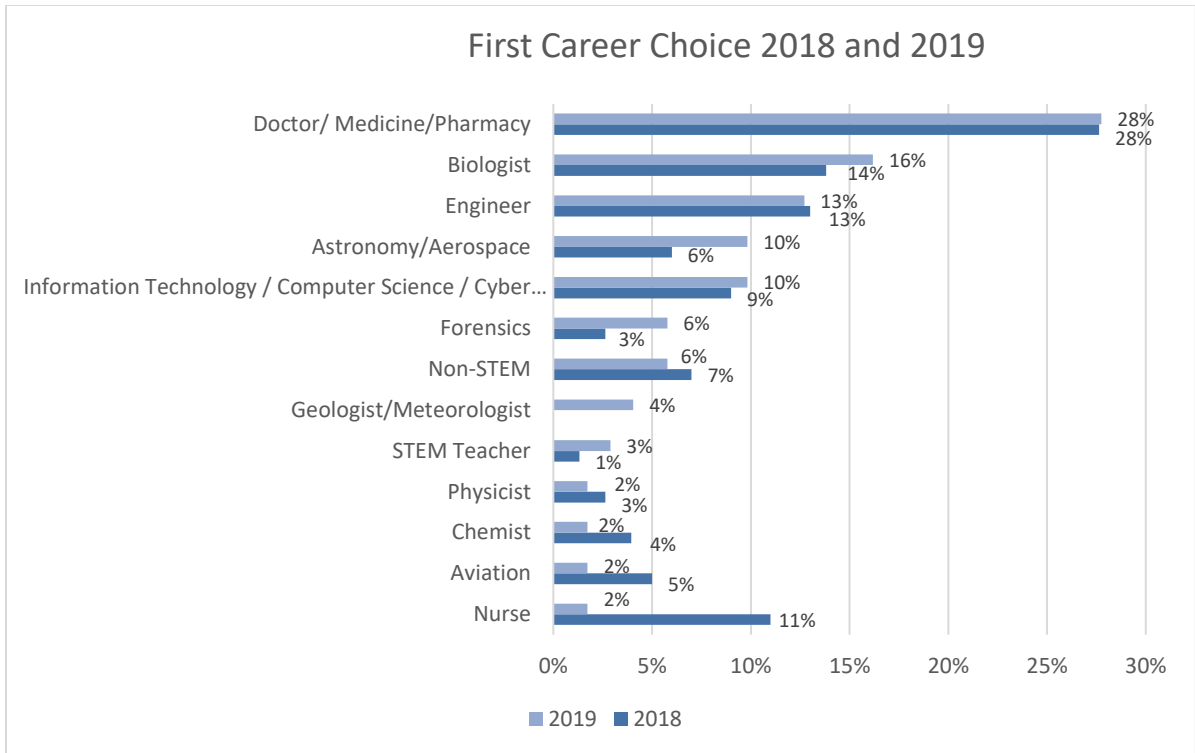


Figure 5. First Career Choice After Attending Tech Trek in 2018 and 2019.

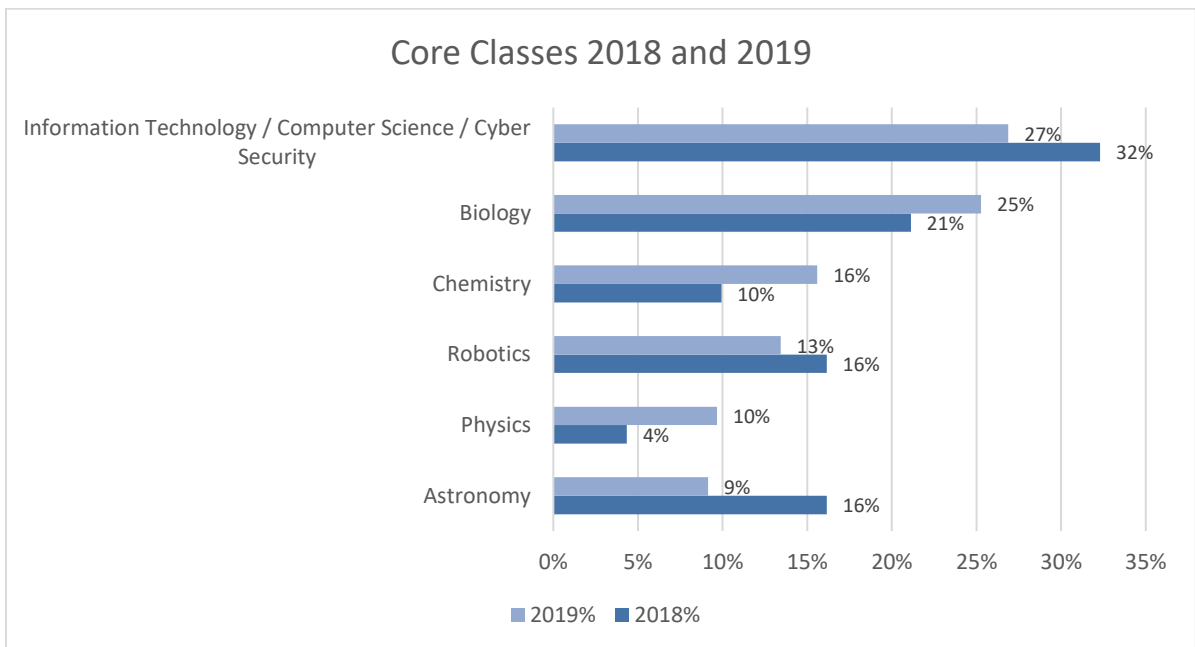


Figure 6. Enrollment in Core Classes 2018 and 2019.

