Techbridge Broad Implementation

2015-2016 Evaluation Findings
from Greater Seattle and Washington, DC

PREPARED FOR

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1   Introduction

Techbridge's mission is to help girls discover a passion for science, engineering, and technology (SET). Techbridge incorporates hands-on curricula and career exploration activities for girls, and provides training and/or resources to teachers, role models, and families.

In August 2013, Techbridge was awarded a five-year National Science Foundation (NSF) grant to scale up its after-school program from the San Francisco Bay Area to multiple new locations around the United States. The objectives of this broad implementation project are to increase girls' SET skills and career interests; build communities' SET capacity and sustainability; enhance SET career exploration for underrepresented girls and their families; and advance research on the scale-up, sustainability, and impact of the model. Techbridge began operating after-school programs in the Highline Public Schools, located near Seattle, WA in 2014. In 2015, Techbridge began operating programs in Washington, DC.

Education Development Center (EDC) is conducting the formative and summative evaluation of the project. This report summarizes the findings from Year 3 of the project (2015-2016), including the two expansion sites of Greater Seattle and Washington, DC.

2   Evaluation Overview

EDC worked with the Techbridge executive team to develop a logic model describing the program's activities and expected outcomes in January 2014 (see Appendix A). The following evaluation questions were established regarding Techbridge's implementation and impact on participating girls and other stakeholders:[1]

3. Techbridge's Impact on Girls

    3.1. What recruitment and retention strategies do expansion sites use to reach underrepresented groups? Are expansion sites successful in reaching and retaining girls from underrepresented groups?

    3.2. What is Techbridge's impact on participating girls at the expansion sites? How do the outcomes of girls participating in the project compare with similar girls at the same site who do not participate?

    3.3. To what degree do the underlying assumptions about girls from the logic model hold true in the expansion sites? Are there any additional assumptions that should be added?[2]

4. Techbridge's Impact on Teachers & Schools

    4.1. What selection process does Techbridge use to identify schools and teachers within those schools?

    4.2. How are teachers trained and supported in the expansion sites?

    4.3. To what degree do teachers have a leadership role in their program?

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[1] The evaluation questions are numbered starting with "3" to match the section headings within the report containing the results for that question.

[2] There are multiple evaluation questions about whether the assumptions included in the logic model are accurate and complete for each stakeholder group (girls, teachers/school, families, and role models). These questions will be addressed in Year 5 evaluation report.

4.4. What is the effect of the program on participating teachers, including their interest, knowledge, and use of strategies to engage girls in SET; their awareness and promotion of SET careers; and their awareness and promotion of SET resources for girls?

4.5. What role do local school districts and/or school administrators have in supporting programs in the expansion sites?

4.6. To what degree do the underlying assumptions from the logic model about teachers hold true in the expansion sites? Are there any additional assumptions that should be added?

5. **Techbridge's Impact on Parents**

5.1. How do expansion sites engage girls' families?

5.2. What is the effect of the program on participating girls' families, including their awareness of SET resources; their understanding of SET careers and career pathways; and their view of SET careers? To what degree do families encourage their daughters to participate in SET activities, and to pursue SET education and careers?

5.3. To what degree do the underlying assumptions from the logic model about families hold true in the expansion sites? Are there any additional assumptions that should be added?

6. **Techbridge's Impact on Role Models**

6.1. How are role models recruited, trained, and supported in the expansion sites?

6.2. What is the effect of the program on role models' confidence and effectiveness in conducting outreach with Techbridge girls?

6.3. To what degree do the underlying assumptions from the logic model about role models hold true in the expansion sites? Are there any additional assumptions that should be added?

7. **Implementation & Fidelity**

7.1. To what extent does each new program site implement the Techbridge curriculum?

7.2. To what extent does each new program site implement Techbridge? How does implementation at the expansion sites vary from the original program model (fidelity and innovation)?

7.3. How does the scale-up influence Techbridge processes in the Bay Area?

8. **Organizational Capacity**

8.1. What does Techbridge need to pay attention to as it expands? What factors emerge as important for the scale-up effort (e.g., vision, resources, knowledge/skills/abilities, incentives, ownership, structure)?

The evaluation is utilizing mixed methods to investigate the implementation of the Techbridge expansion and its outcomes. EDC worked closely with the project's research team, Colorado Evaluation & Research Consulting (CERC), to (1) develop each of the data collection tools to meet the needs of both the evaluation and research (when possible) and minimize the data collection burden on participants, and (2) share collected data.

Data about Techbridge's implementation and impact were collected from girls, parents, teachers, school principals, district representatives, role models, and Techbridge staff. The evaluation team also conducted observations of selected programs, analyzed attendance records, attended Techbridge planning meetings, and

reviewed relevant Techbridge documents. Table 1 shows the data collection instruments and when they were administered. A detailed description of the evaluation methodology can be found in Appendix B.

Table 1. Evaluation Instruments and Administration Timeline

Source	Evaluation Instrument	Administration Date
Girls	Participant Pre/Post Annual Surveys	October 2015 (pre) and May 2016 (post)
	Comparison Student Pre/Post Annual Surveys	October/November 2015 (pre) and May 2016 (post)
	Participant Focus Groups	May 2016
	Embedded Assessments	Fall 2015 and Spring 2016
Teachers, Schools, & District	TB Teacher Survey	May/June 2016
	TB Teacher Interview	May 2016
	Principal Interview	May 2016
	District Leader Interview (Highline)	May 2016
Parents	Parent Survey	May 2016
Role Models	Role Model Survey	June 2016
Techbridge Staff	TB Staff Interview (Expansion Sites)	May 2016
Other	Dimensions of Success Ratings	November 2015 and April/May 2016
	Attend TB Program Team Meetings	September 2015 – May 2016
	TB Attendance Records	Ongoing
	Document Review	Ongoing

The report is organized around the guiding evaluation questions. Results from all relevant data sources are presented together for each question.

In most cases, data from both expansion sites were aggregated and the results are presented for both sites combined: (1) because the primary purpose of the evaluation is to address the evaluation questions regarding the implementation of the scale-up overall; (2) to preserve the anonymity of respondents; and/or (3) because there were too few responses to allow comparison.[3] Some results from the teacher, role model, and parent surveys are presented separately by site.

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[3] In particular, there were only 15 completed post-student surveys and 10 matched pre- and post-student surveys from Washington, DC—too few to compare results by location. Tables A and B in Appendix B present detailed information regarding the response rates for each instrument by site.

3 Techbridge's Impact on Girls

3.1 What recruitment and retention strategies do expansion sites use to reach underrepresented groups? Are expansion sites successful in reaching and retaining girls from underrepresented groups?

★ **Key Findings re: Recruitment and Retention**

Teachers used a variety of strategies to encourage girls to join Techbridge, with personal invitations (of students, students' families, or through teachers) being the most popular and effective methods. The Techbridge expansion sites successfully enrolled girls from underrepresented groups (low-income, racially diverse, and first generation). Attendance at the elementary schools was higher and more consistent than attendance at the middle school programs. Recruitment and retention at middle school programs continues to be a challenge due to competing priorities for girls' time and attention.

Teachers used a variety of strategies to recruit and retain girls from underrepresented groups (see Figure 1). Almost all the teachers who responded to the survey said they reached out to individual girls from underrepresented groups (93%). The majority of Techbridge teachers used recruitment strategies such as asking other teachers for recommendations (64%), reaching out directly to families (57%), and/or creating flyers or materials in multiple languages (57%). However, less than one third of the teachers said they used strategies more relevant to retention efforts, such as making activities relevant to girls from underrepresented groups (29%) or girls with disabilities (21%), or making sure role models were diverse (21%). This pattern of responses could also reflect the typical role of Techbridge teachers in being highly involved in recruiting participants and not as involved in selecting curriculum or activities, or in recruiting role models.

Figure 1. Teachers reported using a variety of strategies to recruit and retain girls from underrepresented groups.

Strategy	Percent
Reaching out to individual girls from underrepresented groups	93%
Asking other teachers for recommendations of girls from underrepresented groups	64%
Reaching out to families of girls from underrepresented groups	57%
Creating flyers or materials in multiple languages	57%
Portraying a diverse group of girls on flyers or Techbridge materials	43%
Making activities/curriculum relevant to girls from underrepresented groups	29%
Ensuring facilities and activities are accommodating for girls with disabilities	21%
Making sure role models are diverse and/or otherwise similar to girls from underrepresented groups in the…	21%
Working with other school clubs or groups that already serve girls from underrepresented groups	14%
Other efforts (please describe):	7%

Source: Teacher Survey; n = 14

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The two Techbridge expansion sites in 2015-16 were successful in reaching girls from underrepresented groups (low-income, racially diverse, and first generation). First, the majority of Techbridge girls' families were low-income: almost three-quarters (71%) of Greater Seattle and Washington, DC Techbridge girls qualified for free or reduced lunch.[4] Second, the expansion programs primarily served girls from racial and ethnic groups that are underrepresented in SET. Techbridge deliberately partnered with school districts which have racially and ethnically diverse populations. Finally, the majority of Techbridge participants would be the first in their immediate families to go to college. A quarter of the Techbridge parents have less than a high school education. Fewer than 20% have earned a four-year college degree and/or advanced degree.

Looking at retention of Techbridge participants, attendance at the elementary schools tended to be higher and more consistent than attendance at the middle school programs (see Figure 2). In general, attendance declined gradually over the course of the year, after a high point in the winter of an average of 25 girls[5] in the elementary school programs, and an average of 14 girls in the middle school programs. At the final Techbridge meetings, attendance was about 18 students in elementary schools and about 9 in middle schools.

Figure 2. 2015-2016 attendance at the elementary school programs in Greater Seattle and Washington, DC (n = 7) was higher and more consistent than at the middle school programs in these locations (n = 8).
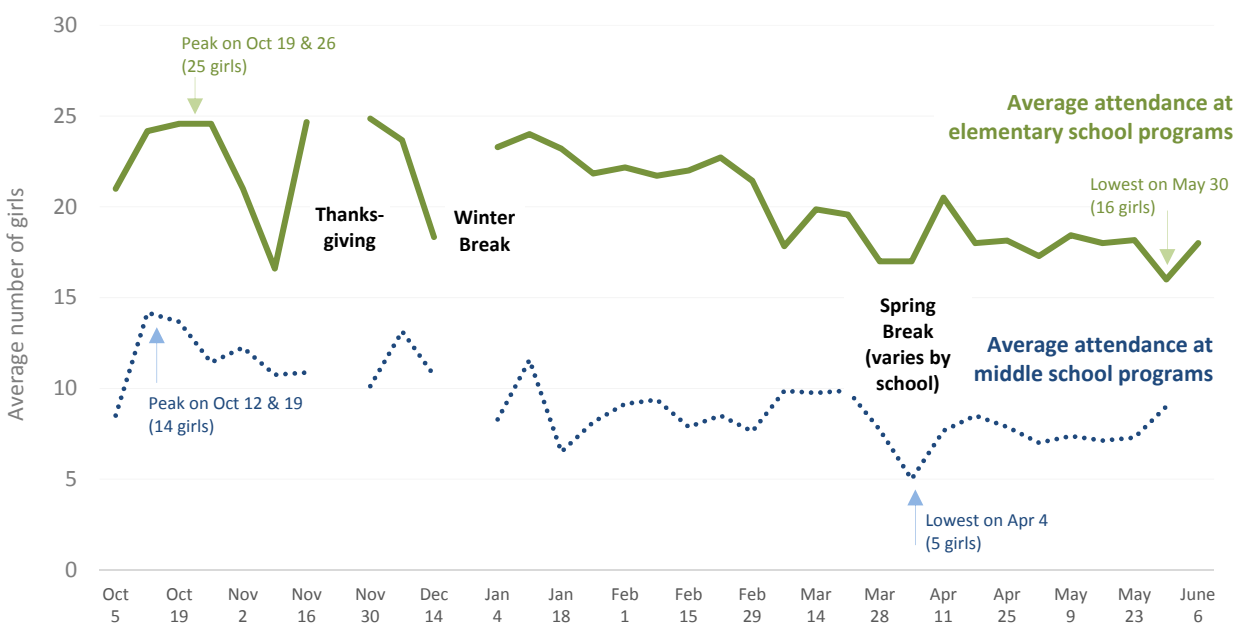
Source: Techbridge attendance data

Both recruiting and retaining students was particularly a challenge at middle schools. Staff reported that initial interest from families and/or girls during recruitment activities did not always translate into enrollment. Girls stopped coming to Techbridge due to a variety of factors, including the start of after-school sports part-way through the year or parents needing the Techbridge girls to take care of their younger siblings.

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[4] The Techbridge Parent Packet, which parents/guardians complete as part of enrolling their child in Techbridge, asked parents/guardians to report their income level.

[5] Programs had the capacity to serve 25-30 students.

★   **Key Findings re: What Girls Thought of Techbridge**

Girls gave the 2015-2016 Greater Seattle and Washington, DC Techbridge programs high marks: 72% gave Techbridge an "A" and 24% gave it a "B." Techbridge provided a safe space where girls felt comfortable, supported, and appropriately challenged. Girls valued the hands-on projects, the ability to learn with their peers, and the opportunities to meet SET role models and visit SET workplaces. Participants said Techbridge made learning about SET fun.

Techbridge participants were asked to grade Techbridge on a five-point scale from A to F. The vast majority of the Greater Seattle Techbridge participants gave the program an A or B (96%), with 72% of them giving Techbridge an A.

Students explained that they rated the program highly because they found it fun (29%); had the opportunity to learn about SET and SET careers (27%); think about future education and career options (11%); and had an opportunity to do hands-on projects (9%). Many girls said they valued the opportunity to

Figure 3. The majority of girls (72%) gave Techbridge a grade of "A."
(mean = 4.64 on a 5-point scale)

Student Post-Surveys; n = 118

work in teams (7%), and that they formed positive relationships with their Techbridge program coordinator, teacher, and/or role models (7%). Some girls said the program increased their confidence (6%), and several students said that the program was specifically empowering to them as girls (5%). Examples of girls' comments included:

- "I gave Techbridge this grade [an 'A'] because I had fun learning more things about science and engineering and I feel like everybody here appreciates me for who I am."
- "I got to go to the Google Company, program a robot, eat the food there, and know now that Google is probably where I want to work at when I finish college. Also it gave me a chance to meet new people and hang out more with my friends. Additionally, it let me experience what an after school program is like. And adding to that, they give me snacks! But more importantly it teaches me about, Science, Tech, Engineering, and Math."

"It is honestly a very, VERY good program that made me think outside the box from what I wanted to do in life. Now I also know how many more jobs there are. #Techbridge4lyfe."

Techbridge Participant

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- "Techbridge deserves this grade because there were many different types of engineering activities we did. Also we didn't just learn about engineering we also learned about teamwork and creating new friendships."
- "Techbridge help me see that I am good in science and engineering. They help me think more about what I want to be."
- "I give Techbridge this grade because I wanted to get out of Techbridge but then I went to a field trip to Google a person that worked there. [She] helped [me] see what coding was and things like that and I started liking it all over again and I'm really proud of myself. The teachers are nice and makes us get interested."
- "I would give them the grade I did because…it did give me a look into the STEM field and I'm happy because of that. For girls who are very interested in STEM, I would recommend this program. It is very hands-on so you don't have to just read about the things in the book you do it yourselves. It's great that you can use your hands and actually make thing instead of reading about it."
- "I gave Techbridge an A because it helped me with my communication skills and it taught me what opportunities I had as a girl. Techbridge was given an A because it showed me more STEM careers."

Girls were also asked to explain what they liked most about Techbridge. The most frequently cited response—given by 39% of the girls—were the hands-on projects. Girls appreciated that the projects were fun and collaborative. Several girls said Techbridge provided a safe space where they felt comfortable, supported, and appropriately challenged. Girls also said they particularly liked the field trips and role models (25%), and the opportunities to work and learn with their peers (17%). Girls' comments included:

- "Field trips and that we get to design things, and those are my two favorite things."
- "The field trips and how we could see how people work and see what they do and how they like to do it."
- "Working with my team. Because they inspire me and we get too work together and make things and plan how to do it."
- "I liked working with different people because each person has a different idea in the projects we did."
- "The activities we did because they challenge my thinking and it made me more confident in myself."
- "I like the field trips because they let you see exactly what career fields are out there and what you do in them."
- "I liked the community we built over the past school year and I really loved all the diverse people I met."
- "I got to break something."
- "What I liked about Techbridge was that it let us have our own creativity and have time to build stuff that we haven't done yet or ever thought about."
- "I really liked how we got to build new things, like when we got to create our own chap stick it was pretty cool because it was something we can use in our daily lives."
- "I like the activities we do together the MOST because it feels like we are one big happy family! #Bigfamily"
- "I liked our teachers most of all because they are really nice and very supporting with what we do."

> "I liked that they let us know that we can do other things too, that we can also make a change in the world. And what I also loved is that they challenged us to do what we didn't know, and we would learn from our mistakes. Thank you for making me change my sighting in things. Thank you, Techbridge!"
>
> Techbridge Participant

- "The field trips. It made me think about if I wanted to do in the future. I would definitely recommend girls to try Techbridge. But I don't think it's fair that only girls get to do Techbridge. Maybe think about making a Techbridge for boys only too."
- "I like that when you're in Techbridge, you can be yourself. Like when we do project we can be our selves. Especially when I'm around [the Program Coordinator]."
- "The activities we do and the teacher we have, the activities we do are really fun and we get to hang out with our friends while working. And the teacher is super nice and not like other teachers that are mean, she is calm when we are really 'hyper' or really loud and she helps us get calmer without being mean."

Girls who gave Techbridge a grade of B or lower most commonly said they found some of the activities boring or repetitive, or they felt they could have learned more (with additional staff support or more challenging curriculum). Comments included:

- "I gave Techbridge a C because we are doing the same stuff from last year, but it's new for the fifth graders so I like seeing them excited so I just go along."
- "Because most of the things were just engineering and technology based, nothing we did was on the science and mathematical side of STEM. It also did not help me think about what I wanted to become after my academic life."
- "I enjoyed this program very much, and learned a lot during our hands-on activities and field trips. But I'm not sure I'd do this again next year if I had the opportunity because quite a few projects we've done in the past were not that exciting, cool, interesting...you get the picture."
- "Well, the field trips and activities were fun but working with people who aren't your friends is difficult. Techbridge made me open up a little bit. Not a lot. A LITTLE BIT."
- "I gave Techbridge this grade because I have learned a lot from it and it brought me closer to my classmates. I like the [Program Coordinator]. But I never really could understand some words like I know what engineering/engineer means but I didn't really get the word. But other than that, I like Techbridge."

Two girls gave Techbridge a grade of F. One of the girls wrote only positive comments about the program (so likely misunderstood the grading scheme), while the other girl had more critical feedback:

- "I gave Techbridge this grade because I think that they do a very good job teaching girls engineering science and technology. And also because they teach and explain [to] girls different careers."
- "Because it can do way better and they need more fun activities and more games to prove that we are good and we can learn from our mistakes."

3.3   What is Techbridge's impact on participating girls at the expansion sites? How do the outcomes of girls participating in the project compare with similar girls at the same site who do not participate?

★ **Key Findings re: Techbridge's Impact on Girls**

2015-2016 Techbridge participants from Greater Seattle and Washington, DC:

- found Techbridge's SET activities to be engaging
- became more knowledgeable about SET careers and educational pathways
- became more interested in studying science, engineering, or technology in college
- improved their understanding of and use engineering design practices
- felt they belong and can succeed in SET
- improved their ability to persevere in the face of challenges
- improved their public speaking skills.

Many girls from the Techbridge expansion sites also:

- became more interested in pursuing a career in SET
- better understand how SET is relevant and important to their lives
- improved their teamwork skills
- became active science learners and increased their participation in additional informal SET activities.

In addition, 2015-2016 Techbridge participants from Greater Seattle and Washington, DC showed stronger gains than participants in 2014-2015 (from Greater Seattle).

Survey results from girls who participated in Techbridge and girls from the same schools who did not participate were compared in order to help assess Techbridge's impact. Figure 4 on the following page shows the pre/post survey results for the Techbridge girls versus the comparison girls. **At the end of the year, Techbridge girls were significantly more likely than comparison students to report they understand practices commonly used in SET (such as the engineering design process) (p < .01).** Techbridge girls were also somewhat more likely than non-participating students to understand SET career options and plan to pursue education in SET; have improved perseverance (growth mindset); have interest in and confidence in SET; increase their speaking skills and confidence; and report greater family support in SET, although these differences were not statistically significant. In contrast, comparison girls reported somewhat better collaboration skills than Techbridge girls (though the difference was not statistically significant).

In general, **2015-2016 Techbridge participants in expansion sites showed stronger gains than participants in 2014-2015,** Techbridge's first year of implementing afterschool programs outside of the Bay Area (see Figure 5). Techbridge participants in 2015-2016 showed greater improvement than 2014-2015 participants on 8 of the 12 survey scales (groups of related questions) that assessed student outcomes. While the differences were small, they suggest a potential positive trend that may reflect Techbridge's maturation as it establishes itself in new locations.

