

Girls in STEM Longitudinal Study

Year 4 Update

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Background

- ▶ In Q3 2013, GSNETX launched a five (5) year longitudinal study funded by ExxonMobil Foundation.
- ▶ Goal was to ascertain the extent to which the GSNETX programming influences girls' attitudes and behaviors related to science, technology, engineering and math.

Primary Study Questions

Is there a correlation between participation in GSNETX STEM programming/leadership dimension growth and:

- ▶ Increased awareness of the need to become STEM literate
- ▶ Increased confidence in performing STEM activities
- ▶ Greater interest in STEM college and career paths
- ▶ Participation in more advanced math and science coursework in middle and high school
- ▶ Improved academic achievement in STEM coursework

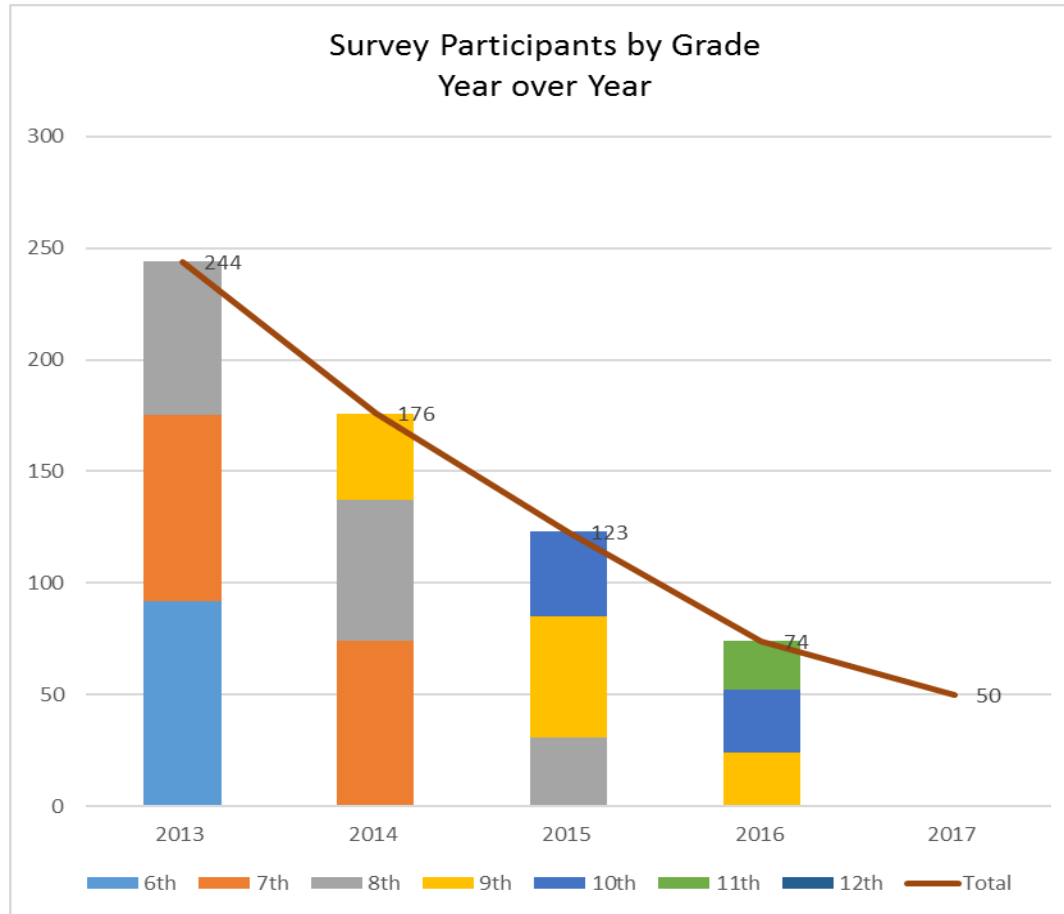
Secondary Study Questions



Also of interest

- ▶ What types of GSNETX STEM activities, if any, have the greatest positive impact on girl interest?
- ▶ What frequency of participation has the greatest positive impact?