Knowledge about STEM careers such as computer science and engineering showed the greatest gains for the girls attending Tech Trek in Washington. However, the choice of the core class did not always translate into their career choices. Given national trends in the STEM career choices for women, this result is not surprising. Eisenhart and Finkel (1998) pointed out two decades ago that science in general, as a cultural practice, has been shaped by the ideas, experiences and biases of white middle class males, and that many (but certainly not all) women lean toward those domains of science that reflect the values to which they have been acculturated, such as caring about the living environment, bodies, and health. It is no surprise that as of 2017, women accounted for nearly half or more of the workforce in the life sciences and in psychology and social sciences. In comparison, women accounted for 27% of computer and mathematical scientists, 16% of engineers, and 29% of physical scientists. (National Science Board, 2020). The data show that among the girls that attend Tech Trek, these cultural influences are still strong.

QUALITATIVE DATA

The girls were asked to respond to open-ended questions at the end of their camps:

1. What was your experience with Teck Trek? What have you learned?
2. How did your camp experience impact how you feel about yourself and STEM classes?
3. How might the Tech Trek Camp be improved?

What was your experience with Teck Trek? What have you learned?

Five-hundred and eighty-four (584) participants responded to this question. The comments were coded using ATLAS Ti to identify common themes that emerged. Forty percent (40%) of the girls began their comments with *“My experience at Tech Trek was... amazing, awesome, fun, inspiring or life-changing”*. That doesn’t mean that only 40% of the girls enjoyed their experience. It means that 40% of the statements included those specific words. Other girls described their experience as “pretty good”, “good” or “positive”. Only 3% of the comments described generally negative experiences (conflicts with staff or dorm mates, being bored, or homesick). Almost all of the girls answered the question of “What have you learned?” with enthusiastic detail about what they did in their core classes like experiments, building robots, dissections, hot air balloons, field trips and more. Twenty-six percent of the comments specifically mentioned learning about STEM careers (26%) or a particular STEM subject (10%) that they would like to pursue.

Another important theme that emerged was the opportunity to socialize or meet new friends (17%), and meet women in STEM at Professional Women’s Night (3%). Even shy girls shared that they were able to branch out and make new friends because they had so many interests in common with the other participants. A sense of belonging is recognized as an important factor in developing STEM identities as well as persistence in college. Rainey (2018) found that STEM student’s sense of belonging is correlated with the number of members of the student’s gender who are also in their major. The visible presence of learners “like me” renders the student’s presence in this STEM environment as normative rather than an aberration-essentially conveying to the student that “she belongs” here. Although the girls did not use that exact phrase, sentiments describing a sense of belonging included:

“We all became best friends and I unleashed the nerdy side of me that no one has really experienced”

“I learned that there are more people like me even though they may not be at my school” and

“I got to hang out with other girls who also wanted to go into similar careers as mine. I have never met so many people as interested in STEM as I did here. I made a lot of new friends, which isn't exactly easy for me.”

These expressions of sense of belonging were mentioned in 8% of the comments.

Other important themes that emerged was learning about *resilience* (5%), often expressed as the girls' understanding of failure as part of a learning process, not an end result. The girls also expressed positive perceptions of women in STEM (3%), or their realization that women are as capable at STEM as men. If the percentages seem low it is because most of the girls focused on describing what skills and content they learned. Only some of the girls went deeper to express personal feelings and self-perceptions. Figure 7 below contains some of the responses that highlight the themes. A more comprehensive set of responses can be found in APPENDIX E.

Representative Responses
<p>Then there were things that I learned on a deeper level like lessons from the amazing ladies at Professional Women's Night. <i>I learned that there are more people like me even though they may not be at my school.</i> I also learned more about myself and the career I want to pursue....I also learned that even though times can be hard there are people just like me that made it through and kept going. I also learned that people can like me just for me and not for anyone else. (2019)</p> <p>The Professional Women's Night helped me learn and talk to women about even MORE careers that I would possibly want to pursue and that was just so much fun, it made me really hopeful and excited for the future. <i>This whole experience has broadened my horizons and actually has made me want to do extra work on this kind of stuff for one, unlike school.</i> (2018)</p> <p>When I first showed up to Tech Trek, I immediately bonded with the rest of my dorm. We all became best friends and <i>I unleashed the nerdy side of me that no one has really experienced at max volume.....</i> My dream job suddenly got more exciting. <i>Walking around the campus and going into their labs made me SO excited to go to college.</i> At school, classes aren't usually very intriguing, but all of the classes here are so fun! (2017)</p> <p>Before (Tech Trek), I knew that it was possible for women to succeed in STEM, but never before have I felt like that was really true. <i>I know and believe now that I can do whatever I want to and be just as good as the boys, and with work, even better!</i> (2017)</p> <p><i>I learned that girls can succeed at science too!</i> (I actually already knew this since people don't treat girls as badly now and treat us as equals... I never thought I couldn't succeed in science or math. (2016)</p> <p>I've always been the only African American in my school to enjoy things like math and science and to see fellow African Americans it made me realize I'm not the only one. Last the camp was overall the best camp I've ever been too it opened me up and made me even learn things about myself (2015)</p>

Figure 7. Representative responses to experiences at Tech Trek and what participants learned.

How did your camp experience impact how you feel about yourself and STEM classes?