Figure 4. Differences in Pre/Post Survey Scores for Expansion Site Techbridge Girls vs. Comparison Girls (2015-2016)
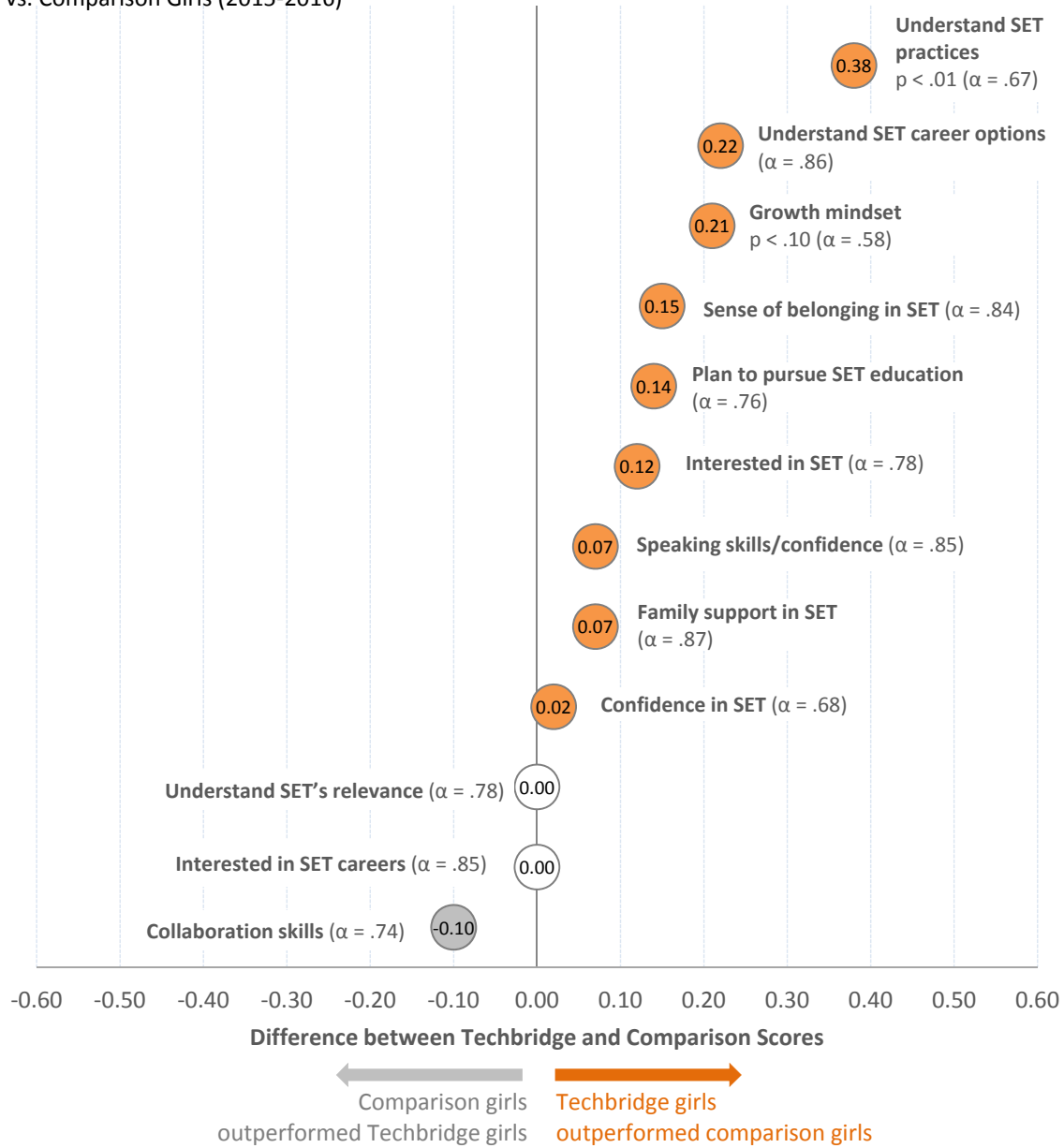
Understand SET practices 0.38 $p < .01$ ($\alpha = .67$)

Understand SET career options 0.22 ($\alpha = .86$)

Growth mindset 0.21 $p < .10$ ($\alpha = .58$)

0.15 **Sense of belonging in SET** ($\alpha = .84$)

0.14 **Plan to pursue SET education** ($\alpha = .76$)

0.12 **Interested in SET** ($\alpha = .78$)

0.07 **Speaking skills/confidence** ($\alpha = .85$)

Family support in SET 0.07 ($\alpha = .87$)

0.02 **Confidence in SET** ($\alpha = .68$)

Understand SET's relevance ($\alpha = .78$) 0.00

Interested in SET careers ($\alpha = .85$) 0.00

Collaboration skills ($\alpha = .74$) -0.10

-0.60 -0.50 -0.40 -0.30 -0.20 -0.10 0.00 0.10 0.20 0.30 0.40 0.50 0.60

Difference between Techbridge and Comparison Scores

Comparison girls outperformed Techbridge girls

Techbridge girls outperformed comparison girls

Change scores were calculated as follows: [Mean Techbridge post-survey scale score – Mean Techbridge pre-survey scale score] – [Mean Comparison post-survey scale score – Mean Comparison pre-survey scale score]. The maximum possible difference was +/-12. Statistically significant differences are marked (paired independent t-tests). Internal consistency reliability scores (using Cronbach's alpha) are shown for each scale, and are based on the post-survey responses.

Source: Matched Student Pre/Post Surveys

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Figure 5. Differences in Pre/Post Survey Scores for Expansion Site Techbridge Girls vs. Comparison Girls (2014-2015)

Understand SET practices
p < .001 (α = .64)   0.52

0.18   Understand SET career options
(α = .86)

0.08   Growth mindset (α = .33)

0.08   Collaboration skills (α = .71)

0.06   Interested in SET careers (α = .84)

0.03   Family support in SET
(α = .82)

Understand SET's relevance (α = .80)   -0.01

Sense of belonging in SET (α = .87)   -0.02

Interested in SET (α = .78)   -0.04

Speaking skills/confidence (α = .91)   -0.10

Plan to pursue SET education
(α = .72)   -0.18

Confidence in SET (α = .72)   -0.21

-0.60   -0.50   -0.40   -0.30   -0.20   -0.10   0.00   0.10   0.20   0.30   0.40   0.50   0.60

Difference between Techbridge and Comparison Scores

Comparison girls   Techbridge girls
outperformed Techbridge girls   outperformed comparison girls

Change scores were calculated as follows: [Mean Techbridge post-survey scale score – Mean Techbridge pre-survey scale score] – [Mean Comparison post-survey scale score – Mean Comparison pre-survey scale score]. The maximum possible difference was +/-12. Statistically significant differences are marked (paired independent t-tests). Internal consistency reliability scores (using Cronbach's alpha) are shown for each scale, and are based on the post-survey responses.

Source: Matched Student Pre/Post Surveys

The following sections present findings for each Techbridge participant outcome. Related findings are presented together from the student surveys, teacher surveys, and parent surveys, as well as from the student focus groups and teacher interviews.

How to Interpret the Figures with Student Survey Results

Students were asked to indicate how much they agreed with each survey statement on a six-point scale from "disagree a lot" to "agr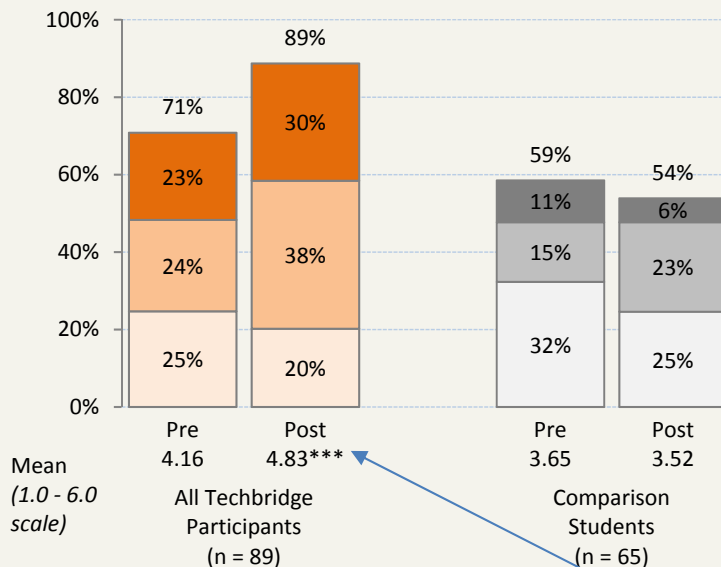ee a lot." Techbridge and comparison students' mean change scores on each survey question were compared to determine whether Techbridge students had better outcomes than comparison students.[6]

| Agree a little | Agree | Agree a lot |

I know what the engineering design process is
(Techbridge post-pre mean +0.80 > than comparison; p < .001)

If Techbridge participants' survey scores were statistically significantly different than comparison students' scores, the mean difference is shown, as well as the "p value" (explained below).

Shows the mean on a 6-point scale. One or more asterisks (*) here means that the pre- and post-survey mean scores were statistically different (higher or lower) for this respondent group.

+p < .10 (1 in 10 chance the difference is just due to chance)
*p < .05 (1 in 20 chance the difference is just due to chance)
**p < .01 (1 in 100 chance the difference is just due to chance)
***p < .001 (1 in 1,000 chance the difference is just due to chance)

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[6] The difference was calculated as follows: [Mean Techbridge post-survey score – Mean Techbridge pre-survey score] – [Mean Comparison post-survey score – Mean Comparison pre-survey score].

3.3.1   What is Techbridge's impact on girls' interest in SET?

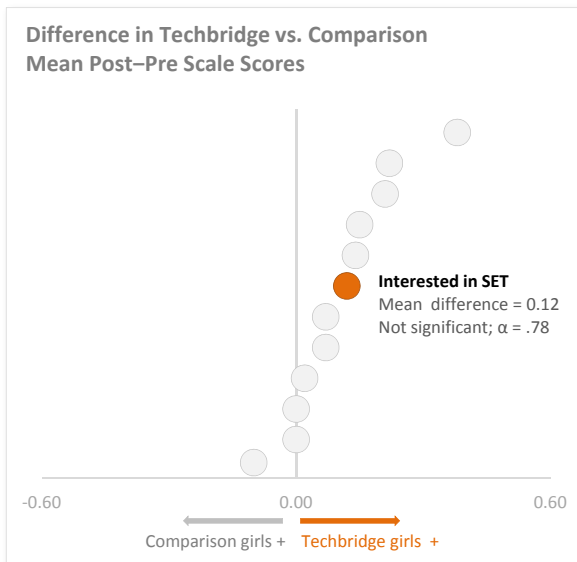★ **Key Findings re: Techbridge's Impact on Girls' Interest in SET**

Survey results suggest that the majority of Techbridge girls from the Greater Seattle and Washington, DC programs already had a strong interest in SET at the beginning of the year in fall 2015. While some Techbridge girls were less interested in SET at the end of the year, an even <u>larger</u> percentage of non-participating students became less interested in SET (i.e., comparison students were more likely to lose interest in SET). Although this difference was not statistically significant, Techbridge may have had a somewhat protective effect and helped reduce girls' loss of interest in SET that research shows to be common among students in the age groups served by Techbridge.[7]

Results

- At the end of the program year, Techbridge participants were significantly less likely to "agree a lot" that they liked science ($p < .001$), creating things with technology ($p < .05$), or figuring out how things work ($p < .05$). However, while the strength of some girls' interest in SET may have waned slightly, the vast majority of Techbridge girls said they continued to enjoy those activities at the end of the school year. For example, 92% of participants said they like creating things with technology at least a little at the end of the year (see Figure 7 on the following page).

- Comparison students' interest in each SET topic also declined from the beginning to the end of the year, and declined more steeply than Techbridge participants'. For example, the percentage of comparison students who agreed at least a little that they like computer programming declined from 84% at the beginning of the year to 67% at the end of the year. In contrast, 90% of Techbridge girls' agreed at least a little both before and after participating in the program that they liked computer programming (although the percentage who agreed strongly decreased from 45% to 35% at the end of the year).

SET Interest Scale (Combined Results of Survey Questions)

Figure 6. At year-end, Techbridge girls had a slightly greater interest in SET compared to non-participants. The difference between the groups was not statistically significant.

Difference in Techbridge vs. Comparison Mean Post–Pre Scale Scores

Interested in SET
Mean difference = 0.12
Not significant; α = .78

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +

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[7] Archer, L., Dewitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2010). "Doing" science versus "being" a scientist: Examining 10/11-year-old schoolchildren's constructions of science through the lens of identity. *Science Education*, 94(4), 617-639.
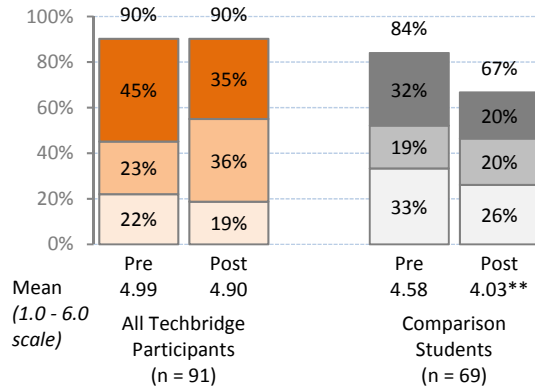
Results of Individual Survey Questions re: SET Interest

Figure 7. Techbridge participants were less likely to lose interest in engineering and technology than girls who didn't participate in the program.

Agree a little	Agree	Agree a little

I like computer programming
(Techbridge post-pre mean +0.46 > than comparison; p < .10)

Mean (1.0 - 6.0 scale)	Pre 4.99	Post 4.90	Pre 4.58	Post 4.03**
	All Techbridge Participants (n = 91)		Comparison Students (n = 69)	

I like creating things with technology

Mean (1.0 - 6.0 scale)	Pre 5.14	Post 4.88*	Pre 4.79	Post 4.48+
	All Techbridge Participants (n = 91)		Comparison Students (n = 71)	

I like figuring out how things work

Mean (1.0 - 6.0 scale)	Pre 5.26	Post 4.98*	Pre 4.96	Post 4.59*
	All Techbridge Participants (n = 91)		Comparison Students (n = 70)	
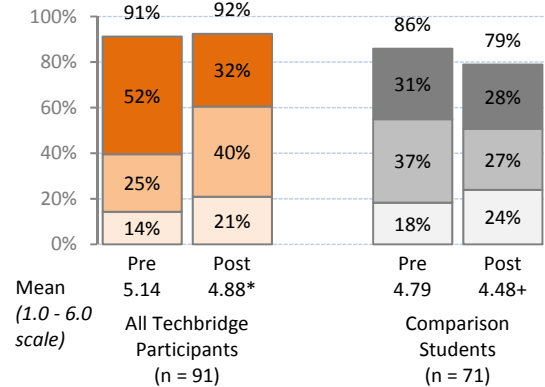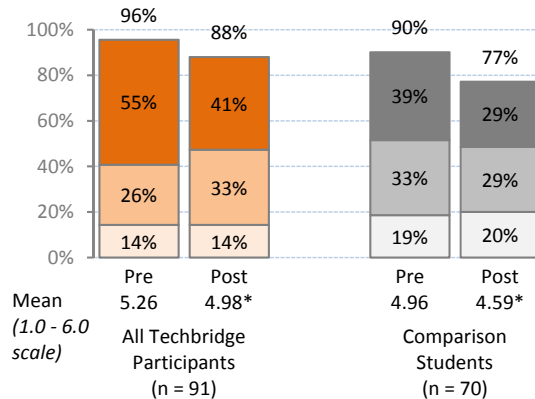
I like building, designing, and/or putting things together
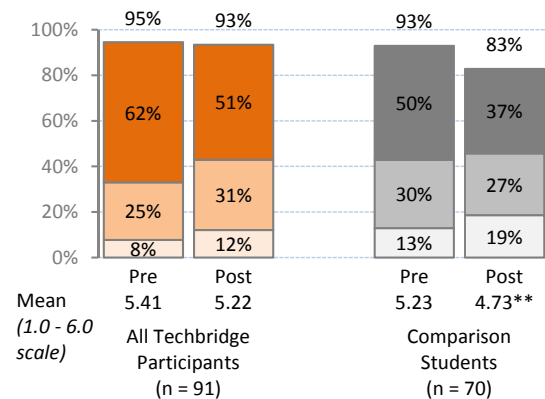
Mean (1.0 - 6.0 scale)	Pre 5.41	Post 5.22	Pre 5.23	Post 4.73**
	All Techbridge Participants (n = 91)		Comparison Students (n = 70)	

I like science

Mean (1.0 - 6.0 scale)	Pre 5.30	Post 4.90***	Pre 4.97	Post 4.82
	All Techbridge Participants (n = 90)		Comparison Students (n = 71)	
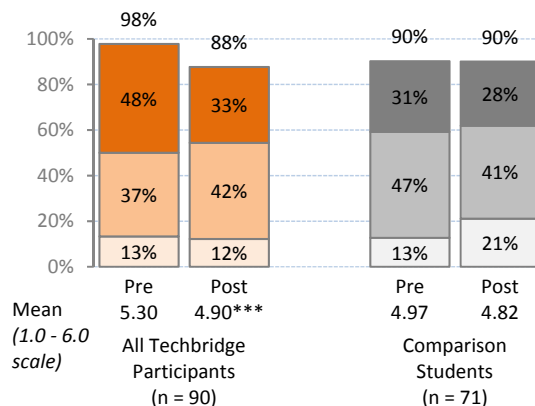
Source: Matched Student Pre/Post Surveys

★   **Key Findings re: Techbridge's Impact on Girls' Confidence**

Girls reported on the post-survey and in focus groups that Techbridge's supportive, collaborative environment helped increase their confidence to try new things, including in SET. However, pre/post-survey findings suggest that many girls still lack confidence in their SET abilities.

Results

- Girls reported that Techbridge helped them improve their confidence in science and engineering, as well as more generally in themselves (see Figure 8 below[8]). Three retrospective questions on the student post-survey asked students to indicate whether Techbridge had an impact on their confidence. The vast majority of Techbridge students (94%) agreed that they were more confident trying new things because of Techbridge. The majority of girls also agreed that Techbridge helped them see they were good at engineering (89%) and at science (85%).
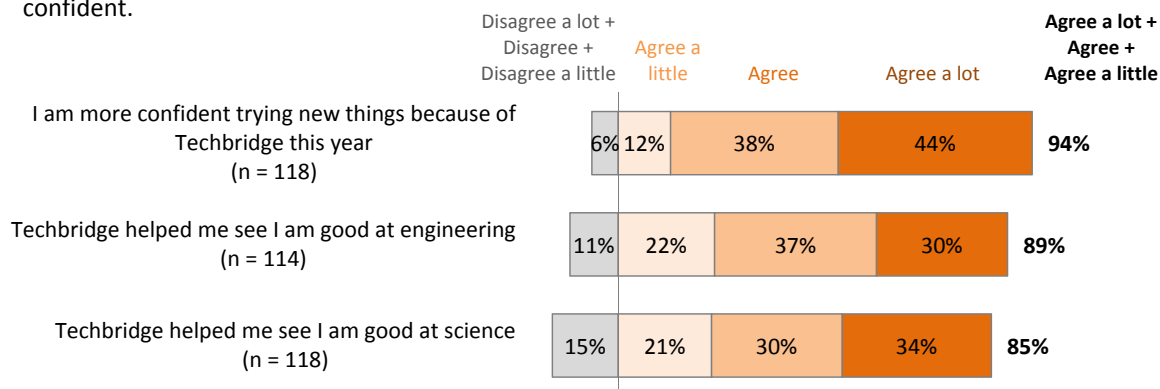
Figure 8. The majority of girls said Techbridge helped them become more confident.

Source: Student Post-Survey

- Several students said the supportive Techbridge staff, teamwork approach, and the hands-on, fun activities created a safe space for them to experiment and build confidence. Students said:

    "[Techbridge] teaches girls to lose their fears about things they can't do, they lose shyness in them (we start to speak up), and it lets us learn new things we did not know together."

    "Techbridge showed me to make to friends and to believe in myself."

    "The activities we did…challenge my thinking and it made me more confident in myself."

---

[8] The combined percentages shown in the figures like Figure 8 for "Agree a lot + Agree + Agree a little" (e.g., 94%) were calculated from the original survey data. Due to rounding, adding the individual percentages shown in the figures for "agree a lot," "agree," and "agree little" may result in a slightly different total than shown in the figures. The combined totals shown in the figures are accurate.

- On the teacher survey, 84% of teachers indicated that their Techbridge girls were more confident about their SET abilities to a "large" or "very large" extent at the end of the program.

- Although Techbridge students reported that the program had a positive influence on their SET confidence, pre/post-survey results suggest that many girls lack confidence in their abilities to do science or technology (see Figure 9 on the following page). Fewer Techbridge girls agreed they did well in science activities at the end of year than at the beginning of year, decreasing from 89% to 81% ($p < .05$), with only 18% agreeing "a lot" with this statement at year-end. There is substantial room for growth in girls' SET confidence.

"Middle school particularly is an age where we see developmentally, boys lean more towards math and science, and girls start leaning more towards the liberal arts. The way the world is moving, everyone needs to be really focused on math and science and so wanting to push at this age and give that empowerment piece to girls was critical for me.

"Thinking about it just developmentally, like middle school, is the perfect age to be doing this because we have seen…their class participation [changes]. With some girls that are in the program that are shy, we will just see them raising their hands more. They at least trying more because Techbridge is giving them that confidence amongst girls to mess up or to be figuring things out so then when they are in front of these little boys, they are not thinking about them anymore, they are just focused on the work. I think developmentally, it was huge."

Principal from Techbridge School

Girls' Confidence in SET Scale (Combined Results of Survey Questions)

Figure 9. The average Techbridge student's mean SET confidence scale score was 0.02 points higher than the average comparison student's. However, this difference was not statistically significant.

Difference in Techbridge vs. Comparison
Mean Post–Pre Scale Scores

Confidence in SET
Mean difference = 0.02
Not significant; α = .68

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +
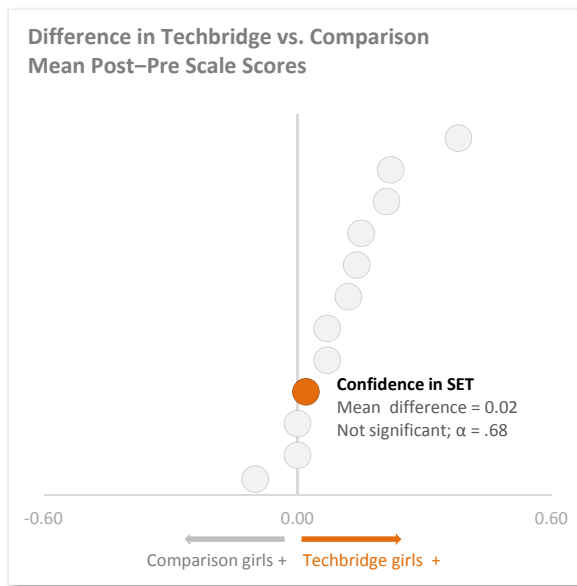
Results of Individual Survey Questions re: Girls' Confidence

Figure 10. Techbridge girls' self-reported confidence in science declined from the beginning to the end of the year.

| Agree a little | Agree | Agree a lot |

I do well in activities that involve science

	89%	81%	80%	79%
	34%	18%	14%	13%
	31%	42%	37%	32%
	23%	21%	30%	34%
	Pre 4.86	Post 4.51*	Pre 4.41	Post 4.28

Mean *(1.0 - 6.0*

All Techbridge Participants (n = 90)   Comparison Students (n = 71)

I do well in activities that involve technology

	90%	89%	83%	79%
	34%	29%	26%	19%
	35%	42%	34%	33%
	21%	18%	23%	27%
	Pre 4.88	Post 4.87	Pre 4.63	Post 4.34

Mean *(1.0 - 6.0*

All Techbridge Participants (n = 89)   Comparison Students (n = 70)

Source: Matched Student Pre/Post Surveys
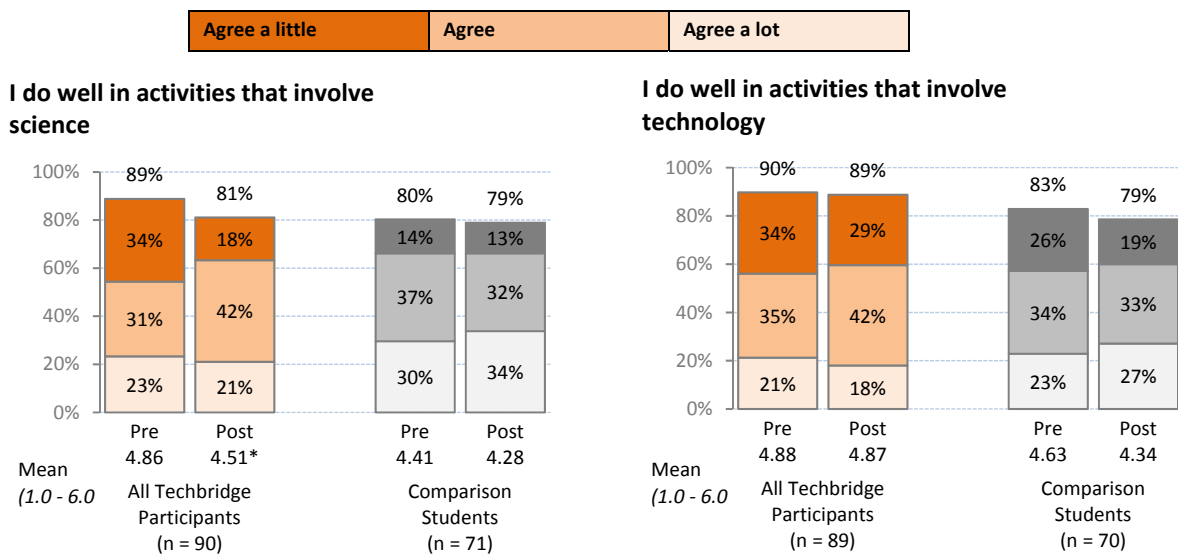
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3.3.3   What is Techbridge's impact on girls' understanding of SET's relevance to their own lives?