Girl Scouts involved in the study



For comparison purposes, a group with similar demographic composition of non-Girl Scouts is also involved in the study. That said, a higher percentage of girls in the Girl Scout population report that both parents graduated college (74% vs. 41%), and 50% of Girl Scout parents currently work in a STEM field vs. 12% in the non-GS population.

P.Q1: Correlation between participation in GSNETX STEM programming/leadership dimension growth and increased awareness of the need to become STEM literate (V=valuation)

Activities with positive correlations to **V** and **SoS/ComfSeekChal**

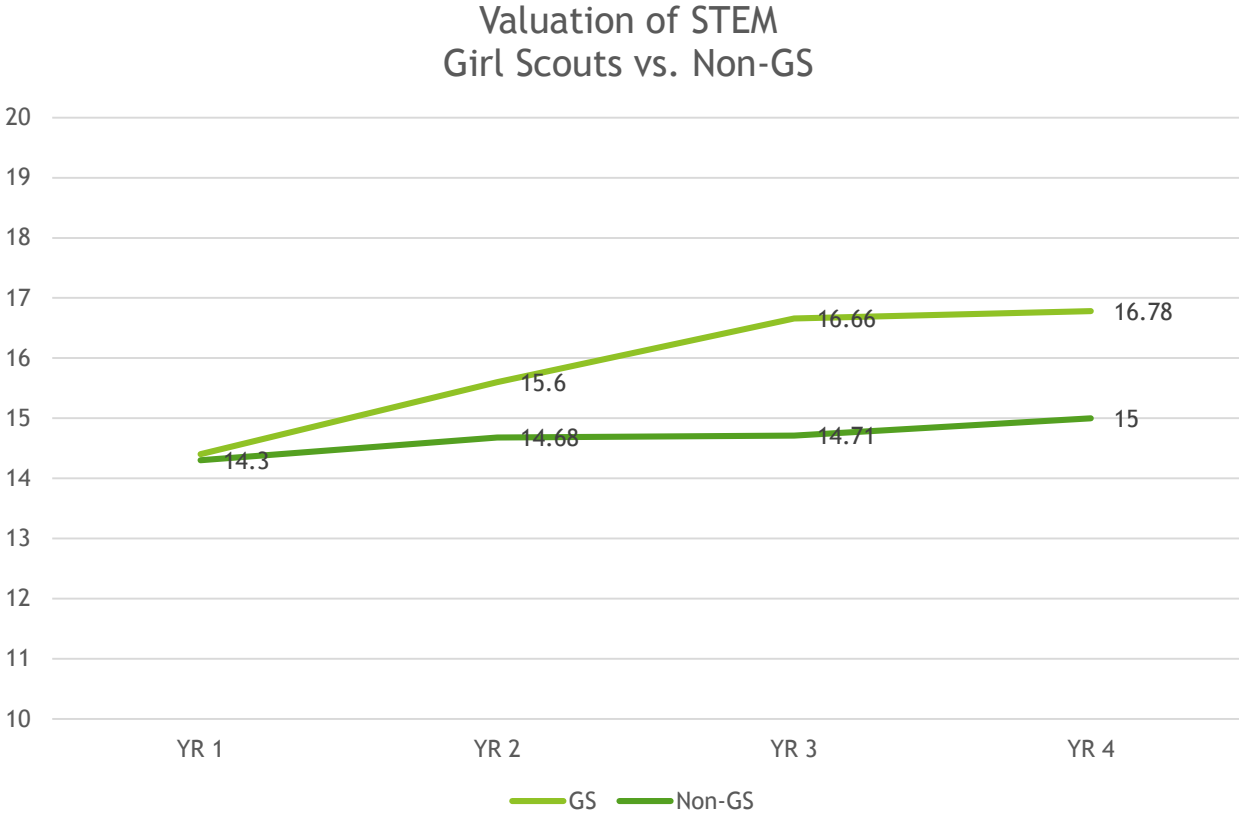
- ▶ Badge activities*/**
- ▶ Workshops**
- ▶ Industry tours
- ▶ STEM Mentor Interaction
- ▶ Campus-based programs**

***H_e**: Participation in Girl Scouts and growth in **Sense of Self/Comfort Seeking Challenge** is positively correlated with girls' increased **valuation** of STEM literacy*

*True only of younger girls (either girls recall doing earlier in Girl Scouts, e.g. "it sparked my interest" or completed as Cadettes (middle school), as interest in badge work was shown to decline among older girls.