There were 584 responses to this question. The comments were once again coded using ATLAS Ti to identify common themes that emerged. Emergent themes included feeling smarter, more confident and the motivation to go to college and to pursue a career in STEM. The camp clearly boosted confidence or self-efficacy in taking STEM courses and gave one girl in particular the confidence to be an underrepresented female in an engineering course:

“This camp ... boosted my confidence levels and assured me that I have peers just like me who are interested in STEM-that I’m not just that one out of three girls in a 30 person engineering class”. (2017)

“My confidence in myself has risen dramatically because of attending Tech Trek. Not only do I feel more comfortable around STEM activities, but I also have greater faith that I can pursue the job I want”. (2019)

“I am more confident in math (which is my weaker point). I believe in myself more after hearing the success stories of real women I got to meet and feel encouraged to take even more STEM classes!” (2018)

Understanding that science, mathematics, and technology can be difficult courses of study. Another important take-away for these girls is that they understand that they have to keep working hard, which was often worded as “push myself”, to attend college and pursue a STEM career.

“I feel confident that I can get a good career if I work hard and keep my eyes on the goal. The professional Women’s night and hearing how people got to where they are now, really made me feel better about my chances in getting a science career”. (2015)

“After tech trek I feel better about myself and that maybe I am pretty smart and I should push myself in academics more. I learned that getting into STEM jobs will be difficult but I can do it if I work hard.” (2019)

Responses show that the AAUW Tech Trek program is reinforcing and strengthening these girls’ motivation and confidence in pursuing STEM course and career goals.

How might the Tech Trek Camp be improved?

The girls were also provided an opportunity to share their thoughts for improving the quality of the program. Five hundred and seventy-six (576) girls provided feedback. Very positive recognition of teachers, dorm moms, and staff provided the bulk of the responses. Most of the complaints (all of which are typical and in line with Tech Trek evaluations in all locations across the country) had to do with the condition of the dorms, dorm beds, cleanliness, and individual critiques/preferences of the food. Some teachers and staff were described as too strict. Figure 8 contains a representative sample of the responses. It may be useful for AAUW to read through the all of the comments as they are nuanced.

Representative Responses
<i>I feel like the experience was great just maybe less snack time and more core classes and fun activities. Maybe have a few more options on Professional Women's Night. I would recommend that you plan an ice breaker activity to get to know your dorm group. I would also enforce that dorms have a meeting EVERY NIGHT! Overall I LOVED Tech Trek! THANKS FOR LETTING ME COME!!! (2019)</i>
<i>I wish that there could be a way besides being a counselor for us to come back. Like maybe a dinner with girls who have previously attended Tech Trek and how it affected their lives. I also wish that we had more time to hang out with each other in the dorms throughout the day. (2019)</i>
<i>If you want to improve Tech Trek, the only thing I would say to do is to have more diversity in the classes and the women you bring to Professional Women's Night. (2019)</i>
<i>The only things that I can think of to improve the Tech Trek camp, is allow more time for the campers to talk to the professional women on Professional Women's Night (2018)</i>
<i>I think that one way to improve Tech Trek would be to have more evening activities with your dorm group and to have more time to speak with each women at the professional women's night. (2017).</i>
<i>Also that we go to both field trips. Also that more people got to go to this camp cause SO many people could benefit from this. (2017)</i>

Figure 8. Responses to how Tech Trek might be improved.

CONCLUSIONS

This report shows that Washington State Tech Trek provided a powerful, positive experience for middle school girls. The location of Tech Trek at university campuses provides the girls the opportunity to be introduced to and become familiar with navigating a college campus, and to be able to envision themselves attending college. This is an important factor that can translate into actual enrollment in college. Not only is this opportunity strategic, but AAUW simultaneously provides them with a high quality campus experience. Classrooms, teachers, food, and interactions with staff scored consistently above 92% excellent/good ratings. Several of the participants expressed excitement at having their first experience at a college campus “Walking around the campus and going into their labs made me SO excited to go to college” and “I thought that mingling with college kids and sharing their space and food was really cool. It was also cool to be in a college classroom and use their technology”.

There is the potential for more Tech Trek camps in Washington State. Attendance increased 27% over the years, as AAUW Washington was able to add additional camps at PLU and run camps simultaneously at Pacific Lutheran and Eastern Washington Universities. The increased attendance reflects the interest in and the popularity of the camps which is not surprising given the results in this evaluation. AAUW Washington has consistently provided high-quality activities for participants. Core classes, workshops/labs, evening activities and Professional Women’s Night, averaged 91.3% excellent/good ratings. The analysis of variance (ANOVA) results show no real differences in responses between years or locations signifying that AAUW Washington provides a consistent experience for girls attending Tech Trek. Extra funding will allow AAUW Washington admit additional participants and/or offer more camps.

AAUW’s assessment of Pre/Post gains in psychometric traits and shows that AAUW is addressing the psychological factors that influence middle school girls’ career choices in STEM. Paired-samples t-Tests showed statistically significant gains in PRE/POST responses for knowledge, interest, and confidence in STEM. The gains in knowledge about STEM careers were especially strong indicating the girls benefit the most from information about STEM careers. As one participant aptly said, “I also got to learn about new careers I didn't even knew existed, and got to realize that I love the career path I’m hoping to take, and I realized even if I didn't follow that path that I would have so many more options”.

As a result of attending Tech Trek in Washington, 44% of the girls are interested in STEM careers that are currently underrepresented by females. The remaining 56% of girls chose traditional careers for women such as allied health, biology, or non-STEM careers. While the core classes in STEM were well attended, they did not translate into career choices that are underrepresented by females. The data show that among the girls that attend Tech Trek, cultural influences that favor values such as caring about the living environment, bodies, and health are still strong. AAUW might consider seeking funding to broaden their curriculum to include more information on STEM careers and how to make them appealing to middle school girls.