★   **Key Findings re: Techbridge's Impact on Girls' Understanding of SET's Relevance**

The majority of Techbridge girls said they already understood SET's relevance and importance prior to participating in the program, so there was little room for improvement in their survey scores. However, many girls said that doing the hands-on activities and going on field trips to SET workplaces helped them better understand the importance of SET.

Results

- Techbridge girls' pre-survey responses suggest that most already understood SET's relevance and importance at the beginning of the school year. For example, on the pre-survey, 94% of Techbridge girls agreed that engineers make a meaningful difference in the world; 57% agreed "a lot" with this statement (see Figure 13 on the following page).

- Although there was little room for improvement in girls' pre-survey scores regarding SET's relevance, other data sources suggest that Techbridge students gained a greater appreciation of SET's importance through the field trips and role model visits. A retrospective question on the post-survey asked the Techbridge students whether and to what degree the field trips and role models helped them understand the importance of SET. Almost all the students (94%) agreed that the field trips and role models helped them understand SET's importance, with half the students (50%) agreeing "a lot" (see Figure 11 below).

Figure 11. 94% of girls said the field trips and role models helped them understand the importance of SET.

Source: Student Post-Survey

- In survey comments and focus groups, girls said that the field trips to SET companies particularly helped bring SET to life. One girl explained, "The field trips/role models…helped me a lot to see more of what I knew and the things we do in Techbridge."

- On the teacher survey, 70% of teachers said that Techbridge girls were more confident about their SET abilities to a "large" or "very large" extent at the end of the program.
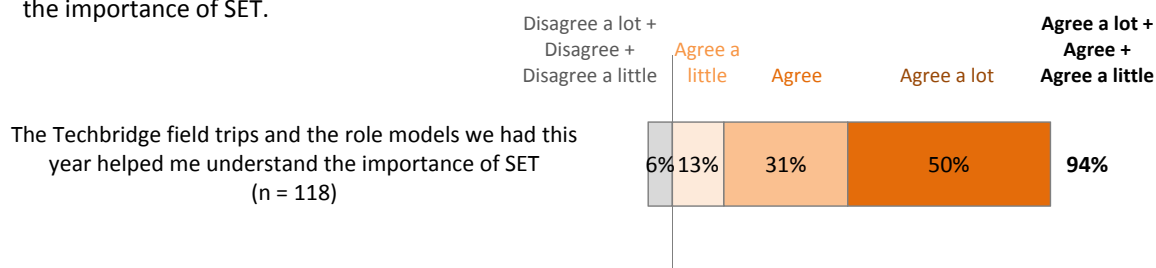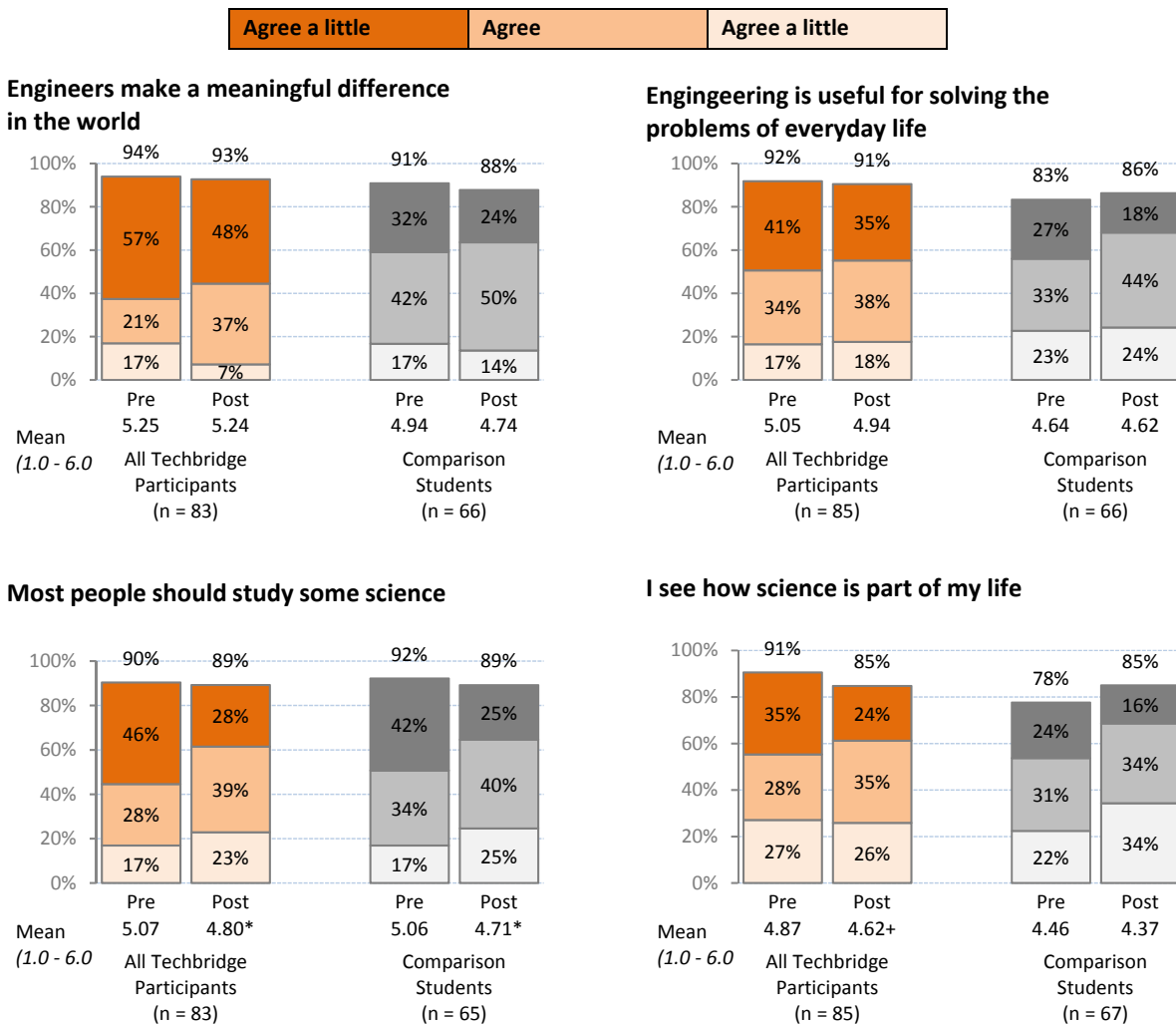
SET Relevance Scale (Combined Results of Survey Questions)

Figure 12. There was no difference between Techbridge and comparison students' mean SET relevance scale scores.

Difference in Techbridge vs. Comparison
Mean Post–Pre Scale Scores

Understand SET's relevance
Mean difference = 0.0
Not significant; α = .78

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +
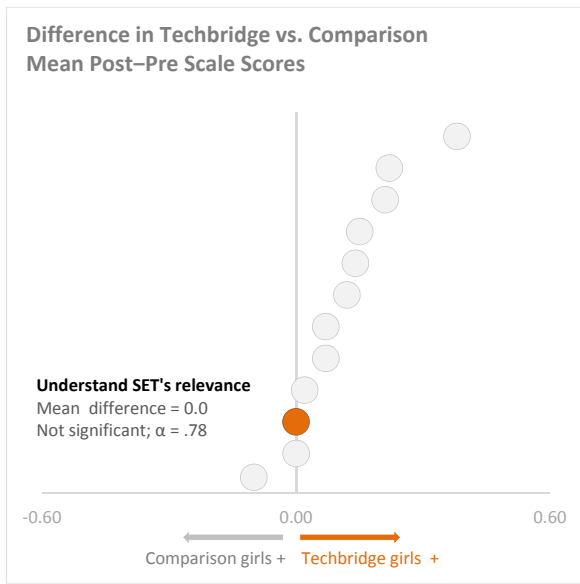
Results of Individual Survey Questions re: Girls' Understanding of SET's Relevance

Figure 13. Most Techbridge (and comparison) girls already understood SET's relevance and importance prior to Techbridge.

Agree a little	Agree	Agree a little

Engineers make a meaningful difference in the world

	Pre	Post		Pre	Post
	94%	93%		91%	88%
	57%	48%		32%	24%
	21%	37%		42%	50%
	17%	7%		17%	14%
Mean (1.0 - 6.0)	5.25	5.24		4.94	4.74
	All Techbridge Participants (n = 83)			Comparison Students (n = 66)	

Engingeering is useful for solving the problems of everyday life

	Pre	Post		Pre	Post
	92%	91%		83%	86%
	41%	35%		27%	18%
	34%	38%		33%	44%
	17%	18%		23%	24%
Mean (1.0 - 6.0)	5.05	4.94		4.64	4.62
	All Techbridge Participants (n = 85)			Comparison Students (n = 66)	

Most people should study some science

	Pre	Post		Pre	Post
	90%	89%		92%	89%
	46%	28%		42%	25%
	28%	39%		34%	40%
	17%	23%		17%	25%
Mean (1.0 - 6.0)	5.07	4.80*		5.06	4.71*
	All Techbridge Participants (n = 83)			Comparison Students (n = 65)	

I see how science is part of my life

|	Pre	Post		Pre	Post
	91%	85%		78%	85%
	35%	24%		24%	16%
	28%	35%		31%	34%
	27%	26%		22%	34%
Mean (1.0 - 6.0)	4.87	4.62+		4.46	4.37
	All Techbridge Participants (n = 85)			Comparison Students (n = 67)	

Source: Matched Student Pre/Post Surveys

★ **Key Findings re: Techbridge's Impact on Girls' Understanding of SET Career and Education Pathways**

Techbridge helped girls understand various career options in science, engineering, and technology and begin to learn about the pathways toward these careers. Techbridge girls showed greater gains in their knowledge of SET careers than comparison girls.

Results

- The vast majority of Techbridge girls (97%) agreed on the post-survey that Techbridge increased their knowledge about various careers, including 52% who agreed "a lot" (see Figure 14).

    Figure 14. 97% of girls said they learned SET careers in Techbridge.
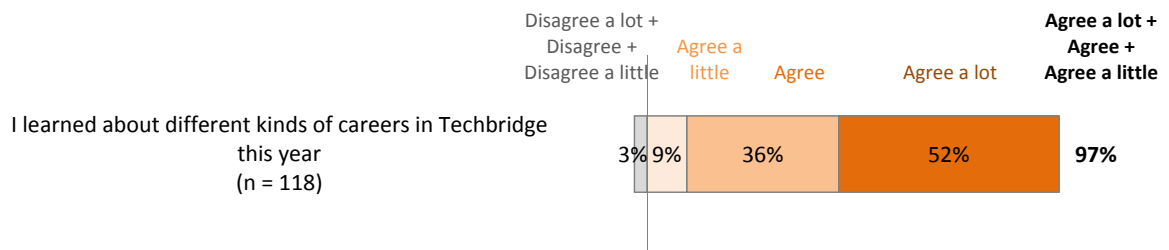
    Source: Student Post-Survey

- Girls particularly broadened their understanding of the field of engineering. As one middle school focus group participant explained,

    "The first thing that comes to mind when I hear 'engineering' is lab coats, little glasses; and you always have your face down where sparks are flying and everything; building a robot or a car that could drive itself, a solar car. That's what I normally think of when I think of engineering at first, before I started Techbridge. But now I know that engineering can be anything that involves building stuff. It could be building machines, building a game, it could be anything that you want to do—that all includes engineering."

- After participating in Techbridge, girls were significantly more likely to agree that they know what technology workers do (p < .05; see Figure 16). In contrast, comparison students' self-reported knowledge of what technology workers do actually declined.

- The pre- and post-surveys asked students three questions about how much they knew about SET careers and SET career pathways. Students were instructed to select from one of four possible answer choices: "I don't know anything about this," "I know a little," "I know some," or "I know a lot." More Techbridge students said they knew something about each topic on the post-survey. For example, the percentage of Techbridge students who said they know "some" or "a lot" about the type of things that people with SET careers do increased from 64% to 84% (p < .01). Techbridge participants made greater gains in their self-reported knowledge regarding SET jobs than comparison students (p < .10).
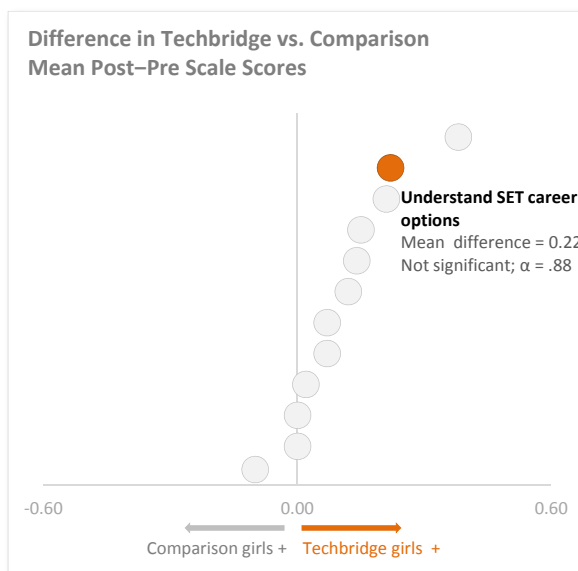
- The role model visits and field trips were particularly powerful ways for helping girls learn about SET careers and educational pathways. One girl said, "I like the field trips because they let you see exactly what career fields are out there and what you do in them."

- Teachers also thought Techbridge helped girls become more knowledgeable about SET careers and education pathways. The majority of teachers reported that girls became more knowledgeable about what SET workers do to a "large" or a "very large" extent (62%) and about what education they need for a SET career to a "large" or a "very large" extent (69%).

- Ninety-seven percent of the parents who completed the parent survey (n = 96) agreed that Techbridge had helped their daughter know more about how to prepare for a SET career.

"There was a lot of excitement around the field trip. The kids were super excited about what they were doing and talking about how the two or three people leading us around were the only women who worked there. They were amazed by that. Their minds were blown. 'If I were working here I'd be working with all these dudes.' That was cool because a lot of our girls are confident and sassy. 'I could do that. I could tell the boys what to do. I'm going to be the boss.' Field trips were big because they don't happen at our school."

Techbridge Teacher

SET Career/Education Pathways Scale (Combined Results of Survey Questions)

Figure 15. At year-end, Techbridge girls had a better understanding of SET career and education pathways than girls who hadn't participated in the program. This difference was not statistically significant.

Difference in Techbridge vs. Comparison Mean Post–Pre Scale Scores

Understand SET career options
Mean difference = 0.22
Not significant; α = .88

-0.60   0.00   0.60

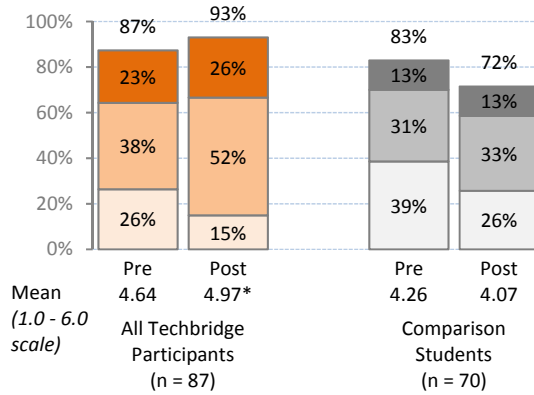Comparison girls +   Techbridge girls +

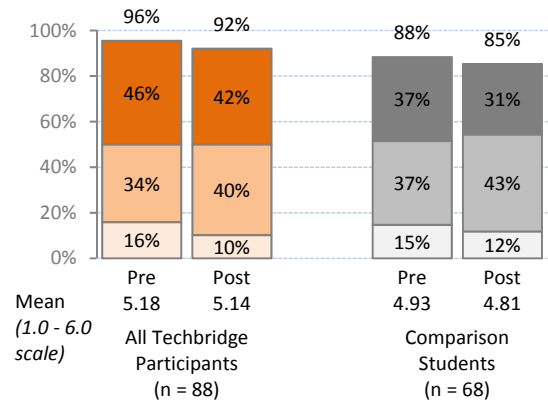## Results of Individual Survey Questions re: SET Career and Educational Pathways

Figure 16. Many Techbridge girls increased their knowledge about what SET workers do even though their self-reported knowledge was initially quite high.
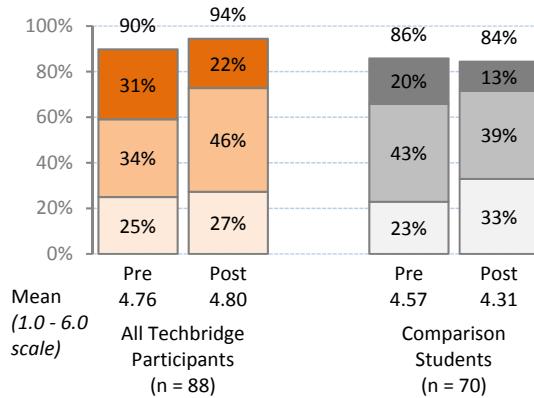
| Agree a little | Agree | Agree a little |

I know what people who work in technology do

Mean (1.0 - 6.0 scale)

All Techbridge Participants (n = 87): Pre 4.64, Post 4.97*
Comparison Students (n = 70): Pre 4.26, Post 4.07

Knowing technology will give me many career choices

Mean (1.0 - 6.0 scale)

All Techbridge Participants (n = 88): Pre 5.18, Post 5.14
Comparison Students (n = 68): Pre 4.93, Post 4.81

I know what scientists do

Mean (1.0 - 6.0 scale)

All Techbridge Participants (n = 88): Pre 4.76, Post 4.80
Comparison Students (n = 70): Pre 4.57, Post 4.31

Knowing science will give me many career choices

Mean (1.0 - 6.0 scale)

All Techbridge Participants (n = 87): Pre 5.30, Post 5.21
Comparison Students (n = 68): Pre 4.81, Post 4.57

I know what engineers do

Mean (1.0 - 6.0 scale)

All Techbridge Participants (n = 85): Pre 4.85, Post 4.92
Comparison Students (n = 67): Pre 4.39, Post 4.19
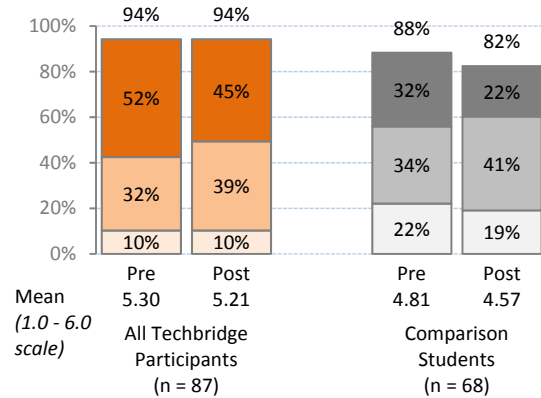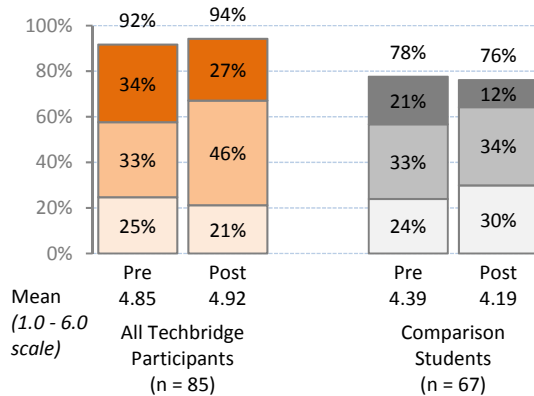
Knowing about engineering will give me many career choices

Mean (1.0 - 6.0 scale)

All Techbridge Participants (n = 88): Pre 5.16, Post 5.21
Comparison Students (n = 69): Pre 4.67, Post 4.51
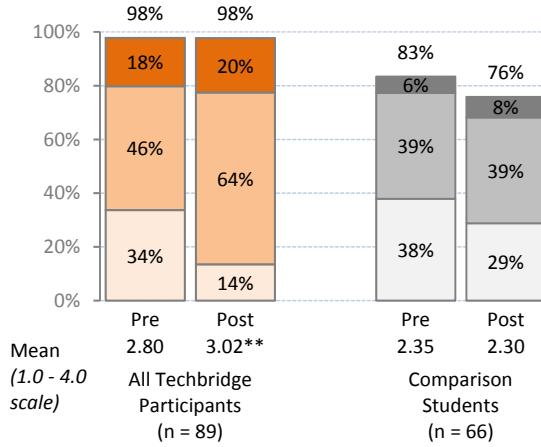
Source: Matched Student Pre/Post Surveys
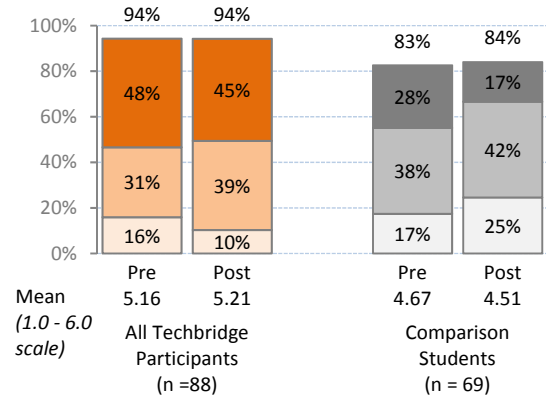
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Figure 17. More Techbridge girls said they understand SET careers and career pathways after participating in the program.
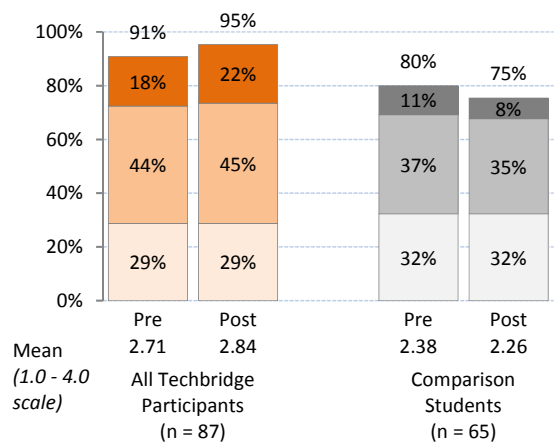
| I know a lot | I know some | I know a little |

The types of things that people with careers in SET do in their jobs
(Techbridge post-pre mean +0.27 > than comparison; p < .10)

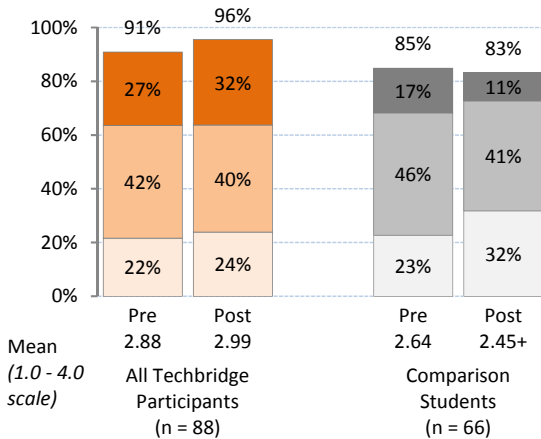| Mean (1.0 - 4.0 scale) | Pre 2.80 | Post 3.02** | Pre 2.35 | Post 2.30 |
| | All Techbridge Participants (n = 89) | | Comparison Students (n = 66) | |

The kinds of classes you need to take to have a career in SET

| Mean (1.0 - 4.0 scale) | Pre 2.71 | Post 2.84 | Pre 2.38 | Post 2.26 |
| | All Techbridge Participants (n = 87) | | Comparison Students (n = 65) | |

How to find information about careers in SET
(Techbridge post-pre mean +0.30 > than comparison; p < .10)

| Mean (1.0 - 4.0 scale) | Pre 2.88 | Post 2.99 | Pre 2.64 | Post 2.45+ |
| | All Techbridge Participants (n = 88) | | Comparison Students (n = 66) | |

Source: Matched Student Pre/Post Surveys

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3.3.5 What is Techbridge's impact on girls' interest in pursuing a SET career?