**Indicates stronger correlation with valuation

Girls participating in Girl Scouts report greater valuation of STEM.



Girls in both comparison groups started with the same indexed score in middle school; however, with continued participation increases in valuation within the Girl Scout population grow at a greater rate.

P.Q2: Correlation between participation in GSNETX STEM programming/leadership dimension growth and increased confidence in performing STEM activities

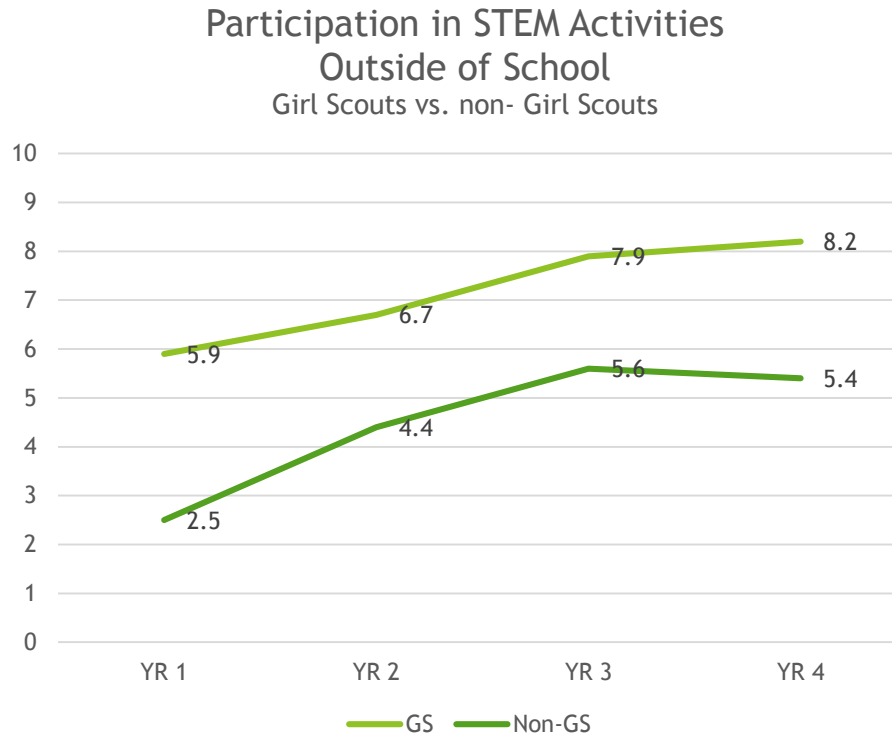
$$\begin{aligned} & \text{FEAR OF FAILURE} \\ & + \text{STRUGGLE} \\ & + \text{SUCCESS} \\ = & \text{GROWTH IN CONFIDENCE} \end{aligned}$$

If girls have a strong fear of failure, but they try and succeed, there is a three-fold increase in confidence.

H^e: *Girls' participation in challenging activities and/or activities in which they use specific tools* are correlated with increases in **Sense of Self, Comfort Seeking Challenge, and STEM Confidence***

*Evidence continues to suggest that girls outside of Girl Scouts who also participate in these types of activities also reap similar benefits; however, Girl Scouts may be able to increase access to such programming, giving girls opportunities they might not otherwise have elsewhere. For example, 21% of Girl Scouts have had the opportunity to work on science project or experiment in a university or professional lab vs. 6% of non-Girl Scouts.