AAUW is addressing a critical national shortage of STEM workers by successfully encouraging and preparing an underrepresented population (girls) to enter the STEM education and career pipeline and is making a contribution to the success of women in STEM. A parting comment really sums up the influence that Tech Trek has on the many of the girls:

“I have learned much more than I expected! I had a wonderful experience here and I really am sad to go but fortunately I now have a wider view on S.T.E.M careers and feel so much more passionate about pursuing a career in science thanks to Tech Trek”.

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APPENDICES

APPENDIX A: AAUW SURVEY QUESTION KEY 2015-2019.

Q#	Post /Pre	Question/Statement	2019	2018	2017	2016	2016 _orig inal	2015	2015 _orig inal
1	✓	I like science.	✓	✓	✓	✓	1	✓	1
2	✓	I am confident that I can learn mathematics.	✓	✓	✓	✓	9	✓	not numbered
3	✓	I would recommend that a girlfriend consider a job in math or science.	✓	✓	✓				
4	✓	I plan to take advanced science classes (such as Advanced Placement (AP) Physics, Chemistry or Biology) in high school.	✓	✓	✓	✓	5	✓	5
5	✓	Girls are as good as boys in mathematics.	✓	✓	✓	✓	12	✓	12
6	✓	I am confident that I can learn what is needed to create new technology.	✓	✓	✓	✓	15	✓	15
7	✓	Girls are as good as boys at science.	✓	✓	✓	✓	6	✓	6
8	✓	I am interested in a career that uses mathematics. (For example Statistician, Engineer)	✓	✓	✓	✓	8		
9	✓	I am interested in a career in science.	✓	✓	✓	✓	2	✓	2
10	✓	I plan to take advanced mathematics classes (such as pre-calculus and calculus) in high school.	✓	✓	✓	✓	11	✓	11
11	✓	I would suggest to a female relative (i.e. sister, cousin, aunt) that she consider engineering as a career choice.	✓	✓	✓				
12	✓	I am confident I can learn to use new technology such as apps, digital textbooks, learning games and computer programs.	✓	✓	✓				
13	✓	My girlfriends do just as well as the boys in their math classes.	✓	✓	✓				
14	✓	I am interested in a career that builds or supports the use of technology in our daily lives.	✓	✓	✓	✓	14	✓	14
15	✓	I believe my girlfriends could be successful in science or math jobs.	✓	✓	✓				
16	✓	I am confident that I can learn science.	✓	✓	✓	✓	3	✓	3

Q#	Post /Pre	Question/Statement	2019	2018	2017	2016	2016 _orig inal	2015	2015 _orig inal
17	✓	I know a woman who is in a STEM career.	✓	✓	✓				
18	✓	I like mathematics.	✓	✓	✓	✓	7	✓	7
19	✓	I can overcome setbacks to conquer an important challenge.	✓	✓	✓				
20	✓	I know what a computer scientist or coder does.	✓	✓	✓	✓	19	✓	19
21	✓	Women can succeed in careers as computer scientists or coders.	✓	✓	✓	✓	22		
22	✓	I am confident that I can become an engineer.	✓	✓	✓	✓	25	✓	25
23	✓	I am interested in joining an after-school club such as robotics, coding or math or science based competition team.	✓	✓	✓				
24	✓	I am confident that I can learn to use coding to create apps.	✓	✓	✓				
25	✓	I am familiar with lots of high tech jobs.	✓	✓	✓				
26	✓	I am interested in learning about computer science or how to code programs.	✓	✓	✓	✓	20*	✓	20*
27	✓	I know what an engineer does.	✓	✓	✓	✓	23	✓	23
28	✓	Women can succeed in engineering careers.	✓	✓	✓	✓	26*	✓	26*
29	✓	I am interested in taking classes that will help me get a high tech job when I finish school.	✓	✓	✓	✓	28		
30	✓	I am confident that I can become a computer scientist or a coder.	✓	✓	✓	✓	21	✓	21
31	✓	Women can be leaders in high tech companies.	✓	✓	✓	✓	29*		
4X	✓	Women can succeed in scientific jobs.				✓	4	✓	4
10X	✓	Women can succeed in mathematics-related jobs.				✓	10		
13X	✓	I like to use technology.				✓	13	✓	13
16X	✓	Women can succeed in technology-related jobs.				✓	16		
17X	✓	I plan to take technology-related classes in high school.				✓	17		
18X	✓	Girls are as good as boys in technology-related courses.				✓	18	✓	18