> ★ **Key Findings re: Techbridge's Impact on Girls' Interest in SET Careers**
>
> One of Techbridge's goals is to encourage girls to consider pursuing a career in science, engineering, or technology. Girls who were not previously interested in SET careers were more likely to say they were considering a career in SET after participating in Techbridge—70% of Techbridge girls who did not identify SET among their top three career choices on the pre-survey listed at least one SET career on the post-survey. (In contrast, only 19% of comparison girls who did not list a SET career on the pre-survey listed one on the post-survey.) The total percentage of Techbridge girls who listed at least one SET-related career among their top three choices climbed from 53% in the fall to 73% in the spring while the percentage of comparison students who did so declined slightly. The field trips and role model visits piqued many girls' interest in SET careers, exposing them to careers they did not know existed and helping them envision themselves doing that work.

Results

- Ninety percent of participants (90%) agreed that the Techbridge helped them think about their career goals, and 94% said the field trips and role models made them more interested in working in SET.

Figure 18. The majority of girls said Techbridge helped them become more interested in SET careers.
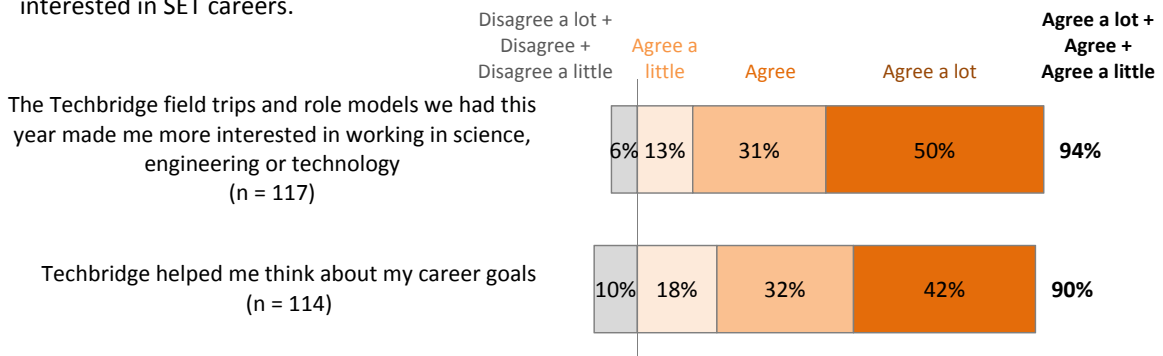
Source: Student Post-Survey

- After participating in Techbridge, girls were more slightly more likely to agree that they would like to be an engineer (increasing from 71% to 75%; see Figure 20). However, they were less likely to agree they would like to be a scientist (decreasing from 74% to 70%; $p < .05$) or have a job in technology (decreasing from 83% to 80%). However, these differences were small and only the decrease in technology job interest was statistically significant, and more than 70% of girls were interested in SET careers at year-end. There was no statistical difference between Techbridge participants and comparison students' SET career interest scale scores.

- On the surveys and in focus groups, some girls said Techbridge increased their interest in SET careers, many of which they had not previously known to exist:

"What I liked most about Techbridge was that we got to go to a lot of different field trips and those field trips made me think of becoming an engineer, scientist or other things."

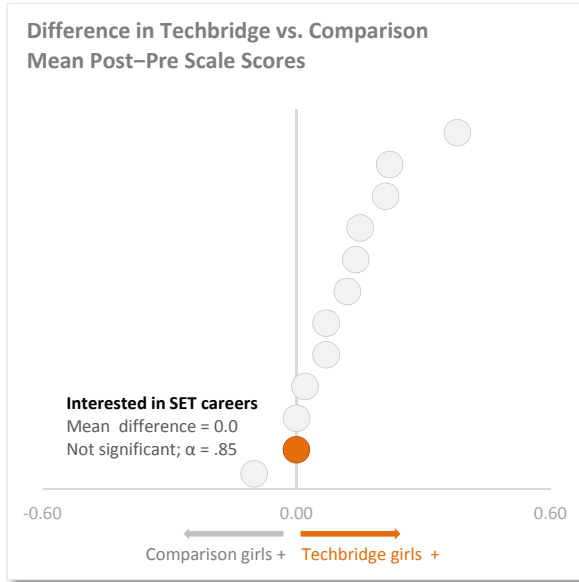"[Techbridge] gave me ideas about what can I do after I'm done with high school."

"The field trips [were my favorite] because I learned a lot and they were super fun, and I [got] to think about what I want to be when I grow up."

For other girls, Techbridge helped clarify what type of SET career they might be most interested in. For example, one middle school focus group participant said, "I've learned that I would like to be something related to science but I would not like to be an engineer scientist. I would like to work for people rather than on objects."

- Many parents reported that their daughters began talking about having a career in SET after attending Techbridge. When asked if their daughters talked about having a job in SET *before* attending Techbridge, 54% of parents said "yes." When asked if their daughters talked about a job in SET *since beginning* Techbridge, 74% of parents said "yes" (see Figure 24).
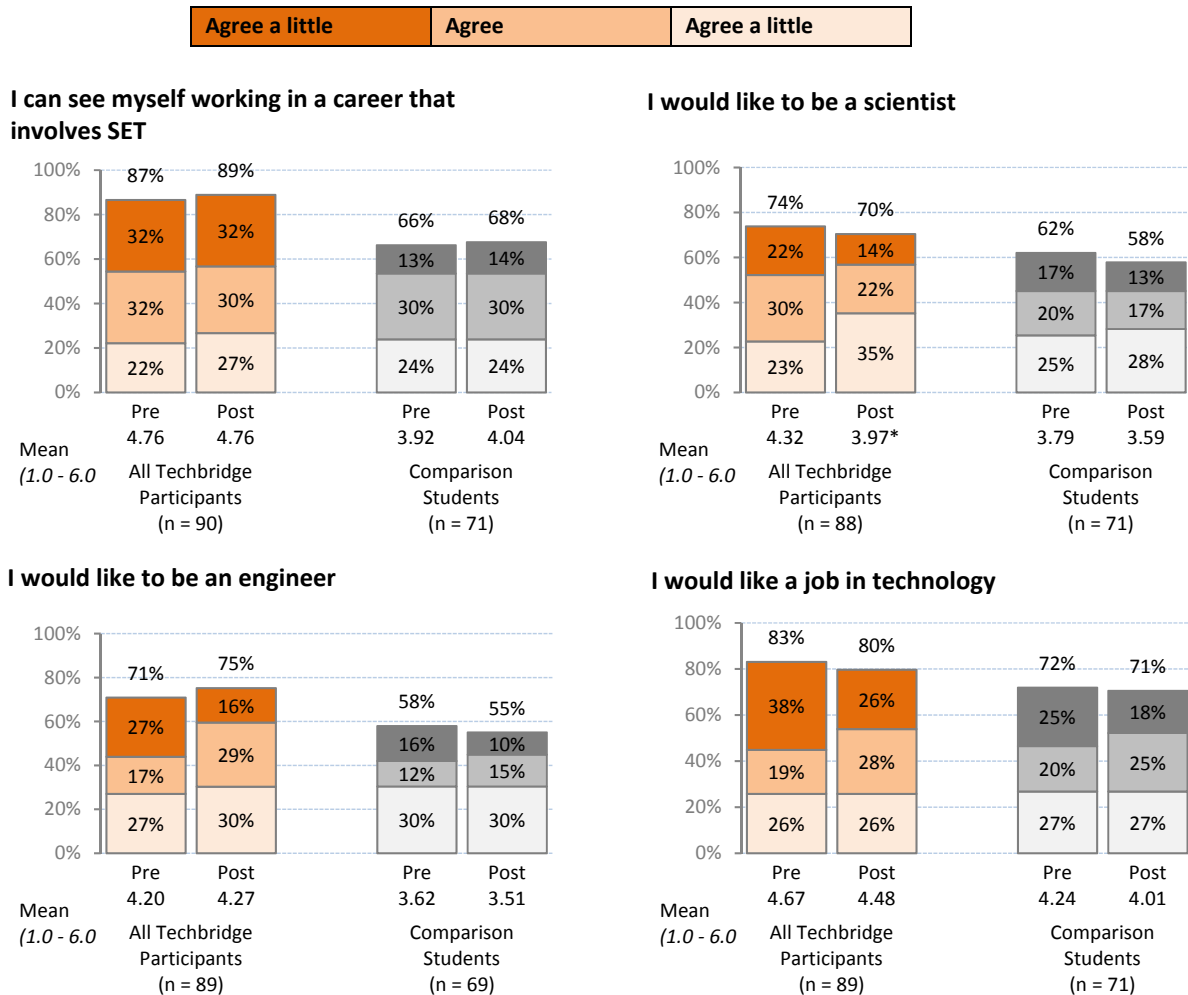
SET Career Interest Scale (Combined Results of Survey Questions)

Figure 19. There was no difference between Techbridge and comparison students' SET career interest scale scores.

Difference in Techbridge vs. Comparison Mean Post–Pre Scale Scores

Interested in SET careers
Mean difference = 0.0
Not significant; α = .85

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +

Results of Individual Survey Questions

Figure 20. More Techbridge girls said they were interested in engineering careers after Techbridge, but lss interested in a career in science.
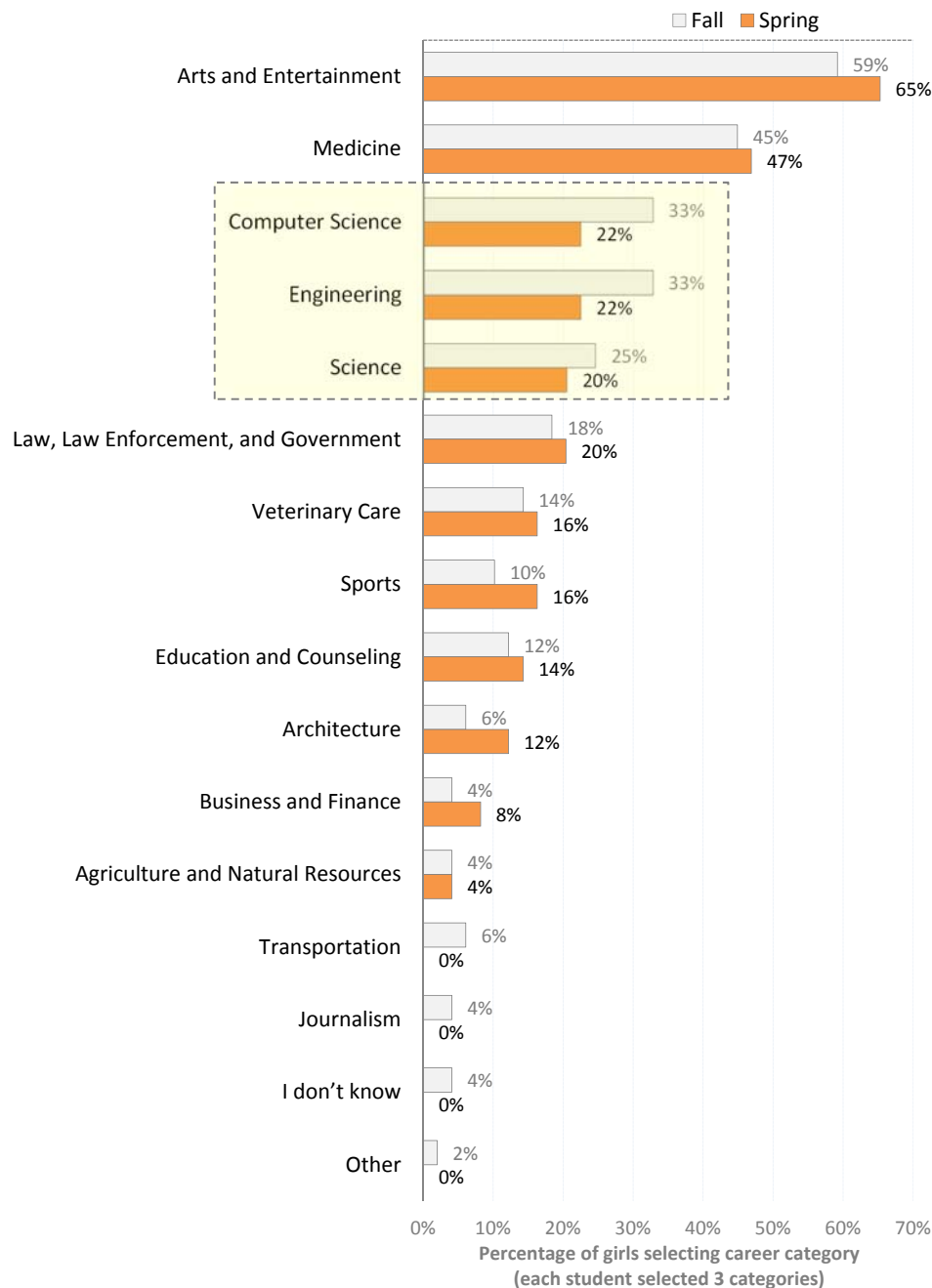
| Agree a little | Agree | Agree a little |

I can see myself working in a career that involves SET

	Pre 4.76	Post 4.76	Pre 3.92	Post 4.04
	87%	89%	66%	68%

Mean (1.0 - 6.0)   All Techbridge Participants (n = 90)   Comparison Students (n = 71)

I would like to be a scientist

	Pre 4.32	Post 3.97*	Pre 3.79	Post 3.59
	74%	70%	62%	58%

Mean (1.0 - 6.0)   All Techbridge Participants (n = 88)   Comparison Students (n = 71)

I would like to be an engineer

	Pre 4.20	Post 4.27	Pre 3.62	Post 3.51
	71%	75%	58%	55%

Mean (1.0 - 6.0)   All Techbridge Participants (n = 89)   Comparison Students (n = 69)

I would like a job in technology

	Pre 4.67	Post 4.48	Pre 4.24	Post 4.01
	83%	80%	72%	71%

Mean (1.0 - 6.0)   All Techbridge Participants (n = 89)   Comparison Students (n = 71)

Source: Matched Student Pre/Post Surveys

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The pre- and post-surveys asked students to choose three career categories they expected to have when they grow up from a provided list of 15 categories. Students were also given the options to select "I don't expect to have a career" or "I don't know," or write in a career(s). Figure 21 shows the types of careers Techbridge girls indicated they were interested in at the beginning and end of the year, in order from most to least frequently selected.

Figure 21. Computer science, engineering and science careers were amongst the most popular careers Techbridge girls said they were interested in.

Pre- and Post-Survey Question: What kind of career do you expect to have when you grow up? Check the <u>TOP THREE</u> job categories you expect to have when you grow up.

Category	Fall	Spring
Arts and Entertainment	59%	65%
Medicine	45%	47%
Computer Science	33%	22%
Engineering	33%	22%
Science	25%	20%
Law, Law Enforcement, and Government	18%	20%
Veterinary Care	14%	16%
Sports	10%	16%
Education and Counseling	12%	14%
Architecture	6%	12%
Business and Finance	4%	8%
Agriculture and Natural Resources	4%	4%
Transportation	6%	0%
Journalism	4%	0%
I don't know	4%	0%
Other	2%	0%

Percentage of girls selecting career category
(each student selected 3 categories)

Source: Matched Techbridge Participant Pre/Post Surveys; n = 49

The previous chart (Figure 21) shows that a *smaller* percentage of girls selected computer science, engineering and science as careers they were interested in at the end of the year, which at first glance might make it appear that girls became *less* interested in SET careers following participation in the program. However, many Techbridge participants actually narrowed their interests in which type of SET career they were interested in, but remained interested in having some type of SET career. For example, a girl who said she was interested in both science and engineering careers on the pre-survey indicated she was interested in just a career in engineering on the post-survey. The majority of Techbridge participants who said there interested in a SET career at the beginning of the year remained interested in having a SET career at the end of the year (77%).

Figure 22. When asked to pick three kinds of careers that they would like to be in when they grow up, **more Techbridge students listed a SET-related career** in the spring (73%) than in the fall (53%) (i.e., selected computer science, engineering and/or science). In contrast, the percentage of **comparison students** who listed at least one SET-related career declined.

Pre- and Post-Survey Question: What kind of career do you expect to have when you grow up? Check the TOP THREE job categories you expect to have when you grow up.
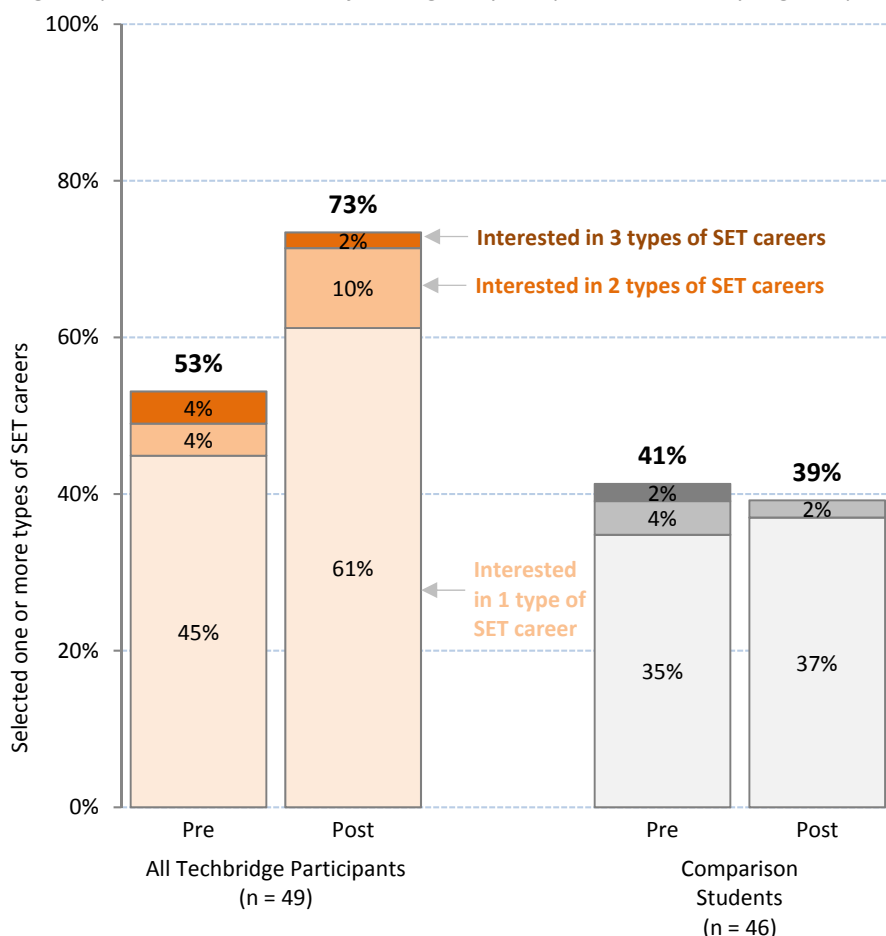
Source: Matched Student Pre/Post Surveys

Figure 23. Girls who were not previously interested in SET careers were more likely to say they were interested in a SET career after participating in Techbridge. Well **over half of the Techbridge girls (70%)** who had <u>not</u> listed a SET career category on the pre-survey listed at least one SET career on the post-survey. In contrast, **only 19% of comparison girls** who did not list a SET career on the pre-survey listed one on the post-survey.

Pre- and Post-Survey Question: What kind of career do you expect to have when you grow up? Check the <u>TOP THREE</u> job categories you expect to have when you grow up.
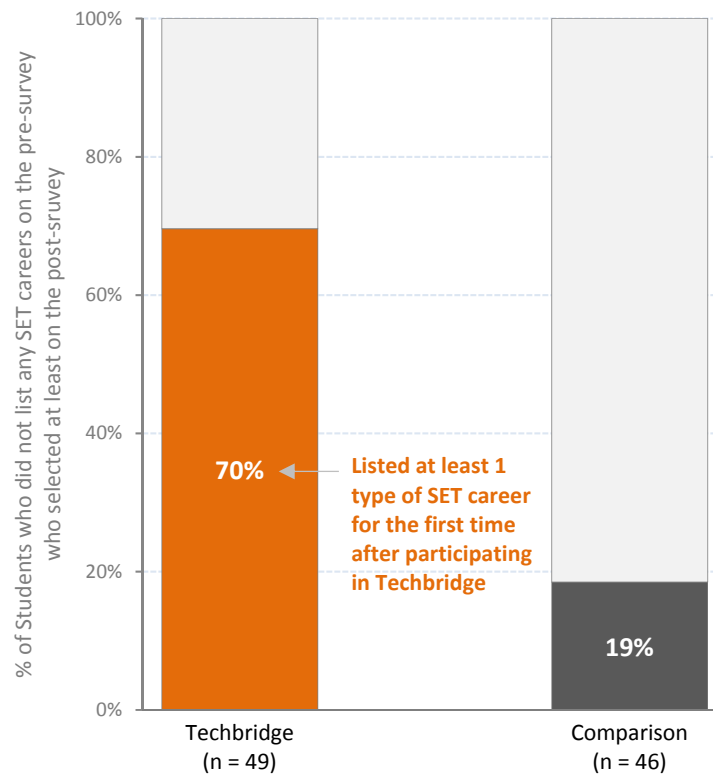
Source: Matched Student Pre/Post Surveys

Figure 24. More parents reported that girls talked about having a job in SET after participating in Techbridge.

Did you daughter talk about having a job in SET?
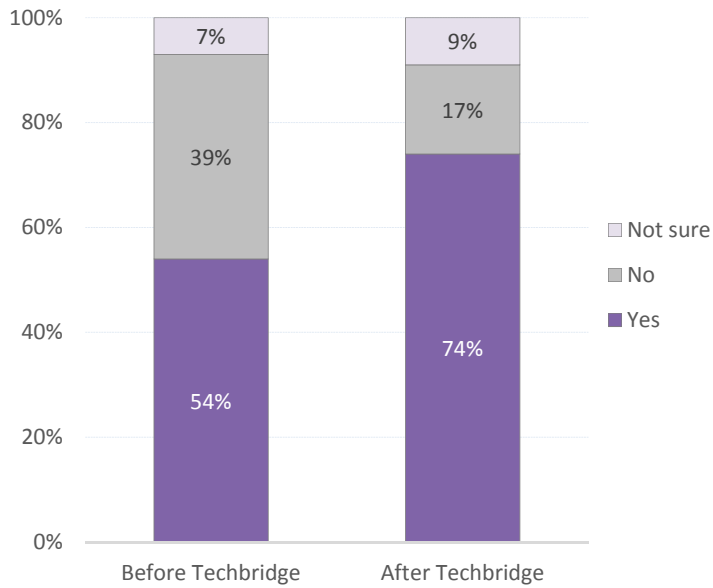
Source: Parent Survey; n = 95

3.3.6   What is Techbridge's impact on girls' understanding of gender inequities in SET and strategies to ameliorate or overcome them?