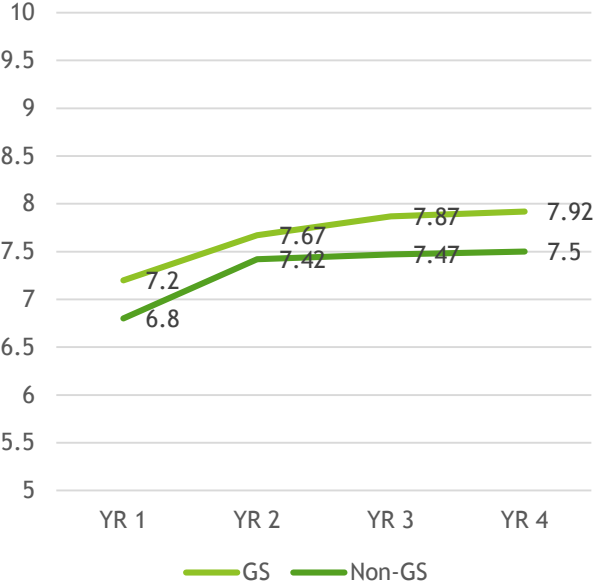
Girls participating in Girl Scouts report greater exposure to STEM related activities outside of school.



Girl Scouts outpace non-Girl Scouts when it comes to: reading books about science, spending time outside learning about nature, making models, writing computer programs or video games, using tools to build things, having collections related to STEM content, taking things apart to see how they work, and designing webpages.

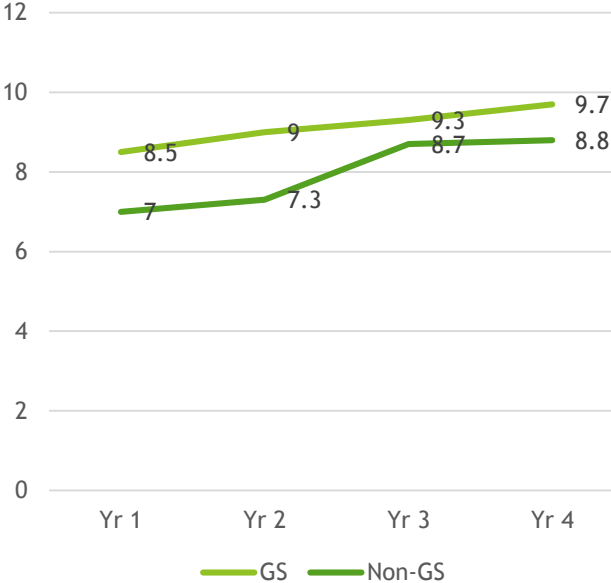
Girls participating in Girl Scouts report greater confidence in performing STEM related activities.

Confidence in STEM
Girl Scouts vs. Non-GS



Girls in both comparison groups consistently report they are unlikely to try things when there is not certainty of success.

Positive Gender Identity
Girl Scouts vs. Non-GS



Girls in both comparison groups consistently report they have positive views of females in STEM; however, Girl Scouts views tend to be more positive than those of non-Girl Scouts.

Challenging Content

- ▶ Content is related to real-world applications
- ▶ Girls understand the link between the content and school/career
- ▶ Programming encourages **critical thinking, problem solving, teamwork.**

Examples

- ▶ Computer Programming
- ▶ Use of Lab Equipment
- ▶ Use of Construction Tools
- ▶ Making/Creating Models

P.Q3: Correlation between participation in GSNETX STEM programming/leadership dimension growth and increased interest in STEM

Increase in interest are not a given, and it is dependent upon a variety of factors to include:

- Exposure to content
- Program delivery method
- Adult facilitator ability/attitude

Personality and other outside factors also play a role.

H^{e1}: *Given the right conditions, the Girl Scout program can increase a girls' interest in STEM.*

1) Elementary/Middle School girl sparks interest in STEM through Girl Scouts, interest is nurtured and sustained through high school. Selects science and math courses to grow in academic preparation.