Q#	Post /Pre	Question/Statement	2019	2018	2017	2016	2016 _orig inal	2015	2015 _orig inal
24X	✓	I am interested in pursuing classes in engineering.				✓	24	✓	24
27X	✓	Being nominated to go to Tech Trek camp means a lot to me.						✓	27
28X	✓	I want to develop my mathematical skills						✓	28
29X	✓	High school math courses would be very helpful no matter what I decide to study.						✓	29
30X	✓	I expect to take physics in high school						✓	30
31X	✓	I'm thinking of having a career in science or technology						✓	35
32X	✓	I plan to attend college.						✓	36
33X	Post	Opportunities to learn about real world applications of STEM.				✓	31	✓	31
34X	Post	Opportunities to build your skills in critical thinking, problem solving and creativity.				✓	32	✓	32
35X	Post	Opportunities to build your skills working together with teams.				✓	33	✓	33
36X	Post	Opportunities to learn about science, technology, mathematics and/or engineering fields.				✓	34	✓	34
37X	Post	My individual learning needs were accommodated at Tech Trek.				✓	48	✓	48
32	Post	Quality of interactions with staff and volunteers.	✓	✓	✓	✓	30	✓	30
33	Post	The quality of the dorm rooms.	✓	✓	✓	✓	35	✓	35
34	Post	The quality of the food.	✓	✓	✓	✓	36	✓	36
35	Post	The quality of the classrooms.	✓	✓	✓	✓	37	✓	37
36	Post	The quality of the teachers.	✓	✓	✓	✓	38	✓	38
37	Post	Other comments about staff and facilities:	OER	OER	OER	OER	39	OER	39
38	Post	Core Class	✓	✓	✓	✓	40	✓	40
39	Post	Workshops/Labs	✓	✓	✓	✓	41	✓	41
40	Post	Field Trip(s)	✓	✓	✓	✓	42	✓	42
41	Post	Evening Activities	✓	✓	✓	✓	43	✓	43
42	Post	Professional Women's Night	✓	✓	✓	✓	44	✓	44

Q#	Post /Pre	Question/Statement	2019	2018	2017	2016	2016 _orig inal	2015	2015 _orig inal
43	Post	Other comments about camp activities:	OER	OER	OER				
44	Post	As a result of attending Tech Trek, I will take more advanced science and math classes.	√	√	√	√	45	√	45
45	Post	I will participate more in my science and math classes as a result of attending Tech Trek.	√	√	√	√	46	√	46
46	Post	As a result of attending Tech Trek, I now plan to consider a degree in a science, technology, engineering or math field in college.	√	√	√	√	47	√	47
47	Post	I am more interested in classes in science and math as a result of attending Tech Trek.	√	√	√				
48	Post	As a result of attending Tech Trek, I am more confident that I can succeed in science and math classes	√	√	√				
49	Post	As a result of attending Tech Trek, I understand how important it is that girls take advanced classes in science and mathematics.	√	√	√				
50	Post	As a result of attending Tech Trek, I realize how important it is for women to pursue STEM careers.	√	√	√				
52	Post	I would recommend Tech Trek to others.	√	√	√	√	49	√	49
53	Post	As a result of attending Tech Trek, I am more aware of the many options for careers in STEM fields.	√	√					
54	Post	As a result of attending Tech Trek, I am more aware of how STEM impacts my daily life.	√	√					
55	Post	As a result of attending Tech Trek, I am more aware of how useful and exciting STEM careers can be for me.	√	√					
56	Post	As a result of attending Tech Trek, I am more confident in my ability to overcome any obstacle to pursue my career interests and/or passion even if others may not support me.	√	√					
57	Post	As a result of attending Tech Trek, I will encourage my girlfriends to consider courses and careers in STEM.	√	√					

Q#	Post /Pre	Question/Statement	2019	2018	2017	2016	2016 _orig inal	2015	2015 _orig inal
58	Post	Career 1:	√	√					
59	Post	Career 2:	√	√					
60	Post	Career 3:	√	√					
61	Post	What was your experience at Tech Trek? What have you learned?	OER	OER	OER	OER	51	OER	50
62	Post	How did your camp experience impact how you feel about yourself and STEM classes?	OER	OER	OER	OER	53	OER	52
63	Post	How might the Tech Trek Camp be improved?	OER	OER	OER	OER	52	OER	51
64	Post	Any other comments about your experience at Tech Trek:	OER	OER	OER	OER	54	OER	53
66	Post	What was the topic of your core class?	OER	OER	OER	OER	55		

OER refers to Open Ended Response. An asterisk (*) indicates that wording is similar but not the same as later years. Grey boxes indicate the questions was not asked in those years

APPENDIX B. Paired-samples t-Test Results and Effect Size for PRE/POST questions.

	Mean Diff	SD	SEM	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)	Cohen's d	Effect Size
				Lower	Upper					
1. I like science.	0.199	0.516	0.021	0.157	0.241	9.311	583	0	0.4	med
2. I am confident that I can learn mathematics.	0.168	0.562	0.023	0.123	0.214	7.228	581	0	0.3	small
3. I would recommend that a girlfriend consider a job in math or science.	0.285	0.668	0.032	0.223	0.347	8.996	445	0	0.4	med
4. I plan to take advanced science classes (such as Advanced Placement (AP) Physics, Chemistry or Biology) in high school.	0.277	0.679	0.028	0.222	0.333	9.868	583	0	0.4	med
5. Girls are as good as boys in mathematics.	0.017	0.366	0.015	-0.013	0.047	1.133	581	0.258	0.0	small
6. I am confident that I can learn what is needed to create new technology.	0.11	0.764	0.032	0.048	0.172	3.473	581	0.001	0.1	small
7. Girls are as good as boys at science.	0.021	0.352	0.015	-0.008	0.049	1.415	580	0.157	0.1	small
8. I am interested in a career that uses mathematics. (For example Statistician, Engineer)	0.265	0.871	0.039	0.188	0.342	6.765	493	0	0.3	small
9. I am interested in a career in science.	0.259	0.753	0.031	0.197	0.32	8.239	575	0	0.3	small
10. I plan to take advanced mathematics classes (such as pre- calculus and calculus) in high school.	0.195	0.652	0.027	0.142	0.248	7.237	583	0	0.3	small
11. I would suggest to a female relative (i.e. sister, cousin, aunt) that she consider engineering as a career choice.	0.247	0.857	0.04	0.168	0.326	6.137	452	0	0.3	small
12. I am confident I can learn to use new technology such as apps, digital textbooks, learning games and computer programs.	0.073	0.664	0.031	0.012	0.135	2.339	450	0.02	0.1	small