★ **Key Findings re: Techbridge's Impact on Girls' Understanding of Gender Inequities in SET**

Techbridge may have primarily served girls who already thought SET has good career options for women. Even before Techbridge, participants were almost twice as likely as comparison girls to see engineering as a good career for women. Compared to other program Techbridge elements, teachers were less likely to report that their programs talked about gender inequities in STEM or that the program had a strongly influenced girls' understanding of gender inequities or how to overcome them. Still, many Techbridge participants said that Techbridge reinforced the message that "girls can do anything," including SET.

Results

- The student surveys did not specifically ask students about their understanding of gender inequities in SET or strategies to overcome inequities. However, the pre- and post-surveys asked girls to indicate their agreement with the statement that "engineering is a good career for women." The vast majority of Techbridge students already saw engineering as a good career option for women before participating in the program. At the beginning of the year, 93% of the girls agreed that engineering is a good career for women (with 70% agreeing "a lot"; see Figure 25).[9] Comparison students had slightly less positive attitudes, with 39% agreeing "a lot" on the pre-survey that engineering is a good career for women.

- On the surveys and in focus groups, some girls said Techbridge's all-girl environment was empowering:

    "Techbridge…encourages girls to think about if they want to be in technology, engineering or science. It also helps us think that not only men can do these kinds of things."

    "It helps you think more about your career and how just because we are girls does not mean we can't do that."

    "[Techbridge] tells girls they can do anything."

    "Techbridge helps me know that science [is] important and it's for girls. People think that girls are not strong but they are."

- Teachers were relatively less likely to report that their program had explicitly talked about gender inequities in STEM (compared to other Techbridge program elements). Perhaps as a consequence,

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[9] Because there was only one student survey question related to gender equity, it was not appropriate to create a scale score combining students' responses to multiple questions. Therefore, no chart is shown comparing the difference of difference as was done for the other student outcomes.

teachers were also less likely to indicate that Techbridge had an influence on girls' understanding of gender inequalities within SET compared to other student outcomes. Sixty-nine percent of teacher respondents agreed said their girls had more knowledge of gender inequities in SET to a "large" or "very large" extent, and 54% of teachers said girls had strategies to overcome them to a "large" or "very large" extent.

Results of Individual Survey Questions

Figure 25. The vast majority of Techbridge girls (70%) <u>strongly</u> agreed that engineering is a good career for women even before participating in Techbridge.

Agree a little	Agree	Agree a little

I think engineering is a good career for women

	Pre 5.48	Post 5.49	Pre 4.93	Post 4.90

Mean
(1.0 - 6.0

All Techbridge Participants (n = 86)

Comparison Students (n = 70)

Source: Matched Student Pre/Post Surveys
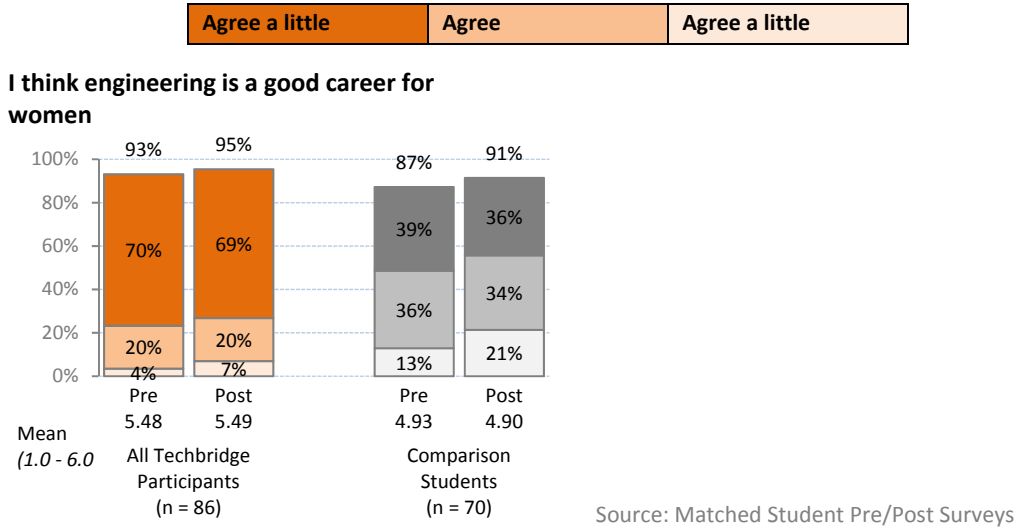
3.3.7 What is Techbridge's impact on girls' understanding of processes and practices commonly used in SET, and ability to use these practices (e.g., using the engineering design process)?

★ **Key Findings re: Techbridge's Impact on Girls' Understanding of SET Practices**

Techbridge helped girls understand various processes and practices commonly used in SET, such as the engineering design process. Of the various outcomes addressed by the evaluation, the Techbridge program appeared to have the greatest impact on girls' understanding of and ability to use SET practices.

Results

- The percentage of Techbridge girls indicating they know what the engineering design process is increased from 71% at the beginning of the year to 89% at the end of the year (p < .001; see Figure 27). Similarly, the percentage of Techbridge girls who agreed they know how to use the engineering design process to build something increased from 74% to 90% (p < .05). (In contrast, only about half the comparison girls indicated they knew what the engineering design process is or how to use it

at the end of the year.) The average Techbridge student's mean SET practice scale score was 0.38 points higher than the average comparison student's (see Figure 26; p < .01).

- Of the various student outcomes that teachers were asked about, teachers said that Techbridge had the greatest impact on girls' understanding of the engineering design process. All but one teacher (92%) said the majority of their girls increased their ability to use the engineering design process to a "large" or a "very large" extent.

SET Practices Scale (Combined Results of Survey Questions)

Figure 26. Techbridge had a significant impact on girls' understanding of SET practices like the engineering design process.
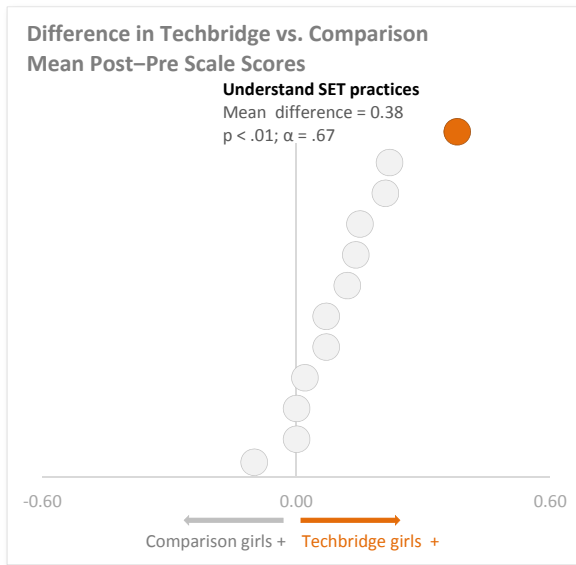
Results of Individual Survey Questions

Figure 28. More Techbridge girls understood SET practices after participating in the program.

Agree a little	Agree	Agree a little

I know what the engineering design process is

(Techbridge post-pre mean +0.80> than comparison; p < .001)

Mean (1.0 - 6.0 scale)

	Pre 4.16	Post 4.83***	Pre 3.65	Post 3.52
	All Techbridge Participants (n = 89)		Comparison Students (n = 65)	

I know how to use the engineering design process to build something

Mean (1.0 - 6.0 scale)

	Pre 4.36	Post 4.64*	Pre 3.52	Post 3.56
	All Techbridge Participants (n = 89)		Comparison Students (n = 66)	
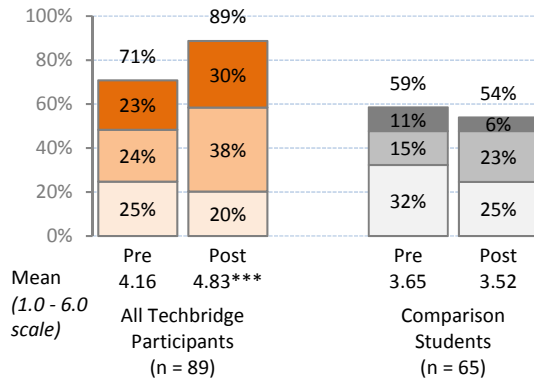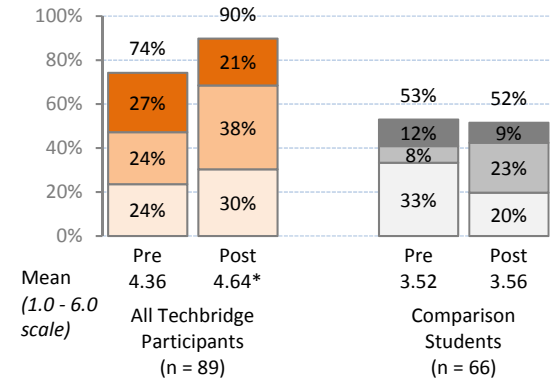
I know how to compare different designs to figure out the best way to solve a problem

Mean (1.0 - 6.0 scale)

	Pre 4.56	Post 4.81+	Pre 4.07	Post 4.07
	All Techbridge Participants (n = 89)		Comparison Students (n = 68)	
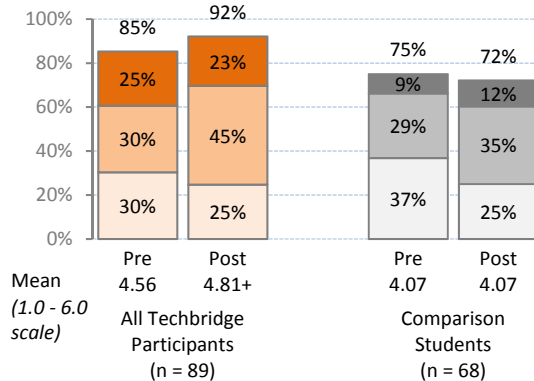
If a project is not going well, I am able to make changes as needed

(Techbridge post-pre mean +0.56> than comparison; p < .05)

Mean (1.0 - 6.0 scale)

	Pre 5.16	Post 5.08	Pre 4.99	Post 4.35**
	All Techbridge Participants (n = 90)		Comparison Students (n = 68)	
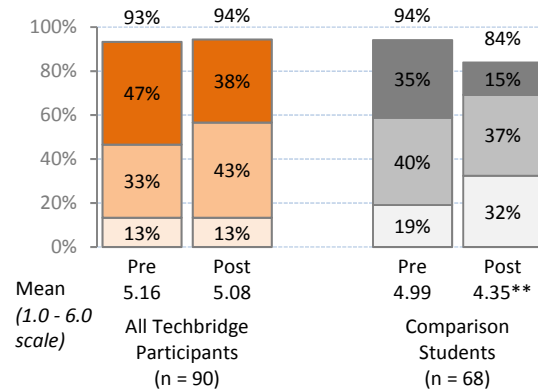
Engineers design things perfectly the first time
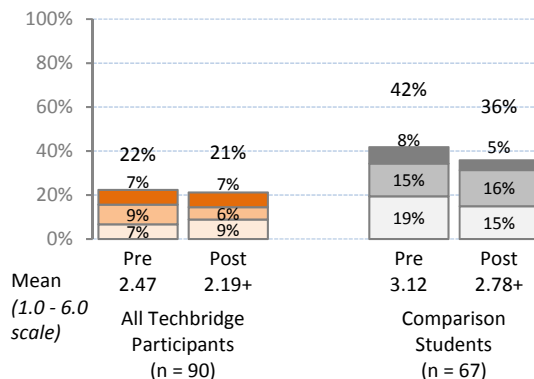
Mean (1.0 - 6.0 scale)

	Pre 2.47	Post 2.19+	Pre 3.12	Post 2.78+
	All Techbridge Participants (n = 90)		Comparison Students (n = 67)	

Source: Matched Student Pre/Post Surveys

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★   **Key Findings re: Techbridge's Impact on Growth Mindset**

Techbridge girls, teachers, and parents reported that Techbridge helped girls become better problem-solvers and to persevere in the face of obstacles. Techbridge participants were more likely than comparison students to ascribe to statements suggesting they have a growth mindset, such as understanding that intelligence is malleable (although the difference wasn't statistically significant). Techbridge's emphasis on the engineering design cycle provides many opportunities for girls to problem-solve, struggle, and not give up. Program coordinators and teachers gently encouraged girls to be patient and persist if they felt frustrated while working on an engineering design challenge.

Results

- The vast majority of Techbridge girls said that Techbridge helped them understand the value of perseverance. A total of 97% of girls agreed that Techbridge helped them understand that it can take many tries to solve a problem, including 51% of girls who agreed "a lot" with this statement.

Figure 29. 97% of girls said Techbridge helped them understand it can take many tries to solve a problem.
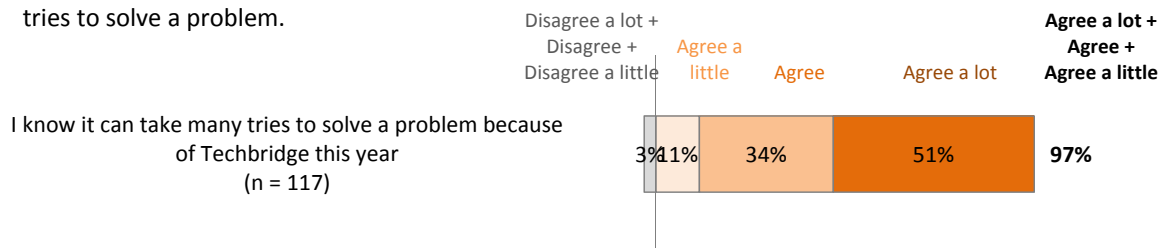
Source: Student Post-Survey

- Techbridge girls' responses to pre-survey questions suggest that many of them already had a growth mindset at the beginning of the school year. For example, on the pre-survey, 97% of Techbridge girls agreed that they learn more when they make mistakes (including 59% who agreed with this statement "a lot"). That said, some participants were more likely to have a growth mindset following participation in Techbridge. For example, the percentage of participants who agreed that intelligence is immutable ("I can't change how smart I am"), declined from 49% on the pre-survey to 38% on the post-survey ($p < .05$). Comparison ratings declined on this item as well (though not significantly).

- Techbridge provides a safe space for girls to take risks, fail, and learn from failure. A number of focus group participants said Techbridge helped them learn problem-solving strategies, as well as the value of patience and persistence. Girls' comments included:

    "We'll view a certain thing bad about ourselves and say, "Well, I can't do this. Why should I even try? I'm not going to make anything." [The PC] tries to find a way to help us do our work but

without her telling us what to do. If we still don't know what to do, then she'll come and sit down next to you one-on-one and then tell you what this is supposed to do, maybe if you do this, that might work. She doesn't leave you hanging or let you give up."

"What I learned in Techbridge was to be patient with things and have a lot of strategies."

"I learned patience a lot too because at first I was like, 'Why does it take all of this explaining?' Whenever I don't like a club, the first few days are always explaining and then after a while I learn that all of that explaining was worth it. It wasn't that boring. [The PC] made it fun."

"I learned how to grow as a good person because at first I was just ready to... just go do all of this cool stuff. At first, we had to start slow because we just started and I use to be so bored. It irritated me. I didn't want to [go to] Techbridge. But I learned how to be patient, wait and just be appreciative that we're even getting this stuff. With soldering, this is something that a twelfth grader would be doing by now. It's very risky in a way, but that's what I like to do—try something new. It's actually enjoyable."

- Teachers said Techbridge helped girls develop a growth mindset orientation: 92% of teachers said the majority of their girls became more likely to believe that they could improve their SET abilities with time, practice, and effort to a "large" or "very large" extent; 85% of teachers said that the majority of their students actually were more persistent in the face of challenges to a "large" or "very large" extent. Teachers also reported that their girls became better problem-solvers through their participation in Techbridge. 77% of the teachers said that the majority of the girls in their program are better able to construct an argument based on evidence to a "large" or "very large" extent.

- Ninety-six of parents completing the parent survey reported that, because of Techbridge, their daughters believed that they can become better in SET with hard work. Furthermore, the vast majority of parents reported that their girls were more willing to take try new things (96% agreed) and to work through challenges (94%) because of Techbridge.

> "I can do more than I [thought]. If they show me like this, I'll be like, 'I doubt it. I can't do that. It's too hard.' Or, 'I [can't] do things that hard.' They'll be like, 'It may look hard. Even though it's hard, or challenging, you just got to put your mind to it, and focus on it, and you can do it.'"
>
> Techbridge Participant

Growth Mindset Scale (Combined Results of Survey Questions)

Figure 30. Techbridge students demonstrated more of growth mindset than comparison students.
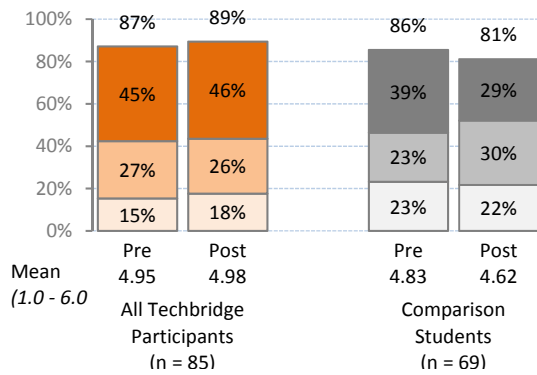

Difference in Techbridge vs. Comparison
Mean Post–Pre Scale Scores

Growth mindset
Mean difference = 0.21
p < .10; α = .58

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +
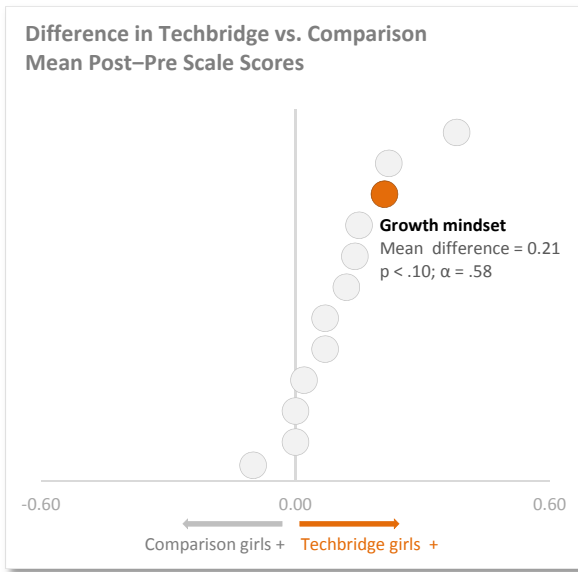
Results of Individual Survey Questions

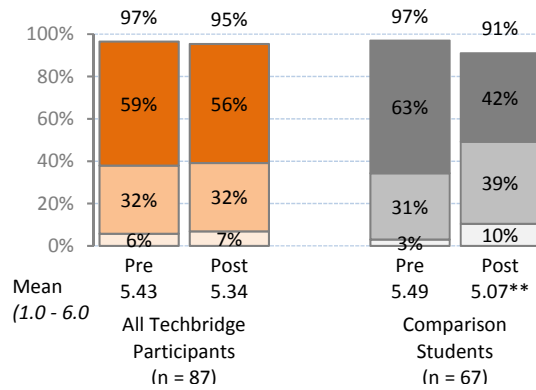**Figure 31.** Girls were more likely to have a growth mindset after participating in Techbridge.

Agree a little	Agree	Agree a little

I think I learn more when a tasks is challenging

	Pre	Post	Pre	Post
Mean (1.0 - 6.0)	4.95	4.98	4.83	4.62
	All Techbridge Participants (n = 85)		Comparison Students (n = 69)	

I learn more when I make mistakes

(Techbridge post-pre mean +0.34> than comparison; p < .10)

	Pre	Post	Pre	Post
Mean (1.0 - 6.0)	5.43	5.34	5.49	5.07**
	All Techbridge Participants (n = 87)		Comparison Students (n = 67)	

I like doing work that I'll learn from even if I make a lot of mistakes
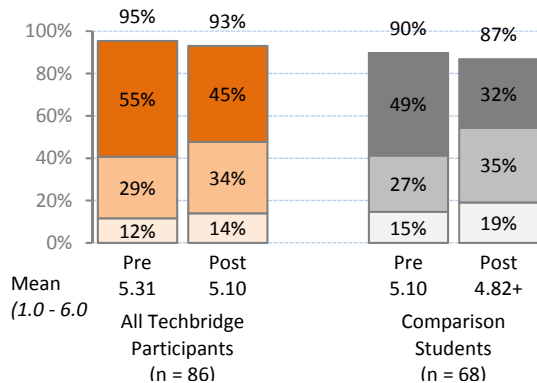
	Pre	Post	Pre	Post
Mean (1.0 - 6.0)	5.31	5.10	5.10	4.82+
	All Techbridge Participants (n = 86)		Comparison Students (n = 68)	

I can't change how smart I am

	Pre	Post	Pre	Post
Mean (1.0 - 6.0)	3.36	2.85*	3.76	3.41
	All Techbridge Participants (n = 87)		Comparison Students (n = 68)	
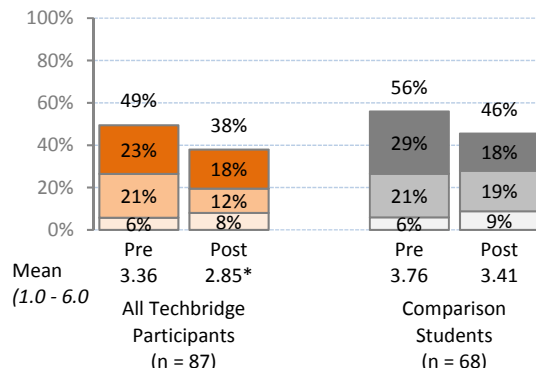
Source: Matched Student Pre/Post Surveys

★   **Key Findings re: Techbridge's Impact on Girls' Collaboration Skills**

Techbridge girls' self-reported attitudes toward teamwork and teamwork skills were very positive prior to their involvement in Techbridge and generally remained high at the end of the year. While the pre/post-survey results suggest little change in girls' collaboration skills, many girls said Techbridge made them better at working in teams and with partners they did not know.

Results

- The majority of girls (91%) said they improved their teamwork skills because of Techbridge.