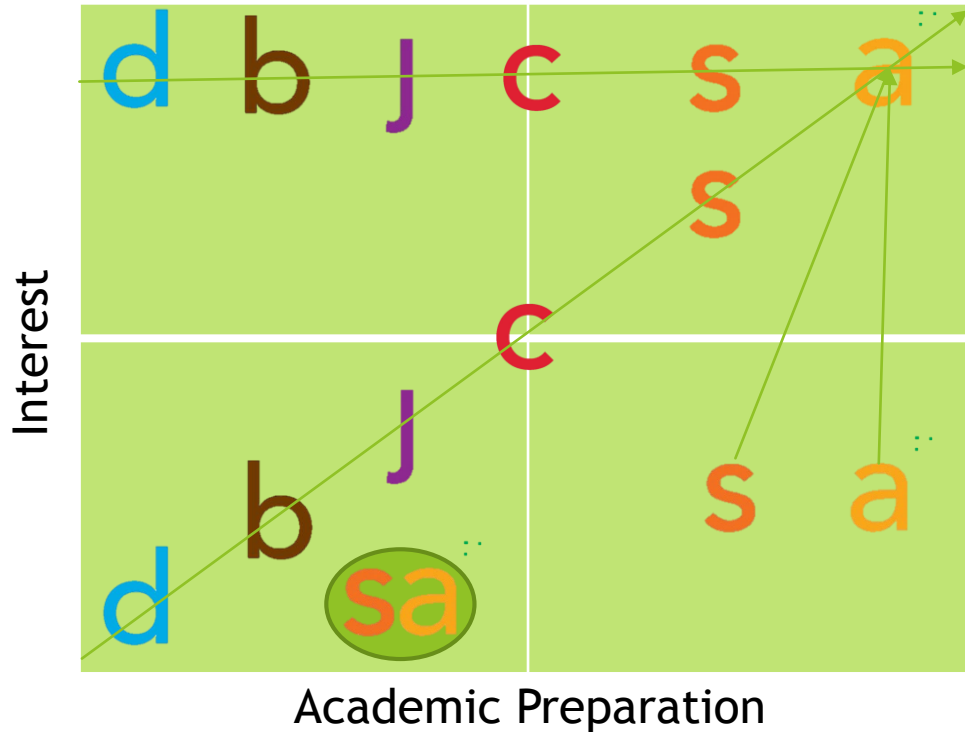
2) High School girl has academic preparation and requisite interest in STEM, but she is not sure what she wants to do/be. Is introduced to mentors and college/career options through Girl Scouts, which subsequently helps her create an action plan for her future.

H^{e2}: *Girl Scout programs do not persuade girls to enter STEM when neither interest nor academic preparation is evident.*

The Importance of Interest

- Recent models suggest that to increase the number of individuals entering STEM majors in college for eventual employment in STEM fields, students must be both proficient and interested in STEM.
- According to one study, fully 94% of 8th graders make course decisions related to preparing themselves for postsecondary school and career; interest in 8th grade is emerging as the greatest predictor of whether or not a child ultimately enters a STEM program of study.
- Additionally, science achievement has been correlated with attitudes towards science.
- As an out-of-school time program provider, Girl Scouts is uniquely positioned to increase interest in STEM throughout a girls' K-12 educational years.