	Mean Diff	SD	SEM	95% Confidence Interval of the Difference		t	df	Sig. (2- tailed)	Cohen's d	Effect Size
13. My girlfriends do just as well as the boys in their math classes.	0.051	0.613	0.029	-0.006	0.107	1.763	452	0.079	0.1	small
14. I am interested in a career that builds or supports the use of technology in our daily lives.	0.119	0.891	0.037	0.046	0.192	3.219	578	0.001	0.1	small
15. I believe my girlfriends could be successful in science or math jobs.	0.073	0.591	0.028	0.019	0.128	2.634	448	0.009	0.1	small
16. I am confident that I can learn science.	0.104	0.466	0.02	0.065	0.144	5.191	536	0	0.2	small
17. I know a woman who is in a STEM career.	0.753	1.2	0.057	0.641	0.864	13.288	448	0	0.6	med
18. I like mathematics.	0.108	0.62	0.027	0.056	0.161	4.04	535	0	0.2	small
19. I can overcome setbacks to conquer an important challenge.	0.2	0.633	0.03	0.141	0.258	6.7	450	0	0.3	small
20. I know what a computer scientist or coder does.	0.88	0.946	0.039	0.803	0.957	22.486	583	0	0.9	large
21. Women can succeed in careers as computer scientists or coders.	0.053	0.434	0.02	0.014	0.091	2.699	492	0.007	0.1	small
22. I am confident that I can become an engineer.	0.22	0.836	0.035	0.151	0.288	6.32	577	0	0.3	small
23. I am interested in joining an after-school club such as robotics, coding or math or science based competition team.	0.259	0.798	0.038	0.186	0.333	6.903	450	0	0.3	small
24. I am confident that I can learn to use coding to create apps.	0.264	0.921	0.043	0.179	0.349	6.085	450	0	0.3	small
25. I am familiar with lots of high tech jobs.	0.676	0.901	0.041	0.596	0.756	16.635	490	0	0.8	large
26. I am interested in learning about computer science or how to code programs.	0.197	0.967	0.044	0.111	0.282	4.518	492	0	0.2	small
27. I know what an engineer does.	0.478	0.798	0.033	0.413	0.543	14.413	579	0	0.6	med
28. Women can succeed in engineering careers.	0	0.345	0.014	-0.028	0.028	0	571	1	0.0	small

	Mean Diff	SD	SEM	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)	Cohen's d	Effect Size
29. I am interested in taking classes that will help me get a high tech job when I finish school.	0.16	0.868	0.039	0.083	0.237	4.101	492	0	0.2	small
30. I am confident that I can become a computer scientist or a coder.	0.284	0.952	0.039	0.206	0.361	7.187	581	0	0.3	small
31. Women can be leaders in high tech companies.	0.002	0.273	0.011	-0.021	0.024	0.152	578	0.879	0.0	small
4X. Women can succeed in scientific jobs.	-0.008	0.34	0.03	-0.066	0.051	-0.257	130	0.797	0.0	small
10X. I'm thinking of having a career in science or technology	-0.071	0.513	0.079	-0.231	0.088	-0.903	41	0.372	-0.1	small
13X. I like to use technology.	0.046	0.541	0.047	-0.048	0.14	0.973	129	0.332	0.1	small
16X. Women can succeed in technology-related jobs.	0.116	0.324	0.049	0.016	0.216	2.351	42	0.024	0.4	med
17X. I plan to take technology-related classes in high school.	0.293	0.716	0.112	0.067	0.519	2.619	40	0.012	0.4	med
18X. Girls are as good as boys in technology-related courses.	0.023	0.315	0.028	-0.032	0.077	0.831	130	0.407	0.1	small
24X. I am interested in pursuing classes in engineering.	0.16	0.84	0.073	0.015	0.305	2.185	130	0.031	0.2	small
27X. Being nominated to go to Tech Trek camp means a lot to me.	0.136	0.459	0.049	0.039	0.234	2.784	87	0.007	0.3	small
28X. I want to develop my mathematical skills	0.114	0.535	0.057	0	0.227	1.994	87	0.049	0.2	small
29X. High school math courses would be very helpful no matter what I decide to study.	0.159	0.5	0.053	0.053	0.265	2.983	87	0.004	0.3	small
30X. I expect to take physics in high school	0.091	0.737	0.079	-0.065	0.247	1.157	87	0.25	0.1	small
31X. I'm thinking of having a career in science or technology	0.182	0.687	0.073	0.036	0.327	2.482	87	0.015	0.3	small
32X. I plan to attend college.	0.011	0.239	0.026	-0.039	0.062	0.445	87	0.657	0.0	small

Abbreviations: Difference of the Means (Mean Diff, Standard Deviation (SD), Standard Error of the Mean (SEM), Confidence Interval (CI), Degrees of freedom (df), Statistical significance $\alpha = 0.05$ (Sig.)

APPENDIX C. Analysis of Variance (ANOVA) Results.