Figure 31. The majority of girls said Techbridge improved their teamwork skills.
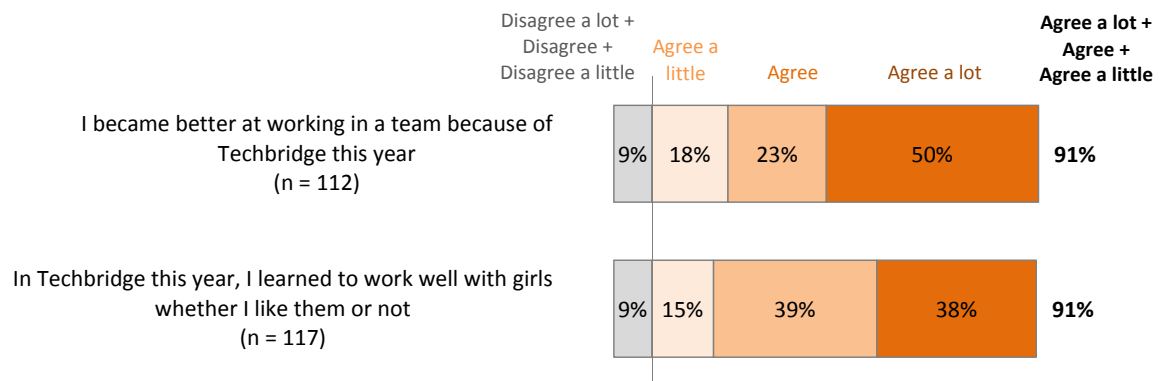
Source: Student Post-Survey

- Techbridge girls' responses suggest that most of them already valued teamwork at the beginning of the school year: on the pre-survey, 92% of Techbridge girls agreed working with others is usually more fun than working alone (including 55% who agreed with this statement "a lot"; see Figure 33).

- Many girls said they appreciated that Techbridge emphasized group work (it was one of the reasons girls cited for liking the program). A few girls said Techbridge improved their collaboration and teamwork skills:

    "It helped me a lot with working with people."

    "They showed me that working with a team is good."

- 84% of teachers thought the majority of their girls had developed teamwork skills to a "large" or "very large" extent because of Techbridge.

Collaboration Skills Scale (Combined Results of Survey Questions)

Figure 32. The average Techbridge student's mean collaboration skills scale score was 0.10 lower than the average comparison student's. However, this difference was not statistically significant.

Difference in Techbridge vs. Comparison Mean Post–Pre Scale Scores

Collaboration skills
Mean difference = -0.10
Not significant; α = .74

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +
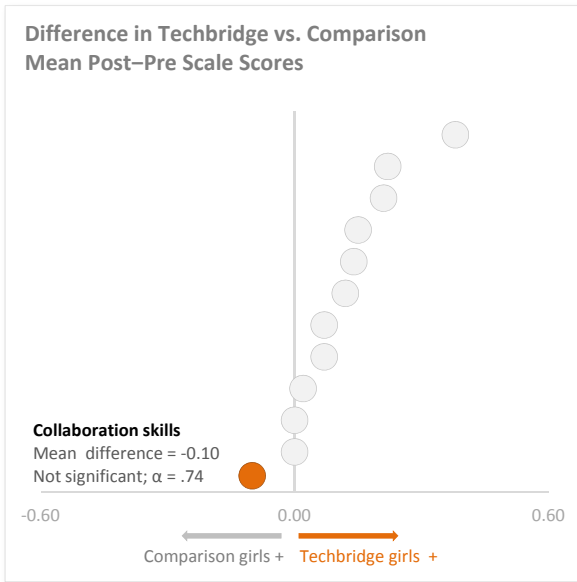
Results of Individual Survey Questions

Figure 33. Girls' collaboration skills were already high and changed relatively little following Techbridge.

Agree a little	Agree	Agree a little

I work well with different types of students

	Pre 4.83	Post 4.52*	Pre 4.86	Post 4.54+

Mean (1.0 - 6.0) | All Techbridge Participants (n = 89) | Comparison Students (n = 70)

I like being part of a team

	Pre 5.44	Post 4.98**	Pre 5.24	Post 5.01

Mean (1.0 - 6.0) | All Techbridge Participants (n = 88) | Comparison Students (n = 67)

Working with others is usually more fun than working alone

	Pre 5.16	Post 5.14	Pre 5.17	Post 5.06

Mean (1.0 - 6.0) | All Techbridge Participants (n = 88) | Comparison Students (n = 70)

I learn better when I am working with others

	Pre 5.05	Post 4.84	Pre 5.13	Post 4.78+

Mean (1.0 - 6.0) | All Techbridge Participants (n = 87) | Comparison Students (n = 69)

I learn better when I am by myself

	Pre 3.66	Post 3.63	Pre 3.91	Post 3.46+

Mean (1.0 - 6.0) | All Techbridge Participants (n = 89) | Comparison Students (n = 70)

Source: Matched Student Pre/Post Surveys

3.3.10 **What is Techbridge's impact on girls' speaking skills and confidence in expressing their ideas?**

⭐ **Key Findings re: Techbridge's Impact on Girls' Speaking Skills/Confidence**

While some Techbridge girls reported having more confidence in public speaking situations, others did not make gains in their public speaking skills or confidence. Public speaking is an area of growth for Techbridge participants.

Results

- Compared to other program impacts, girls reported that Techbridge had relatively less influence on their speaking skills. The large majority of Techbridge girls (86%) agreed that the program helped them become more comfortable speaking in front of a group of people, but only 29% agreed "a lot."

Figure 34. 77% of girls said Techbridge helped them become more comfortable speaking in front of a group of people.

	Disagree a lot + Disagree + Disagree a little	Agree a little	Agree	Agree a lot	Agree a lot + Agree + Agree a little
I am more comfortable speaking in front of a group of people because of Techbridge this year (n = 118)	14%	25%	32%	29%	**86%**
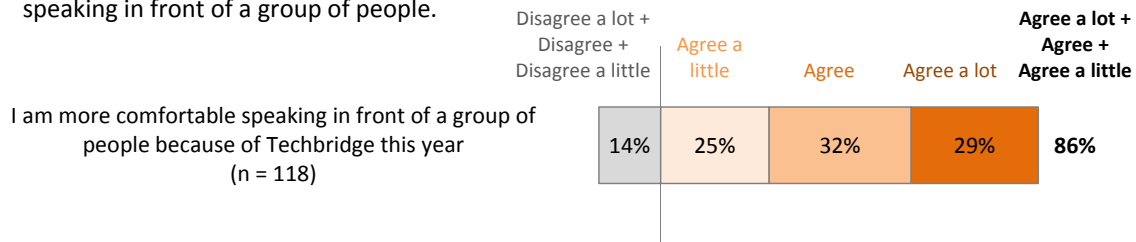
- Techbridge girls saw the value of presenting—the vast majority of Techbridge girls said presenting in front of others makes them feel proud (85% on the pre-survey and 84% on the post-survey). However, the percentage of Techbridge girls who indicated they actually felt comfortable in public speaking situations declined slightly (although not statistically significantly) from the beginning to the end of the year. For example, fewer girls said they feel they do a good job when they present (declining from 87% to 84%) and fewer girls said they like to speak up in class (declining from 76% to 69%).

- Similar to students, teachers were also somewhat less likely to report that girls had improved their public speaking skills versus other student outcomes: 62% of teachers said their girls were more likely to speak up in a group and were more comfortable speaking in front of a group to a "large" or "very large" extent.

- The vast majority of parents believed that Techbridge helped their daughters improve their communication skills: 95% agreed their daughter was better able to communicate her ideas to other people.

Speaking Skills/Confidence Scale (Combined Results of Survey Questions)

Figure 35. Techbridge and comparison students were both less likely to report they felt confident public speaking by year-end. Because comparison girls' confidence declined relatively more, Techbridge participants showed slight gains.

Difference in Techbridge vs. Comparison
Mean Post–Pre Scale Scores

Speaking skills/confidence
Mean difference = 0.07
Not significant; α = .85

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +
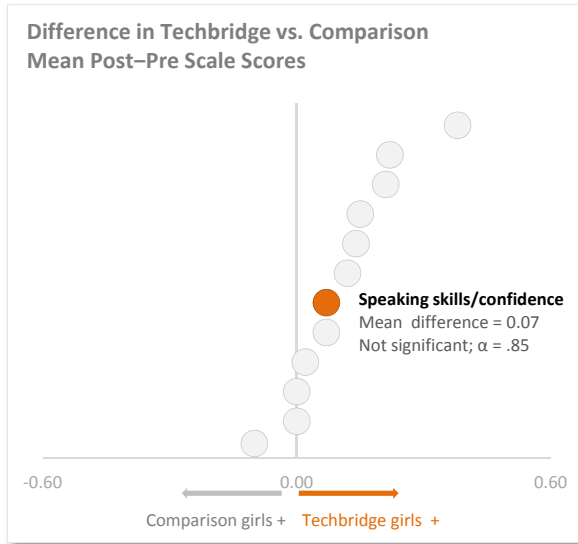
Results of Individual Survey Questions

Figure 36. Some Techbridge girls improved their speaking skills and confidence.

Agree a little	Agree	Agree a little

Presenting something in front of other people makes me feel proud

	Pre 4.73	Post 4.64	Pre 4.42	Post 4.15
Mean (1.0 - 6.0)	All Techbridge Participants (n = 88)		Comparison Students (n = 67)	

I feel like I do a good job when I present to other people

	Pre 4.74	Post 4.61	Pre 4.31	Post 4.13
Mean (1.0 - 6.0)	All Techbridge Participants (n = 89)		Comparison Students (n = 70)	

I am comfortable speaking in front of a group of people

	Pre 4.27	Post 4.17	Pre 4.01	Post 3.80
Mean (1.0 - 6.0)	All Techbridge Participants (n = 88)		Comparison Students (n = 69)	

I like to speak up in class

	Pre 4.34	Post 4.08	Pre 3.70	Post 3.67
Mean (1.0 - 6.0)	All Techbridge Participants (n = 88)		Comparison Students (n = 66)	

Source: Matched Student Pre/Post Surveys

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★ **Key Findings re: Techbridge's Impact on Girls' Plans to Pursue SET Education**

Techbridge appeared to have a positive impact on girls' interest in studying engineering or technology in college. Following participation in Techbridge, 84% of participants said they planned to study engineering (vs. 75% before Techbridge) and 86% of participants said they planned to study computer science (vs. 77% before Techbridge). In contrast, comparison students' reported intentions to study engineering or computer science declined over the course of the year.

Results

- The majority of Techbridge girls (92%) said that Techbridge had specifically increased their interest in studying engineering in college.

Figure 37. 92% of girls said Techbridge increased their interest in studying engineering in college.
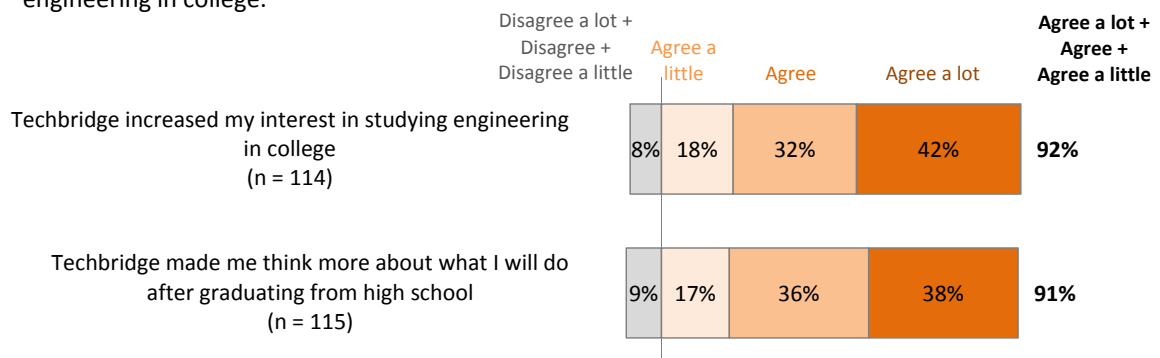
Source: Student Post-Survey

- More than three-quarters of Techbridge girls agreed they planned to study science, engineering, or technology in college after participating in Techbridge. The percentage of Techbridge girls who said they planned to study *computer science* in college increased from 77% to 86%, while the percentage of girls who said they were interested in studying *engineering* increased from 75% to 84%. In contrast, comparison students' interest in studying SET remained the same or declined from pre- to post.

- The majority of parents (96%) agreed their daughters were more interested in taking SET classes in high school and college because of Techbridge.

SET Education Scale (Combined Results of Survey Questions)

Figure 38. After participating in Techbridge, girls were more likely report they plan to pursue SET education.

Difference in Techbridge vs. Comparison
Mean Post–Pre Scale Scores

Plan to pursue SET education
Mean difference 0.14
Not significant; α = 78

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +
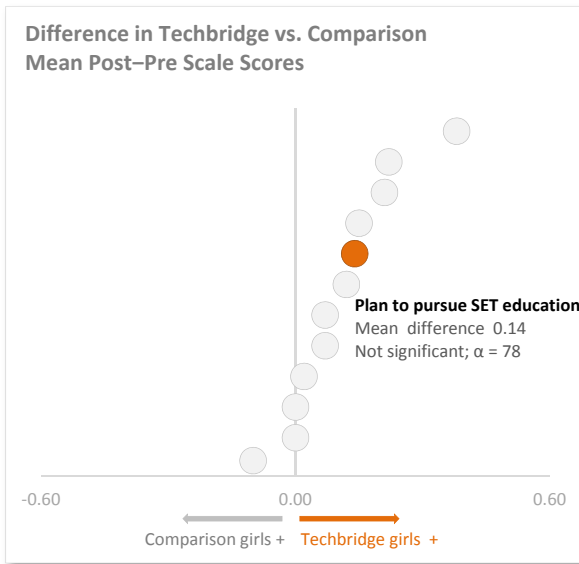
Results of Individual Survey Questions

Figure 39. More participants intended to study engineering or computer science after Techbridge.

Agree a little	Agree	Agree a little

I will go to college

	Pre 5.88	Post 5.79	Pre 5.61	Post 5.56

Mean (1.0 - 6.0 scale)

All Techbridge Participants (n = 89) | Comparison Students (n = 70)

Bars: Pre 100%, Post 99%; Pre 99%, Post 99%
12% / 88%; 5% / 8% / 87%; 7% / 19% / 73%; 7% / 23% / 69%
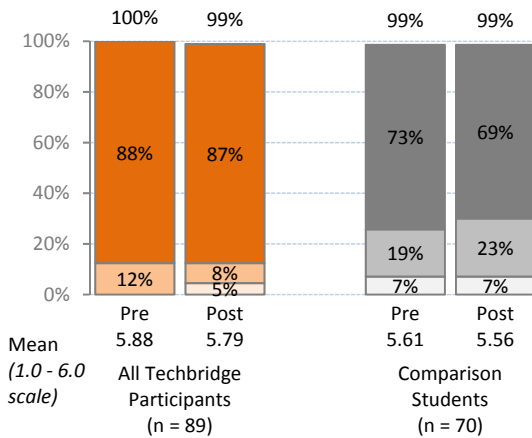
I plan to study computer science in college

(Techbridge post-pre mean +0.40 > than comparison; p < .10)

Mean (1.0 - 6.0 scale)

	Pre 4.64	Post 4.58	Pre 4.34	Post 4.01+

All Techbridge Participants (n = 88) | Comparison Students (n = 70)

Bars: Pre 77%, Post 86%; Pre 74%, Post 70%
16% / 27% / 34%; 34% / 26% / 26%; 20% / 24% / 30%; 29% / 23% / 19%
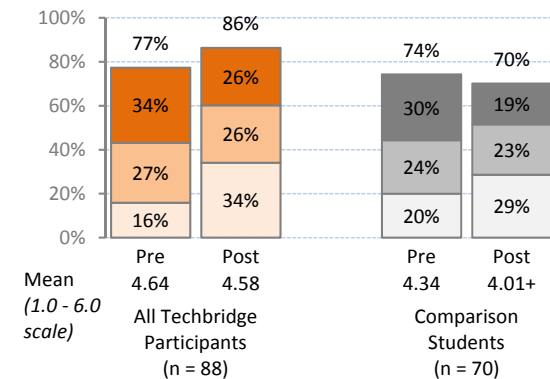
I plan to study engineering in college

Mean (1.0 - 6.0

	Pre 4.43	Post 4.57	Pre 4.09	Post 3.84

All Techbridge Participants (n = 87) | Comparison Students (n = 67)

Bars: Pre 75%, Post 84%; Pre 73%, Post 69%
22% / 25% / 28%; 30% / 28% / 26%; 28% / 24% / 21%; 31% / 24% / 13%
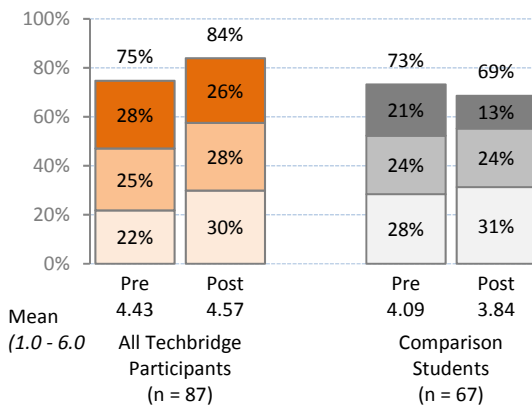
I plan to study science in college

Mean (1.0 - 6.0

	Pre 4.55	Post 4.36	Pre 4.28	Post 4.18

All Techbridge Participants (n = 85) | Comparison Students (n = 67)

Bars: Pre 79%, Post 79%; Pre 76%, Post 76%
21% / 28% / 29%; 28% / 32% / 19%; 24% / 28% / 24%; 27% / 28% / 21%
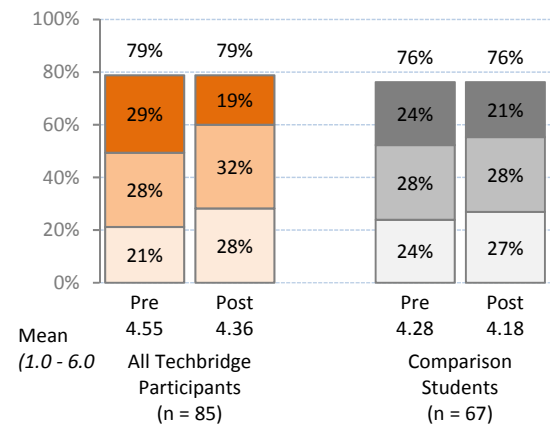
Source: Matched Student Pre/Post Surveys

3.3.12 What is Techbridge's impact on girls' participation in curricular and extracurricular activities (related to SET or otherwise)?

★ **Key Findings re: Techbridge's Impact on Girls' Participation in SET Activities**

The majority of Techbridge participants said they were already interested in science before participating in the program. More Techbridge girls said they did engineering activities outside of school after participating in Techbridge.

Results

- The majority of Techbridge participants reported that they were already active SET learners before participating in the program. The vast majority of Techbridge girls (90%) said they were already interested in science and science-related things before the program. Just over half (56%) indicated they had worked on science activities at home.

Figure 40. The majority of girls were already interested and engaged in SET activities before joining Techbridge.
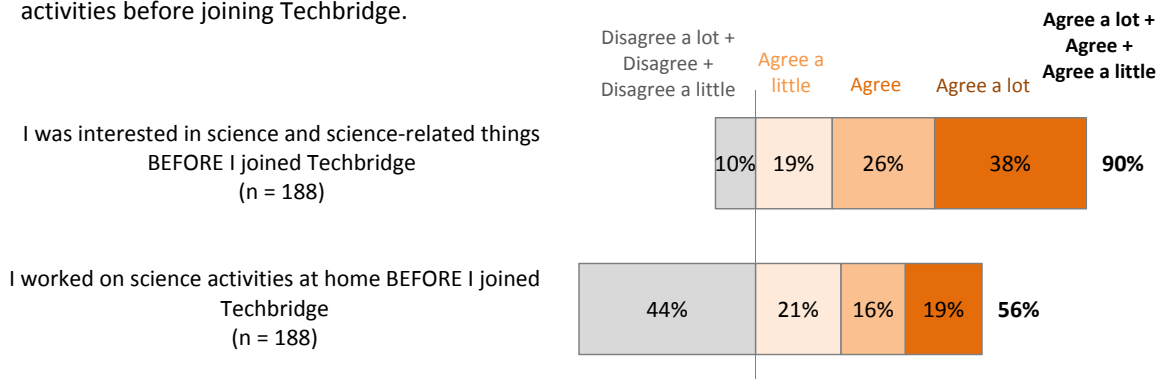
Source: Student Post-Survey

- The percentage for girls who said they did engineering activities outside of school increased from 34% to 52% following participation in the program. In contrast, the percentage of comparison girls who reported they did engineering activities declined slightly from 40% to 38%.

Results of Individual Survey Questions

Figure 41. More Techbridge girls reported engaging in various SET activities by the end of the year, though there is still room for growth.
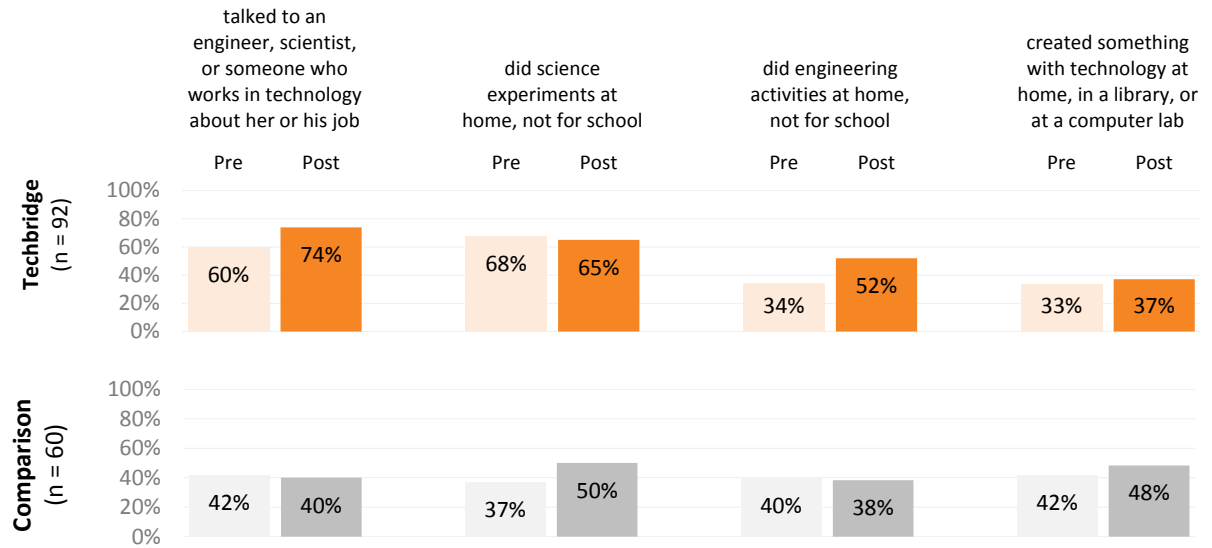
Source: Matched Student Pre/Post Surveys

3.3.13 What is Techbridge's impact on girls' sense of belonging in SET?

★ **Key Findings re: Techbridge's Impact on Girls' Sense of Belonging in SET**

After participating in Techbridge, girls were more likely to say that someone like them could work in engineering or technology. Many girls said they felt a sense of belonging in Techbridge, and that Techbridge facilitators played a large role in developing these positive relationships. The girls also consistently noted Techbridge as being fun. Being able to engage in SET in a comfortable and enjoyable environment can contribute to a higher sense of belonging in these fields. As one girl said, "We are able to thrive."

Results

- The percentage of Techbridge girls who agreed that someone like them could become an engineer or work in technology increased (from 82% to 88% for engineering and from 86% to 92% for technology). In contrast, the response of comparison students showed declines on these items from fall to spring.