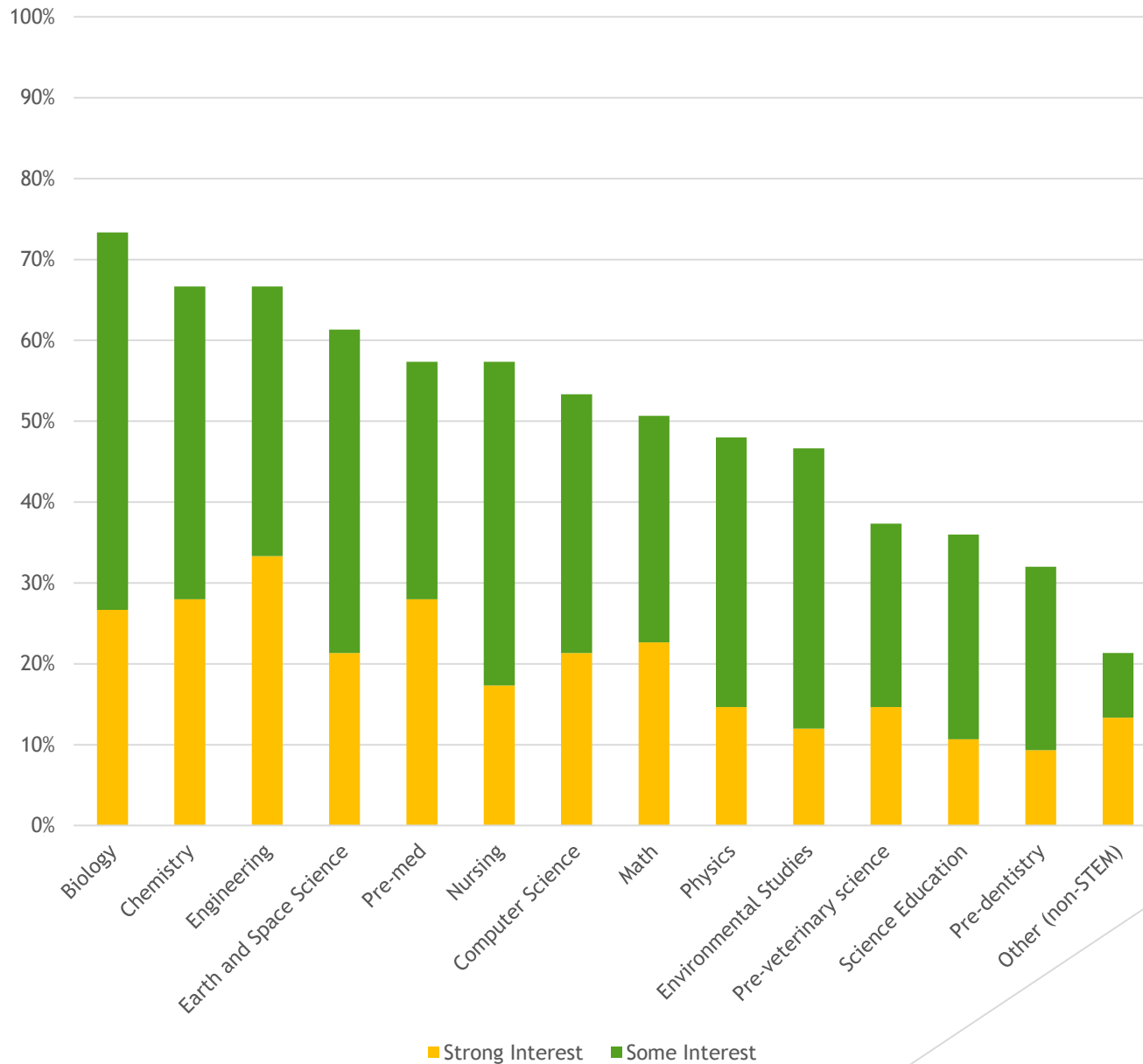
Likely pathways within the STEM pipeline through Girl Scouts



Particular opportunities exist related to Senior and Ambassador Girl Scouts. Of those who are 'academically prepared' (engaged and doing well in advanced math and science coursework):

- 88% report being unsure of their career goals, and
- 82% do not know where they want to attend college.

Girl Interest in Particular Programs of Study *As expressed after Junior Year of High School*



When choosing a particular career, girls in the study place a strong emphasis on interest, capability/competence/ and steadiness of employment.*

| Factor | Very Important | Somewhat Important | Total |
|--|----------------|--------------------|--------|
| To be interested in my work | 96.0% | 4.0% | 100.0% |
| To do something I am good at | 89.3% | 10.7% | 100.0% |
| To have a steady job | 85.3% | 14.7% | 100.0% |
| To earn a lot of money | 44.0% | 54.7% | 98.7% |
| To have time for family | 73.3% | 25.3% | 98.7% |
| To be able to provide for my family | 88.0% | 9.3% | 97.3% |
| To make a difference in the world | 66.7% | 29.3% | 96.0% |
| To make my parents happy or proud of me | 57.3% | 37.3% | 94.7% |
| To gain respect from others | 67.1% | 27.4% | 94.5% |
| To have time for other interests | 54.7% | 37.3% | 92.0% |
| To have friends where I work | 44.6% | 44.6% | 89.2% |
| The cost of the education and training | 33.3% | 52.0% | 85.3% |
| To work in a group with others instead of by myself | 24.0% | 54.7% | 78.7% |
| To be my own boss | 31.1% | 44.6% | 75.7% |
| Whether I would have to go to school for a long time | 16.2% | 55.4% | 71.6% |
| To be in a workplace with people who share my ethnic background | 12.0% | 36.0% | 48.0% |
| To work outdoors | 8.0% | 30.7% | 38.7% |
| To be in a workplace with people who are the same gender as I am | 8.0% | 17.3% | 25.3% |