PRE/ POST Diff		Sum of Squares	df	Mean Square	F	Sig.
Q1_Diff	Between Years	4.861	4	1.215	4.688	0.001
	Within Years	150.097	579	0.259		
	Total	154.959	583			
Q2_Diff	Between Years	1.943	4	0.486	1.544	0.188
	Within Years	181.555	577	0.315		
	Total	183.498	581			
Q3_Diff	Between Years	0.426	2	0.213	0.476	0.622
	Within Years	198.41	443	0.448		
	Total	198.836	445			
Q4_Diff	Between Years	0.875	4	0.219	0.472	0.756
	Within Years	268.187	579	0.463		
	Total	269.062	583			
Q5_Diff	Between Years	0.4	4	0.1	0.745	0.561
	Within Years	77.428	577	0.134		
	Total	77.828	581			
Q6_Diff	Between Years	2.92	4	0.73	1.254	0.287
	Within Years	336.042	577	0.582		
	Total	338.962	581			
Q7_Diff	Between Years	0.541	4	0.135	1.094	0.359
	Within Years	71.211	576	0.124		
	Total	71.752	580			
Q8_Diff	Between Years	2.586	3	0.862	1.136	0.334
	Within Years	371.675	490	0.759		
	Total	374.261	493			
Q9_Diff	Between Years	1.908	4	0.477	0.839	0.500
	Within Years	324.548	571	0.568		
	Total	326.457	575			
Q10_Diff	Between Years	2.517	4	0.629	1.486	0.205
	Within Years	245.23	579	0.424		
	Total	247.747	583			
Q11_Diff	Between Years	0.997	2	0.499	0.677	0.508
	Within Years	331.312	450	0.736		
	Total	332.309	452			
Q12_Diff	Between Years	0.517	2	0.258	0.585	0.558
	Within Years	198.069	448	0.442		
	Total	198.585	450			
Q13_Diff	Between Years	1.426	2	0.713	1.906	0.15
	Within Years	168.406	450	0.374		
	Total	169.832	452			
Q14_Diff	Between Years	2.513	4	0.628	0.79	0.532
	Within Years	456.264	574	0.795		
	Total	458.777	578			
Q15_Diff	Between Years	1.075	2	0.537	1.541	0.215

PRE/ POST Diff		Sum of Squares	df	Mean Square	F	Sig.
	Within Years	155.5	446	0.349		
	Total	156.575	448			
Q16_Diff	Between Years	0.075	3	0.025	0.115	0.951
	Within Years	116.085	533	0.218		
	Total	116.16	536			
Q17_Diff	Between Years	6.855	2	3.427	2.393	0.093
	Within Years	638.704	446	1.432		
	Total	645.559	448			
Q18_Diff	Between Years	0.24	3	0.08	0.207	0.892
	Within Years	205.484	532	0.386		
	Total	205.724	535			
Q19_Diff	Between Years	1.408	2	0.704	1.766	0.172
	Within Years	178.632	448	0.399		
	Total	180.04	450			
Q20_Diff	Between Years	18.519	4	4.63	5.328	0.000
	Within Years	503.09	579	0.869		
	Total	521.61	583			
Q21_Diff	Between Years	0.154	3	0.051	0.271	0.847
	Within Years	92.475	489	0.189		
	Total	92.629	492			
Q22_Diff	Between Years	1.549	4	0.387	0.553	0.697
	Within Years	401.546	573	0.701		
	Total	403.095	577			
Q23_Diff	Between Years	2.168	2	1.084	1.707	0.183
	Within Years	284.479	448	0.635		
	Total	286.647	450			
Q24_Diff	Between Years	5.59	2	2.795	3.33	0.037
	Within Years	376.011	448	0.839		
	Total	381.601	450			
Q25_Diff	Between Years	1.535	3	0.512	0.629	0.596
	Within Years	395.976	487	0.813		
	Total	397.511	490			
Q26_Diff	Between Years	4.959	3	1.653	1.777	0.151
	Within Years	454.955	489	0.93		
	Total	459.915	492			
Q27_Diff	Between Years	10.29	4	2.573	4.127	0.003
	Within Years	358.418	575	0.623		
	Total	368.709	579			
Q28_Diff	Between Years	0.473	4	0.118	0.994	0.41
	Within Years	67.527	567	0.119		
	Total	68	571			
Q29_Diff	Between Years	1.504	3	0.501	0.665	0.574
	Within Years	368.837	489	0.754		
	Total	370.341	492			

PRE/ POST Diff		Sum of Squares	df	Mean Square	F	Sig.
Q30_Diff	Between Years	11.093	4	2.773	3.106	0.015
	Within Years	515.128	577	0.893		
	Total	526.222	581			
Q31_Diff	Between Years	0.053	4	0.013	0.178	0.95
	Within Years	42.945	574	0.075		
	Total	42.998	578			
Q4x_Diff	Between Years	0.016	1	0.016	0.135	0.714
	Within Years	14.977	129	0.116		
	Total	14.992	130			
Q13x_Diff	Between Years	0.33	1	0.33	1.129	0.29
	Within Years	37.393	128	0.292		
	Total	37.723	129			
Q18x_Diff	Between Years	0.315	1	0.315	3.218	0.075
	Within Years	12.617	129	0.098		
	Total	12.931	130			
Q24x_Diff	Between Years	0.903	1	0.903	1.284	0.259
	Within Years	90.731	129	0.703		
	Total	91.634	130			

APPENDIX D. Question Groupings for Composite Scales.