- Teachers also believed that girls' confidence in SET grew as a result of Techbridge: 85% of teachers indicated that the majority of their girls became more confident about their SET abilities to a "large" or "very large" extent after participating in Techbridge.

"I've been very pleased about the girls who have been involved. Just their awareness at STEM in general. Just going to industry places and seeing it, their leadership skills have grown.

"You can go into a classroom and see them be leaders and not followers. You can pretty easily pick out a Techbridge girl in just the way that they conduct themselves and talk in a class. Not just in Techbridge but just in the regular science and math classes, which is fun to see because it is not just about the STEM modules that they do but it's the girl power skills and leadership stuff that they get...I've been really pleased to see."

School Administrator from Techbridge Expansion Site

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SET Belonging Scale (Combined Results of Survey Questions)

Figure 42. Techbridge participants increased their sense of belonging in SET more than comparison students.
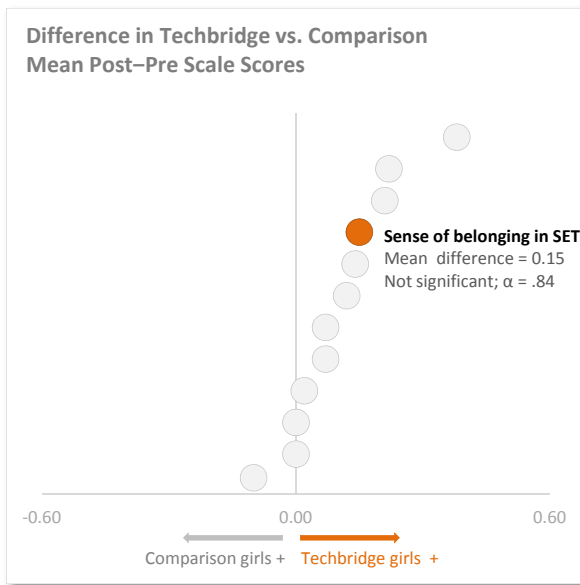
Results of Individual Survey Questions

Figure 43. More Techbridge girls were able to envision themselves in engineering and technology after participating in the program.

Agree a little	Agree	Agree a little

Someone like me could become an engineer

Someone like me could work in technology

Someone like me could become a scientist
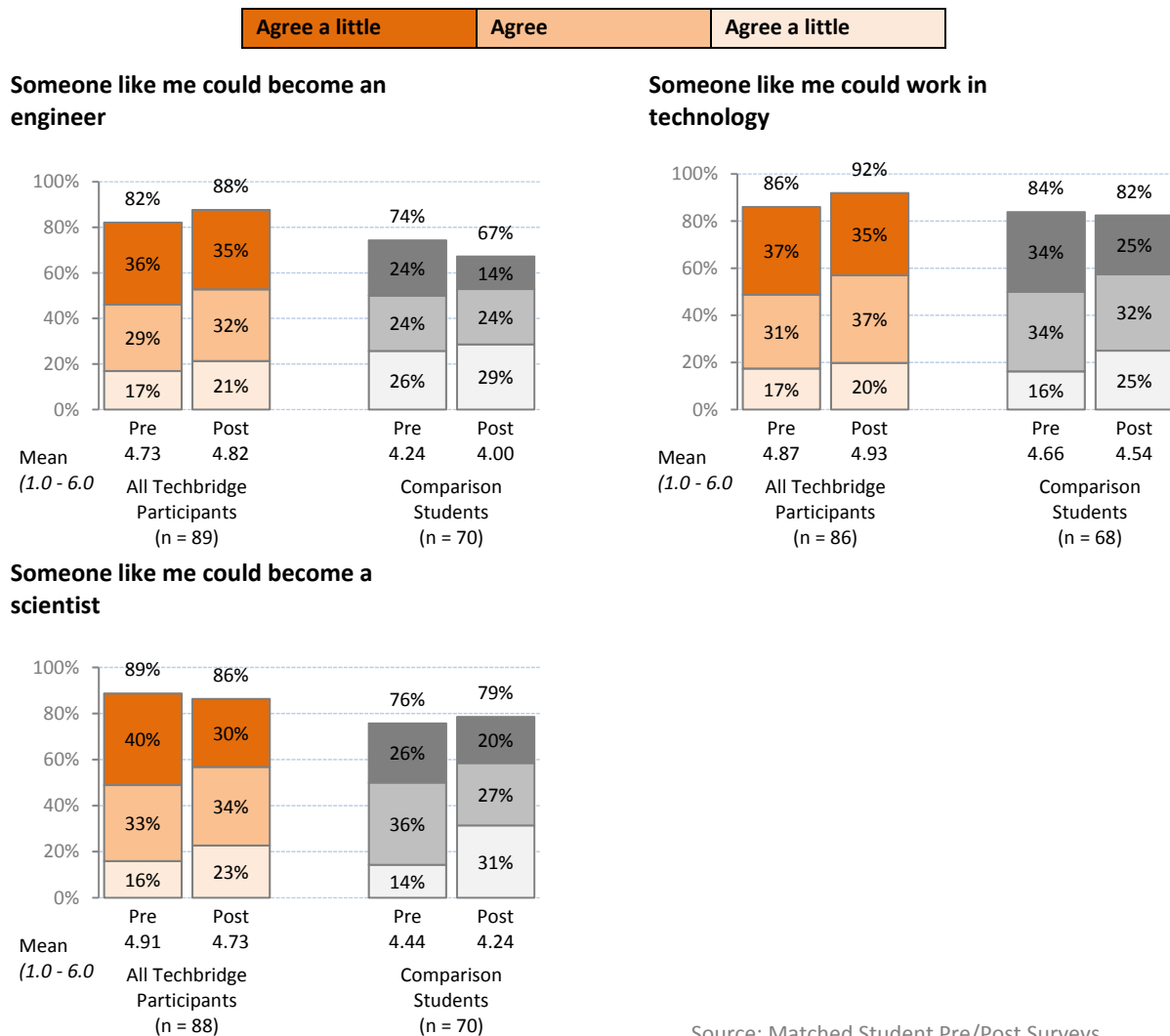
Source: Matched Student Pre/Post Surveys

4 Techbridge's Impact on Teachers & Schools

4.1 What selection process does Techbridge use to identify schools and teachers within those schools?

> ★ **Key Findings re: Techbridge's Selection Process for School and Teachers**
>
> The selection process varied between each expansion site. The district partner in Greater Seattle had more input on which schools offered Techbridge. In Washington, D.C., programs were offered in DC Public Schools (DPCS) and a few charter schools that Techbridge identified as a good fit. Principals typically helped identify teachers to help facilitate Techbridge and looked for teachers who had SET content knowledge, engaged with gender equity, and/or had good relationships with students.

The selection process for schools in Greater Seattle was covered in detail in the 2015 annual evaluation report. To summarize, Highline Public Schools suggested Techbridge partner with its STEM Academy schools and then suggested one other school that it thought would benefit from the program. Techbridge continued at all of the same schools for a second year in 2015-16, and added one additional school.

In Washington, D.C., the Techbridge staff member who managed the expansion hired a regional Executive Director and they worked together to identify seven schools that they thought would be a good fit. Five were from DCPS and two were charter schools. The Washington, DC ED also used her connections to help recruit schools.

Techbridge preferred to have a high level of support from the principal to help ensure the success of the program. A school that had established SET as a priority area was also valued. One school administrator described how he felt his school fit well with Techbridge because they shared similar pedagogical strategies:

> "We are an EL (English Learner) Education School so our whole instructional model is around project-based learning, and hands on learning. Anything where our students are getting a chance to really dive into this topic and are trying it and are learning in it. We talk about grappling a lot so instead of just telling a kid, 'Okay, this is the answer,' we are going to give you the problem and let you grapple with it and start to just think about what the question might be. It is this whole backwards flip. Instead of asking the question and then telling you the answer, 'Here's the answer now you tell me what the question is'—like working backwards. It just seemed like and looking at the curriculum and the natural move of the models and the things that Techbridge was doing, it fit with what we naturally do anyway, what we try to do in classes as much as possible, especially in science class and in math class."

Principals were typically involved in recommending a teacher to be the co-teacher in the Techbridge program. At one school, the principal noted that the teacher who first came to mind had good relationships with students, was doing work related to girl empowerment, and also was already involved with a technology program.

> "It was like this is perfect transition piece for her. The job fit to her. It was the perfect position for her to continue getting her feet wet being mixed in there. She had a great relationship with a lot of those girls and just builds great relationships with the girls, so I was like, okay, this will be someone

that they will also see regularly during the week and be able to still connect with. She is awesome as far as like no matter what, sign me up type of thing. She was a volunteer at Black Girls Code. She wants to do the field trips with Techbridge. She helps logistically help make things happen on this. It just naturally fit for her."

According to another principal, the two most important qualities for a successful Techbridge teacher are a passion for the content and passion for the students. The principal added:

"If you can have those two, then we can figure out. There are supports in the building to be able to make sure that we're delivering the content in a meaningful way, et cetera. We can support that as long as you have those two things. Then you're going to be successful."

Principals said they appreciated having Techbridge at their school because it provides additional SET opportunities for their students. At one school, they were in the process of trying to boost science instruction when they heard of the opportunity for Techbridge:

"Last year, we were looking at how to be able to increase the amount of science instruction in the building and making sure that it's a meaningful experience for the students… With that in mind, looking for something additional to be able to expose students to the STEM field, we were approached via email by Techbridge. We set up a meeting. It was right around budget season. We heard little bit about the program; we were excited that someone on our staff was able to also work along with [the PC], which we thought was really important."

> "The principal talked to me about the opportunity of Techbridge during the summer. She sent me videos about Techbridge and about the program. When I looked at the Techbridge videos, it was exciting just to see girls being so involved in science. The girls who are in fifth and fourth grade used to be my students. It was like a personal connection to see these girls that I know being involved more in science. I thought that was a great opportunity for them."
>
> Techbridge Teacher

4.2   How are teachers trained and supported in the expansion sites?
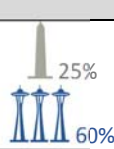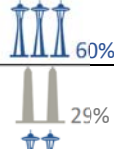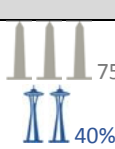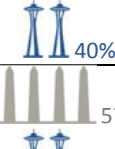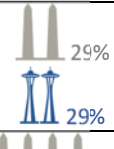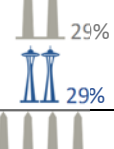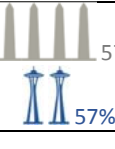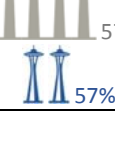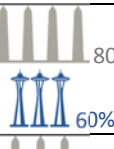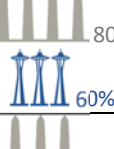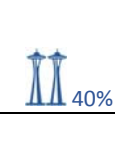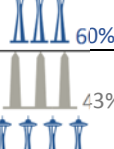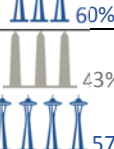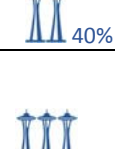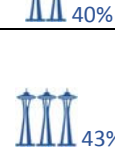
⭐   **Key Findings re: Teacher Training and Support**

Teachers rated the training and support they received from Techbridge highly, especially the initial training during the summer before the program began, and the debrief meetings with their Techbridge Program Coordinator. There is room for more or better opportunities to connect with other Techbridge teachers and suggestions for more information on the content and activities.

Teachers generally found Techbridge's training and support helpful. The initial two-day training during the summer before the programs started was most highly rated, with all teachers finding it to be "very" or "extremely" helpful. Debriefing meetings with the Techbridge Program Coordinator were also very highly rated. There were some regional differences, with the teacher meetings during the year and input from the Techbridge director rated slightly more highly by the Greater Seattle teachers than by DC teachers. The four DC teachers who rated the opportunities to interact with other Techbridge teachers indicated it was "moderately," "slightly," or "not at all" helpful.

Table 2. Teachers indicated that the initial training and debriefs with the Techbridge coordinator were most helpful.

⬧ *represents the response of one DC teacher;* ⬧ *represents the response of one Seattle teacher. Percentages of are based on the number of respondents from that site selecting that answer choice for the item.*

	Overall Mean on 1-5 Scale	Not at all Helpful (1)	Slightly Helpful (2)	Moderately helpful (3)	Very Helpful (4)	Extremely Helpful (5)
Initial teacher training in the summer (n=9)	4.56				25% / 60%	75% / 40%
Debriefing meetings with Techbridge program coordinator (n=14)	4.36		14%	14%	29% / 29%	57% / 57%
Input/coaching from the Techbridge director/manager (n=10)	4.10			20%	80% / 60%	40%
Teacher meetings during the school year (n=14)	3.86		14%	43%	43% / 57%	43%
Opportunities to interact with other Techbridge teachers, in a group or Individually (n=10)	3.30	25%	25% / 17%	50%	50%	40%

Source: Teacher Survey

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Teachers wrote that the most valuable aspect of the training and the support was the opportunity to "tinker," where they got hands-on time to do the activities that the girls would be doing (mentioned by 8 out of 12 teachers). As one teacher described:

> "I was able to play the role of the student and complete some of the same projects the students were going to complete. I was able to ask some of the same questions, make some of the same mistakes and learn as the student would in their Techbridge session."

To one teacher, thinking about gender identity and how that interacts with SET was a valuable aspect of the training. Another respondent mentioned the reflection with the Program Coordinator after each session was very helpful.

In interviews, one teacher said the in-person trainings provided an opportunity to work with and learn from what other teachers were doing and thinking through the potential trouble points for students:

> "We did a training before Techbridge started where we talked about the program, the structure of the program, how it worked. Then we also participated in some of the activities that we were going to ask the girls to do so that we could work through some of the frustrations they might feel and some of the roadblocks they were going to face, and we would troubleshoot the ways that we would handle certain situations. I liked that experience."

Most teachers did not have suggestions to improve training and support. One teacher noted: "Everything was superb in my book!" The in-person trainings were thought to be especially valuable. Three teachers had recommendations related to receiving more information on the curriculum and plan for the day and the year: providing an outline of the curriculum and projects for the year and sharing plans, presentation slides, or vocabulary with teachers so they can go over them prior to the program meeting:

- "Give an outline of the tentative schedule for the year so we know how long projects will be, what we will be working toward, etc."
- "Send plans/PowerPoint ahead of time so teachers have more of an idea of what is being taught and can better support students during lessons."
- "A little more support or information about the project, vocabulary, the purpose, etc. I felt I learned along with the girls in the moment."

Other support for curriculum, including an online catalogue and quarterly meetings were suggested. One teacher suggested more workshops to get them better versed in STEM. Another teacher felt the workshops could be more individually tailored to teachers:

> "Perhaps evaluate teacher strengths/backgrounds to find out which units they would like tinker time for. I imagine most would choose something they are not very familiar with versus something they might have done before."

> "I have no other recommendations for training or support; I was delighted about how it's being run and where it's going."
>
> Techbridge Teacher

4.3 To what degree do teachers have a leadership role in their program?

★ **Key Findings re: Degree of Teacher's Leadership in Techbridge**

Teachers were very satisfied with the level of leadership and control they had in their Techbridge program, though the role of teacher varied widely from program to program (or day to day). There was no agreement on the areas that teachers wanted more or less control of, though a few teachers noted that it was nice to not have to lead the lesson and instead be able to help make sure it was at the right level for their girls and that girls were understanding.

Overall, teachers were satisfied with the amount of control they had over different aspects of the program (see Table 3). There were no patterns in the responses of aspects that teachers wanted more or less control over, suggesting that the teacher's role in the program is an individual preference. One teacher each wanted more control over the program schedule and facilitating activities. For two program aspects, communicating with families and selecting curriculum, one teacher wanted more leadership and another teacher wanted less leadership. One teacher wanted less involvement in organizing field trips and another wanted less in involving role models.

Table 3. Teachers were generally satisfied with the amount of control they had in the program.

represents the response of one DC teacher; represents the response of one Seattle teacher

To what degree did you feel like you had an appropriate role in making decisions about the following aspects of your Techbridge program?	I wanted more control or leadership of this aspect ↑	I had a satisfactory level of leadership or control of this aspect	I wanted less leadership or control of this aspect ↓
Recruiting girls to participate in the program (n=13)		100% / 100%	
Other SET-related content of the program, such as SET career information (n=12)		100% / 100%	
Deciding on the program schedule (n=13)	14%	100% / 86%	
Facilitating activities (n=13)	14%	100% / 86%	
Communicating with girls' families about the program (n=12)	17%	83% / 86%	14%

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To what degree did you feel like you had an appropriate role in making decisions about the following aspects of your Techbridge program?	I wanted more control or leadership of this aspect ⬆	I had a satisfactory level of leadership or control of this aspect	I wanted less leadership or control of this aspect ⬇
Choosing curriculum or activities (n=12)	14%	80% / 86%	20%
Organizing field trips (n=12)		80% / 100%	20%
Involving role models in the program (n=12)		80% / 100%	20%

The role of teachers in Techbridge and the coordination of the PC and teacher varied somewhat by school.

The PC usually brought the activity and often led the introduction of the activity (unless otherwise planned). Teachers were frequently responsible for classroom management and using their relationships with and knowledge of students to improve the program. Teachers could therefore contribute by offering insight into the appropriate level of complexity of activities and how Techbridge content related to what was covered during classes. As one teacher said, "I know the students very well because these are my kids. If I know what I'm doing, I can prep them linguistically or tie it into what is happening in the school day." Having the curriculum or presentation slides a week or so prior to the program meeting would allow the teacher to offer suggestions to tailor it to students.

This division of roles made sense to one teacher, who said:

> "I think it's been really cohesive and easy. I love that Techbridge curriculum comes with a person who is familiar with it. My job becomes knowing what to do to support it and to get kids in the room because they know me. I think it's a really cool partnership that makes a club like this more possible."

One teacher commented that while she was satisfied with her role, she wondered if her PC wanted her to take on more leadership: "I feel like my PC and I have a good working relationship. She may feel like she wants me to take more control or leadership, but for this year, it felt satisfactory all the way around to me." Similarly, another teacher commented that after teaching all day, it "felt good not to have to take the lead" and a third said, "By the end of Monday, I'm exhausted. It's nice that she has it ready. I make sure the girls are ready. I'm the management person because I know the girls. I don't mind that."

Most teachers said they worked well with PC and had a collaborative relationship. It was important for them to feel heard and listened to (and they did).

4.4   What is the effect of the program on participating teachers, including their interest, knowledge and use of strategies to engage girls in SET; their awareness and promotion of SET careers; and their awareness and promotion of SET resources for girls?

★   **Key Findings re: Techbridge's Impact on Teachers**

Techbridge teachers were impacted by their involvement in the program, especially in their interest in engaging girls in SET and their knowledge of strategies to engage girls in SET.

Teachers indicated at least a small impact on each of the five areas measured in the teacher survey. The highest areas of impact were in teachers' interest in engaging girls in SET and their knowledge of strategies to do so (see Figure 44). They experienced the least growth in their ability to provide academic guidance for girls to pursue SET (the same as last year).

Figure 44. Techbridge increased teachers' interest and ability to support girls in SET.
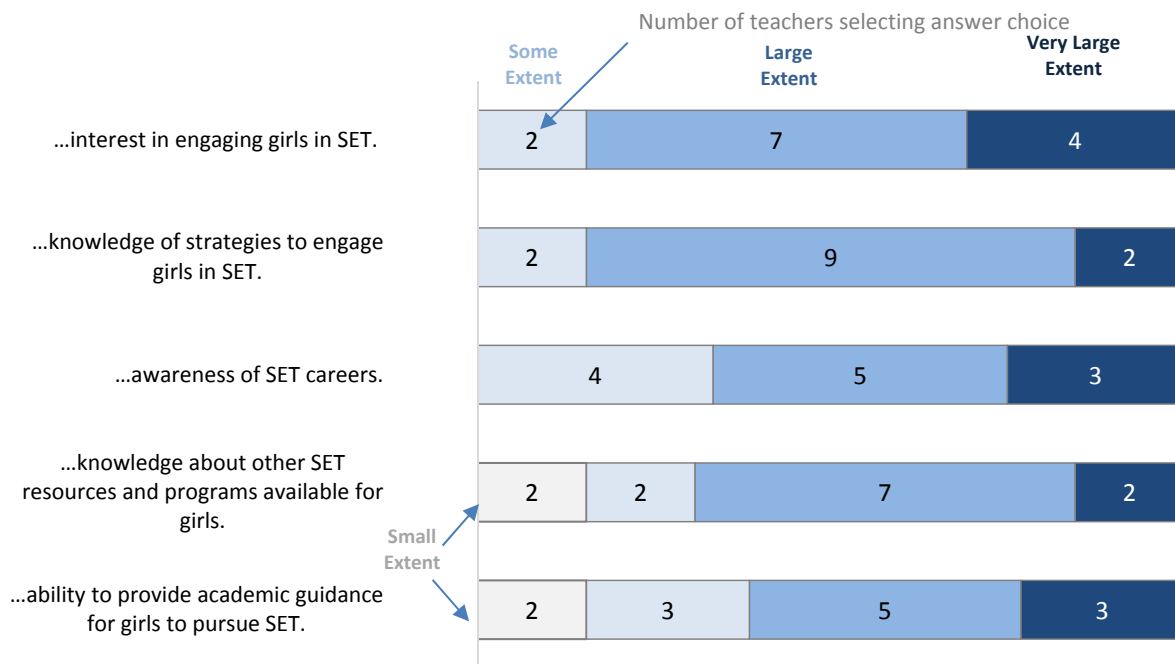
This year, Techbridge increased my…

There were few differences in ratings between the expansion sites, even though most Techbridge teachers from Greater Seattle were participating for their second year. Seattle teachers had slightly higher ratings on the areas with the lowest mean, suggesting that there might be more growth in those areas during the second year.

Figure 45. Mean ratings of teachers from the two expansion sites (Washington, DC and Greater Seattle) on the impact of Techbridge were very similar.