*as expressed at conclusion of Junior year of high school

P.Q4: Correlation between participation in GSNETX STEM programming/leadership dimension growth and participation in more advanced math and science coursework in middle and high school

- There is a correlation between interest in STEM programming and participation in more advanced math and science coursework in middle and high school.
- The leadership dimensions of **SoS** and **ComfSeekChal** are also correlated with participation in more advanced math and science coursework.
- There is not yet evidence of a correlation between participation in programs and the leadership dimensions and pursuit of STEM in college and career.
- Older Girl Scouts elect to participate in STEM programs, which likely results in population response bias
- Similar to other studies, there is evidence that girls who are college bound take advanced math and science coursework regardless of their intended majors in order to increase their chance of admissions

P.Q5: Correlation between participation in GSNETX STEM programming/leadership dimension growth and improved academic achievement in STEM coursework (as measured by self-reported grades)

- There is a correlation between **interest in STEM programming** and **academic achievement** in math and science coursework in middle and high school.
- There is also evidence that girls continue to set a high bar for themselves

Girls receiving A's and B's in advanced math and science still rate themselves as “not as good as others” or “not confident in their ability in math/science.”
- Lastly, girls who were confident in middle school, appear to **experience uncertainty when transitioning to high school** (even when grades remain strong).
- Girl Scouts are **more likely to receive an award or special recognition** for doing well in science-related activities (e.g. science fairs, competitions, etc.) than non-Girl Scout counterparts. (65% vs. 47%)

S.Q1: What types of GSNETX STEM activities, if any, have the greatest positive impact on girl interest?

- Older girls continue to reflect fondly on earlier experiences in Girl Scouts and credit those experiences with sparking their STEM interest. Mentioned most frequently are:
 - Badge activities (in particular technical badges, many of which have been discontinued)
 - Camping with troops (nature-based interest)
 - Bronze award (in particular those dealing with the environment and/or health issues)
- Older girls most frequently cite recent participation in more immersive experiences, including:
 - Direct interaction with current College Students
 - Projects involving tools, e.g. lab work, construction challenges
 - Industry Site Visits and Field Trips
 - Interactions with STEM professionals/personal mentors
 - Specific programs mentioned include College Journey and Cookie Box Creations

**Journeys have not been cited by respondents and do not correlate with STEM interest.*

Programs emerging as the most effective have:

▶ Challenging Content

- ▶ Content is related to real-world applications; learners understand the link between the content and career opportunities later in life; program encourages critical thinking and problem solving and teamwork.

▶ Defined Outcomes and Assessments

- ▶ Activities are purposeful and designed with particular outcomes in mind; learners are aware that they are doing science, technology, engineering and math and understand that they are learning; girls have time to reflect on learning and make their own meaning out of the experience.

▶ Sustained Commitment and Community Support

- ▶ Continuity of funding and continued stakeholder involvement allows for repeat attendance and progression; positive recommendations lead to organic program growth.

▶ Engaged Adults

- ▶ Adults who believe in the potential of the girls stimulate interest and create expectations (for challenge and for success); adults share their own histories, to include struggles and lessons learned; girls have a support person (family or beyond) who encourages persistence and celebrates success.

▶ Personalization of Approach

- ▶ Girl-centered teaching and learning strategies are used. Mentoring and peer interaction are important parts of the learning environment.

S.Q2: What frequency of participation has the greatest positive impact?

- ▶ **Elementary school** exposure are important. They spark interest, but require continued nurturing. Since younger girls are not the subject of this study, more research is needed.
- ▶ The **middle school** age group appears to be more volatile; research suggests that this age of girl may benefit from 3-4 immersive experiences over the course of a year in order to sustain their interest so they persist with the correct academic coursework.
- ▶ By **high school**, most girls appear to be on a predefined academic path. These girls can benefit from deeper dives during the summer months and mentorship support throughout the academic school year. The girls suggest this helps them make decisions, simultaneously broadening their world of career possibilities and helping them to narrow in on a field of interest.