Q#	Group	Question/Statement	2019	2018	2017	2016	2015
2	CONF	I am confident that I can learn mathematics.	X	X	X	X	X
6	CONF	I am confident that I can learn what is needed to create new technology.	X	X	X	X	X
12	CONF	I am confident I can learn to use new technology such as apps, digital textbooks, learning games and computer programs.	X	X	X		
16	CONF	I am confident that I can learn science.	X	X	X	X	X
19	CONF	I can overcome setbacks to conquer an important challenge.	X	X	X		
22	CONF	I am confident that I can become an engineer.	X	X	X	X	X
24	CONF	I am confident that I can learn to use coding to create apps.	X	X	X		
30	CONF	I am confident that I can become a computer scientist or a coder.	X	X	X	X	X
8	INT	I am interested in a career that uses mathematics. (For example Statistician, Engineer)	X	X	X	X	
9	INT	I am interested in a career in science.	X	X	X	X	X
14	INT	I am interested in a career that builds or supports the use of technology in our daily lives.	X	X	X	X	X
23	INT	I am interested in joining an after-school club such as robotics, coding or math or science based competition team.	X	X	X		
26	INT	I am interested in learning about computer science or how to code programs.	X	X	X	X	X
29	INT	I am interested in taking classes that will help me get a high tech job when I finish school.	X	X	X	X	
17	KNOW	I know a woman who is in a STEM career.	X	X	X		
20	KNOW	I know what a computer scientist or coder does.	X	X	X	X	X
25	KNOW	I am familiar with lots of high tech jobs.	X	X	X		
27	KNOW	I know what an engineer does.	X	X	X	X	X
5	PERC	Girls are as good as boys in mathematics.	X	X	X	X	X
7	PERC	Girls are as good as boys at science.	X	X	X	X	X
13	PERC	My girlfriends do just as well as the boys in their math classes.	X	X	X		
15	PERC	I believe my girlfriends could be successful in science or math jobs.	X	X	X		
21	PERC	Women can succeed in careers as computer scientists or coders.	X	X	X	X	
28	PERC	Women can succeed in engineering careers.	X	X	X	X	X
31	PERC	Women can be leaders in high tech companies.	X	X	X	X	

Abbreviations: Confidence Scale (CONF), Interest Scale (INT), Knowledge Scale (KNOW), Perceptions Scale (PERC).

APPENDIX E. Representative Responses about Attending Tech Trek Washington.

Representative Responses
<p>Then there were things that I learned on a deeper level like lessons from the amazing ladies at Professional Women's Night. <i>I learned that there are more people like me even though they may not be at my school. I also learned more about myself and the career I want to pursue.</i> I also learned that I don't have to have everything figured out right now and there is still time to learn and grow. <i>I also learned that even though times can be hard there are people just like me that made it through and kept going.</i> I also learned that people can like me just for me and not for anyone else. (2019)</p>
<p>Tech Trek was one of the best experiences of my life. <i>I love how it teaches us more about STEM, gives us a chance to connect with other girls like us, and gives us a taste of what college life is like.</i> I have learned many things, including how to count in Binary Code, how to build apps, why we are made of stardust, and what a cell looks like. (2018)</p>
<p>My experience was honestly the best. I made new friends, learned so many new things, and in a type of way it felt like I was at school (Good Thing), but <i>mostly I notice how everybody around me works so hard so it encourages me to try even harder.</i> (2018)</p>
<p>The Professional Women's Night helped me learn and talk to women about even MORE careers that I would possibly want to pursue and that was just so much fun, it made me really hopeful and excited for the future. <i>This whole experience has broadened my horizons and actually has made me want to do extra work on this kind of stuff for one, unlike school.</i> (2018)</p>
<p>While learning about STEM I was also able to learn more about myself, in a place and in a way that felt separate from school, and my daily life. This helped me step back and think about other areas of study that I don't expose myself to. Mainly, I realized that I can do things I don't think I can do and I learned about new ways I can work to help others through STEM. (2018)</p>
<p>When I first showed up to Tech Trek, I immediately bonded with the rest of my dorm. We all became best friends and I unleashed the nerdy side of me that no one has really experienced at max volume..... My dream job suddenly got more exciting. Walking around the campus and going into their labs made me SO excited to go to college. At school, classes aren't usually very intriguing, but all of the classes here are so fun! (2017)</p>
<p>I have had an amazing experience with Tech Trek. This camp has really motivated me to pursue whatever I feel I would like to do. Before, I knew that it was possible for women to succeed in STEM, but never before have I felt like that was really true. I know and believe now that I can do whatever I want to and be just as good as the boys, and with work, even better! (2017)</p>
<p><i>I learned that I am interested in many different science fields, and before I got here, I thought I didn't completely like science.</i> I learned that women have challenges to overcome, but we will be stronger because of it, and I learned to embrace who you are because friendships and futures can only happen when you are truly being you. (2017)</p>

My experience was amazing *I got to talk to professional women and they told us about their lives and what they did to succeed in there career and lives.* (2017)

I have learned what it takes to be a chemist and an engineer. *Tech Trek has made me more confident in math and science so instead of backing down from an argument about the right answer most of the time I will stand up and own it.* (2017)

I learned that girls can succeed at science too! (I actually already knew this since people don't treat girls as badly now and treat us as equals... I never thought I couldn't succeed in science or math. (2016)

Tech trek has benefited me and made a huge impact on me. Not only educationally, but socially as well. *I have met many people here and it was really nice to meet girls my age with so much in common.* this camp gave me an opportunity to expand my social life, and my education. (2015)

During my time at Tech Trek, I have had the opportunity to experience many different new things from how to program robots and design apps, to how to make root beer with yeast. I went to Mount Rainier and learned from a ranger and it was really a great experience to be at an actual volcano while learning about it, as well as see a bear. *I made new friends and was able to be happier because I was other people who cared about school as I do.* (2015)

I've always been the only African American in my school to enjoy things like math and science and *to see fellow African Americans it made me realize I'm not the only one.* Last, the camp was overall the best camp I've ever been too it opened me up and made me even learn things about myself (2015)