This year, Techbridge increased my…

	DC	SEA
…interest in engaging girls in SET.	4.2	4.1
…knowledge of strategies to engage girls in SET.	4.0	4.0
…awareness of SET careers.	4.0	3.9
…knowledge about other SET resources and programs available for girls.	3.5	3.9
…ability to provide academic guidance for girls to pursue SET.	3.3	4.0
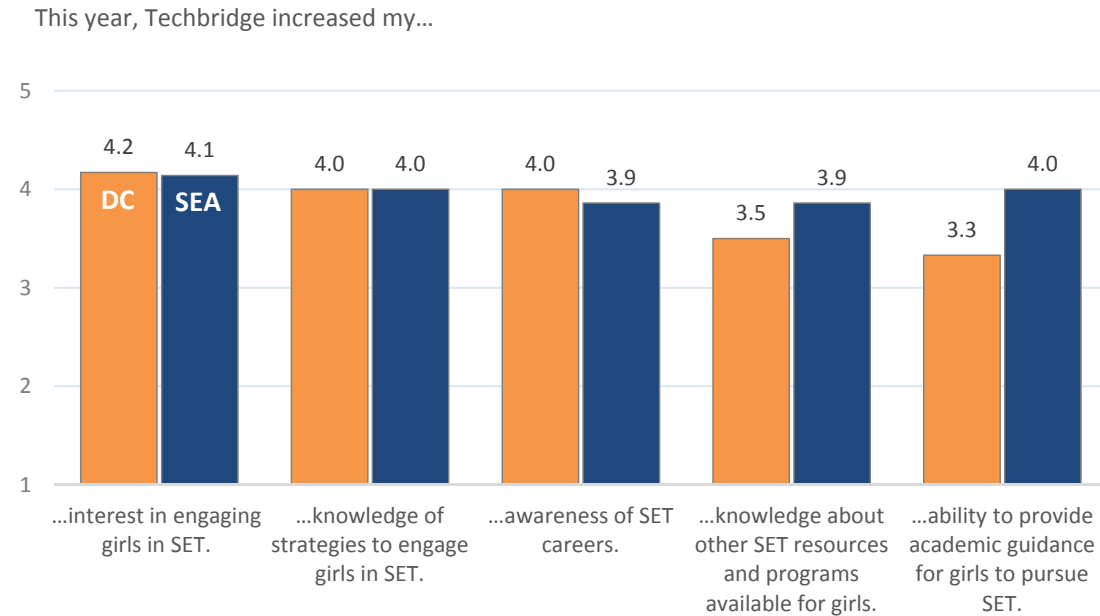
Source: Teacher Survey (Seattle n = 7; DC n = 5-6)

Teachers elaborated further on Techbridge's impact during interviews. Teachers described getting to know students better, talking about growth mindset with their classes, and learning SET content along with the girls. One teacher said, "It's been a great experience for me, helped me in other parts of teaching. It allows me to further connect with students, building those relationships so I can talk with them in class more and they can approach me more."

4.5   What role do local school districts and/or school administrators have in supporting programs in the expansion sites?

★   **Key Findings re: Role of Districts and School Administrators in Supporting Techbridge**

Highline Public Schools continues to play an active role in supporting and shaping Techbridge and considers the organization to be a strong partner. Principals also praised the benefits of Techbridge in their school and offered many types of support, especially spreading the word about the program, helping to recruit students, and looking for ways to be able to continue the program after the grant funds.

In Greater Seattle, the Highline Public Schools district has had an active role in the program and were highly involved in selecting the schools, brokering connections with principals, and selecting teachers. Since the start of the program, the district helped arrange transportation for student participants, distributed payment to teachers, and worked on any contract-related addendums. During the 2015-16 school year, a representative from Highline met with Seattle staff about every six weeks in person or by phone, attended programs about once per month, and come to a few of the Family Nights. They are helping to shape the future direction of the programs in the district, such as championing the expansion to bring Techbridge to a high school.

The Highline district has been partners on Techbridge grant proposals, including a Race to the Top proposal. District representatives praised many aspects of Techbridge, from the grant-writing, to the social media efforts, plus staff's responsiveness and collaborative nature. A district representative said, "[Highline has] benefited from partnering with Techbridge. Our approach is as a district versus a school. [We're] really trying to leverage a strategy to be supported throughout the careers."

In DC, even though Techbridge is in five DC Public Schools, the district has not been as involved. Techbridge was also in two charter schools in DC. One described his/her role as the principal of the school to identify a teacher to facilitate, help recruit the girls and find space for the program. "Techbridge has done everything else and has done it well and has done it professionally and has done it effectively. They are building relationships with the girls."

At both expansion sites, principals mentioned they were a spokesperson for Techbridge, spreading the word about the program and advocating for its importance and value and especially for its continuation at their school. One principal said:

> "I see myself as having to be the strongest advocate of this work and making sure it's something I truly believe in, and I'm going to stick with that and support it every step of the way. Also, I do my part in making sure it can continue over time. It's not something we did for a year and now next year it went away, but that it becomes part of our long-term school program. Even thinking, with Techbridge, 'How do we continue to enhance the program?', and 'How do we expand or come up with more opportunities for the parents to engage?' That's always going to be my feelings about anything that's working. How do we do more of it?"

Principals promoted Techbridge to parents and families and spread the word about the opportunity for their girls:

> "I see it as having a vision; having a vision for why we do this work. Why it matters. How to promote it, support it, and be a good partner to the organization. If my stance is, this is good for our girls, for our families, I believe in it, and I want it to be a partnership that is long-term. I want to make sure that the school is providing Techbridge with all the necessary items that we need to be taking care of to make the partnership work, and to make it be smooth. I'm the face of the school. I have to promote it. I have to talk to families about what we're doing. How we're doing it. Why we're doing it. I have to have these conversations with the parents about what are the opportunities that are available to their children."

Since they generally had such a high value of the program and appreciation for the opportunities it provided students at their schools, most principals were active in their support of Techbridge. This support took many forms, including advocating for district-paid transportation for participants. One teacher described how the principal was very involved with recruiting students:

> "My principal was really enthusiastic about the program and did a lot of help recruiting girls— especially girls that maybe wouldn't necessarily choose this. But when she was having conversations with parents about kids that were struggling to find their place in the school, she always highly recommends the program. She has been really supportive as much as she can be with everything that's going on at the school."

Most Principals attended one or both Family Nights at the school and often visited the program at least once. One teacher said, "Our principal always talked very positively to parents and staff. He came to Family Night and he knows what girls are doing. He visited one or two times."

> "I would really hone in on this piece around like the girl power…Anyone that leads a middle school knows the shift developmentally that we watch girls go through physically, socially, emotionally, and this is a program where I have watched the girl that has no friends matched with one of the popular eighth grade girls and that eighth grade girl speaks to her in the hallway and completely gives her street cred because that eighth grader knows her and says hi to her.

> "Then the other kids are like, 'How do you know her?' I have literally witnessed this and they have been like, 'Oh, we are in Techbridge together.' It is like, 'Well, what is Techbridge?', and, it's like, 'You are not in it.' Like it is this club, because middle school is already clique-y, and so I am fine for Techbridge to be a clique for my little girls to clique up because of their likes around math and science."

> Techbridge Principal

5 Techbridge's Impact on Role Models

5.1   How are role models recruited, trained, and supported in the expansion sites?

★ **Key Findings re: Recruitment and Support of Techbridge Role Models**

Role models were generally well-prepared for their interactions with Techbridge participants. Their preparation showed in their execution of Techbridge strategies to engage girls in SET: at least 9 out of every 10 role models indicated they described their careers in ways that girls could understand, made connections between their jobs and the girls' everyday lives, and shared personal information about themselves. Recommendations from role models to improve the support from Techbridge included more detailed logistics and information about the girls in the program. Teachers rated role model visits and especially the field trips highly, naming benefits to students such as exposure and inspiration regarding SET career opportunities.

PCs, supported by their ED, were primarily responsible for recruiting role models to visit the programs, typically by reaching out to SET-related companies and higher education institutions. Techbridge aimed to involve role models who were female and who reflected the ethnic diversity of participants. Involving role models who were similar to the girls participating in Techbridge (at least in terms of gender and ethnicity) was important to establish that people "like them" worked in SET and help enable girls envision themselves working in SET.

The training and support for role models included information about Techbridge and how to talk to and mentor youth. Techbridge provided role models with the link to the Techbridge website which includes resources related to serving as a role model. PCs also frequently talked with role models in-person or over the phone prior to the role model visiting the program and provided details on the day's activity and agenda and any other tips.

> "I've thoroughly enjoyed being a role model each time that Techbridge has come to my work. The interactions are just as helpful for the role models as it is for the girls!
>
> "I'm amazed at how inspired the girls get and how they light up while they hear our stories. You can literally feel their futures changing while you talk to and encourage them!"
>
> Techbridge Role Model

All but five of 93 role models responding to the 2016 spring survey were new to Techbridge for the 2015-16 year. Twenty-one respondents (21%) indicated they had not participated in any type of training (see Figure 46 on the following page). Others most commonly attended an in-person training (38%), accessed materials on the Techbridge website (28%), or talked on the phone with a Techbridge staff person (28%). Other responses included a training at their company or from another role model, and email messages or handouts with information.

Figure 46. Of the various types of preparation that role models might have received, role models most commonly reported that they attended an in-person training by Techbridge.

Preparation Type	Percentage
Attended an in-person training for Techbridge role models	38%
Accessed role model materials on Techbridge's website (Role Models Matter Toolkit)	28%
Prepared over the phone or in a web meeting with a Techbridge staff member	28%
None	21%
Other	10%
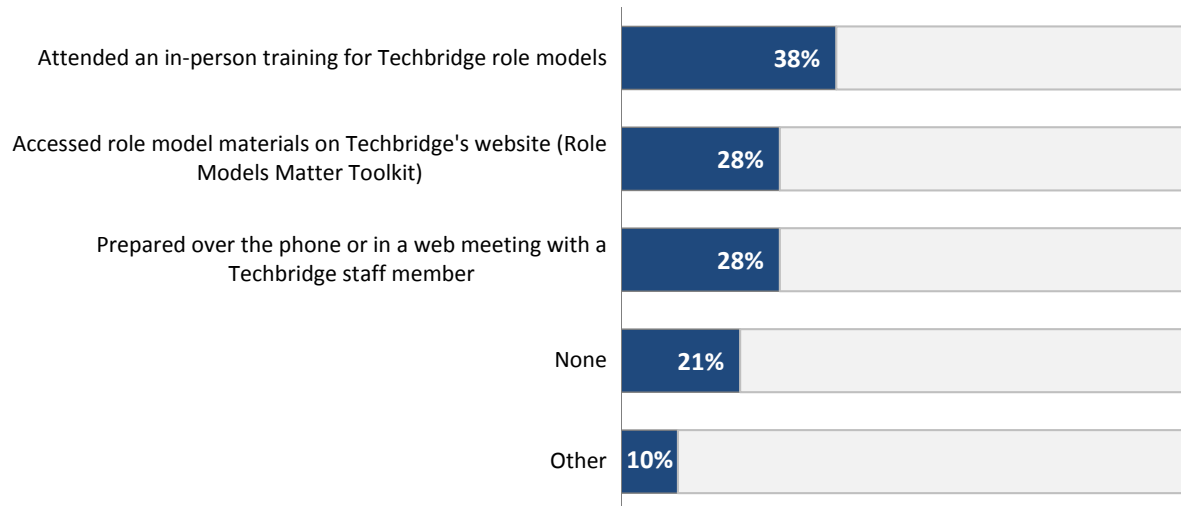
Source: Role Model Survey; n = 92

Of those attending a Techbridge role model training, 96% felt that it was "somewhat helpful" or "very helpful." Of three respondents who felt that the trainings were "only a little helpful," one person wrote that she had extensive experience working with youth, but that the online resources would be good resources for other mentors. Another role model commented felt the training was over-burdensome given that she was already experienced at doing outreach:

> "I honestly felt that it was too much. We have VERY limited time and they required a lot of initial 'training' that was already common sense to us. Had we been a company or something that doesn't typically interact with students, that would have been different! But we are a program that presents to young people every day, so it was all common sense for us. Ultimately, the training just ended up being a large burden, given the volume of events that we were hosting during that time."

Figure 47. The majority of role models (89%) said the Techbridge training was at least "somewhat helpful."

	Only a little	Somewhat helpful (3)	Very helpful (4)
Helpfulness of Techbridge Training	4%	45%	51%
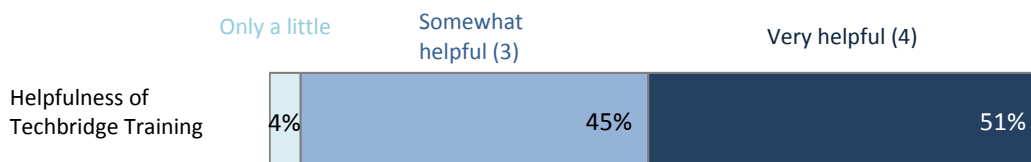
Source: Role Model Survey; n = 74

Other suggestions to better prepare role models for their visit included more details on the logistics of the visit or field trip and the expectations for the day (mentioned by 12 role models). Eight role models wanted more information about the Techbridge girls, mostly to help them ensure their materials were at the appropriate level. As one role model wrote, "I had a harder time knowing what the girls in the class would understand and what their range of experience was." Five role models wanted a general overview of

Techbridge, such as "a video to watch on what Techbridge is about." Four role models recommended providing examples or slides of activities or previous role model visits.

Role models were asked whether the content covered during their Techbridge visit was related to their own area of expertise. For more than half of the respondents, the content was "very related" (Figure 48). Only six percent of respondents reported that the content was "not at all" related to their work.

Figure 48. The content covered during a Techbridge visit was almost always related to role models' area of expertise.
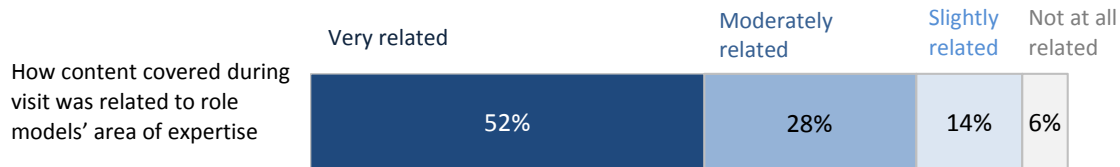
Source: Role Model Survey; n = 85

The large majority of role models indicated that they understood Techbridge expectations of role models and understood the mission of Techbridge (see Figure 49).

Figure 49. Almost all role models said they understood the mission of the program and expectations of role models.
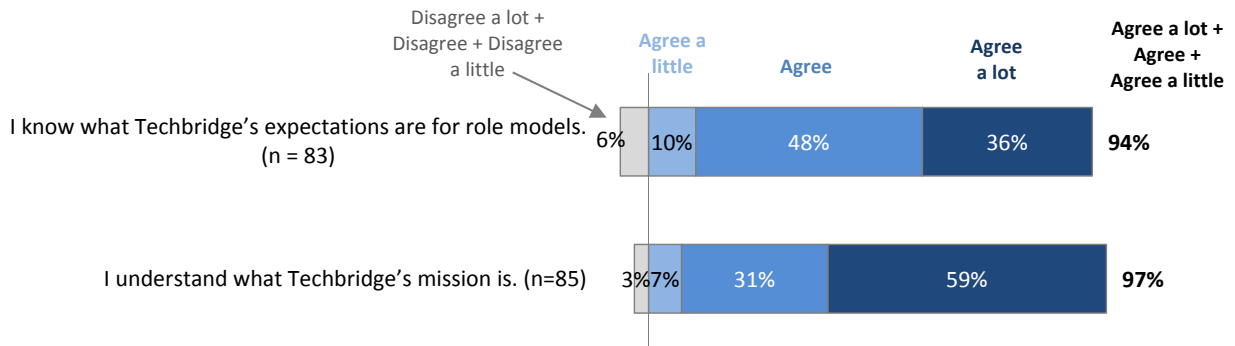
Source: Role Model Survey

The majority of role models said they implemented Techbridge strategies for engaging with the girls. A total of 94% of role models encouraged girls to ask them questions as part of their presentation (including 80% who said they did so on every visit/trip; see Figure 50). Role models were also very likely to talk about how they decided to work in SET (71% did so at all their visits/trips) and facilitate a hands-on activity with the girls (69% did so in all visits/trips).

Figure 50. Role models were highly likely to implement Techbridge strategies during visits to a Techbridge program or field trip they hosted.
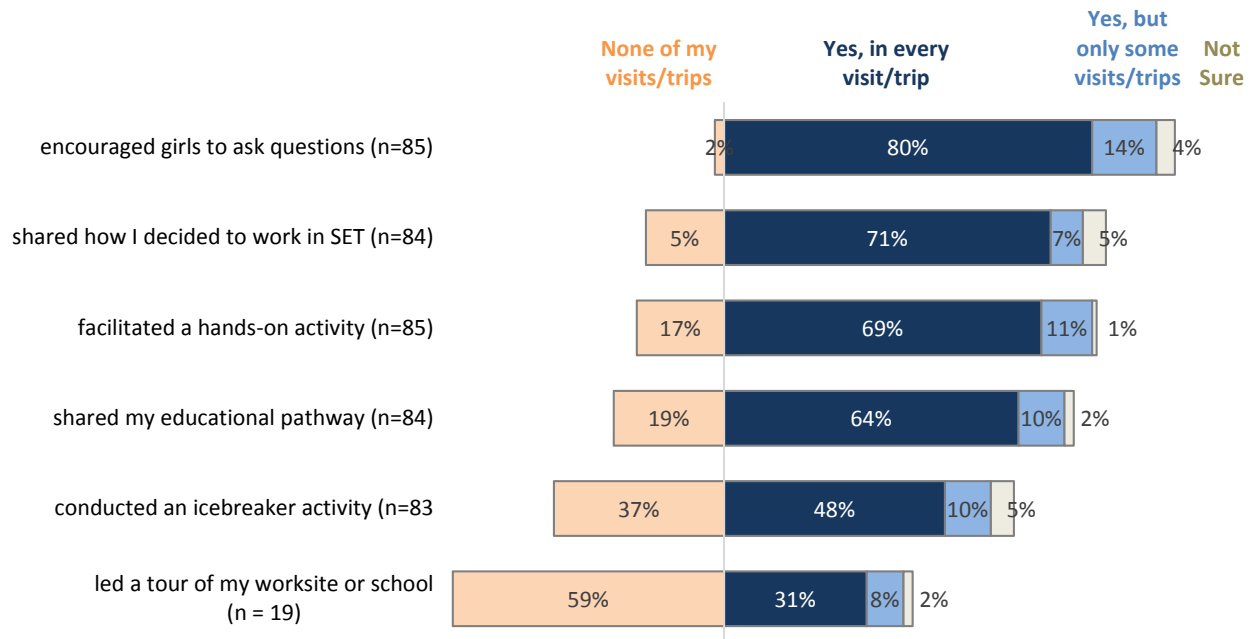
Source: Role Model Survey

With most visits or field trips, almost every role model felt comfortable answering girls' questions and guiding girls in a hands-on project (see Figure 51). At least 9 out of every 10 role models felt that they described their careers in ways that girls could understand, agreed they made connections between their jobs and the girls' everyday lives and shared personal information about themselves.

Figure 51. Role models used strategies that helped them connect with the Techbridge participants.
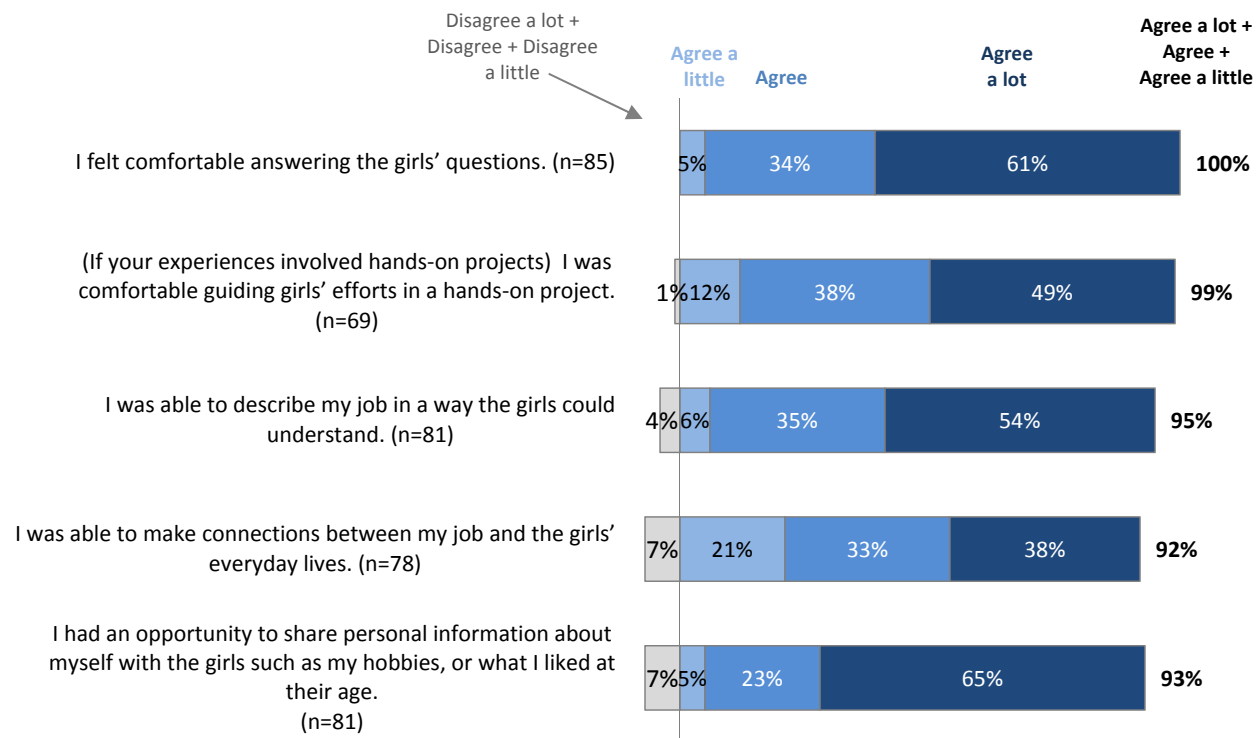
Source: Role Model Survey

Many role models were open to a follow-up visit, especially hosting a field trip (57% said they probably or definitely would). Other role models were less certain of their continued involvement, but described barriers such as the distance, moving out of the area, not having enough time at their job, and spending time with their own children. Sixty-three percent of the respondents indicated that they "probably will" or "definitely will" serve as SET career role models outside of Techbridge.

Figure 52. Most role models planned to serve as a role model outside of SET and host a field trip next year.
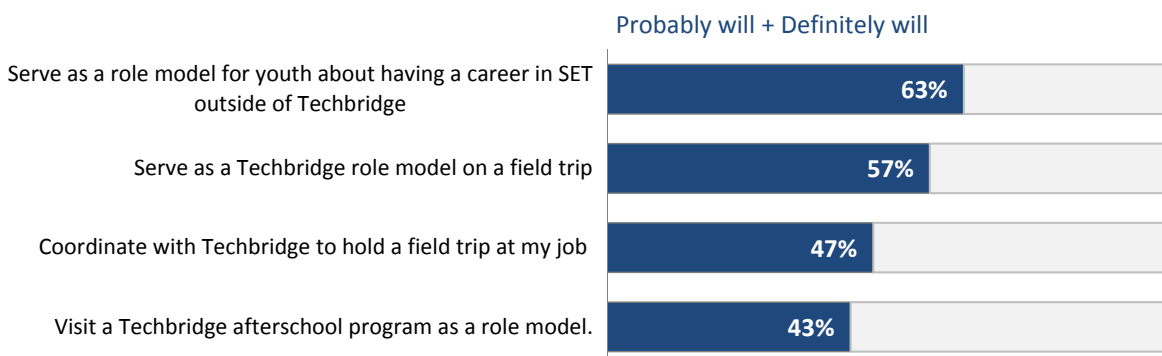
Source: Role Model Survey; n = 85

Role model visits and field trips were rated highly by teachers. Field trips received especially high ratings, with 12 out of 13 teachers (92%) indicating they were effective to a "large" or "very large" extent (see Figure 53). As one teacher wrote: "The students benefitted most from field trips. Being able to take a trip outside of the students' usual space allowed their minds to also become opened. Being in a new space allowed the girls to have a real life experience and connections with their work."

Figure 53. Teachers rated the role model visits and field trips highly.

	Not at All	Some Extent	Large Extent	Very Large Extent
Overall, the role model visits were effective.	1	4	4	4

	Small Extent	Large Extent	Very Large Extent
Overall, the field trips were effective.	1	5	7
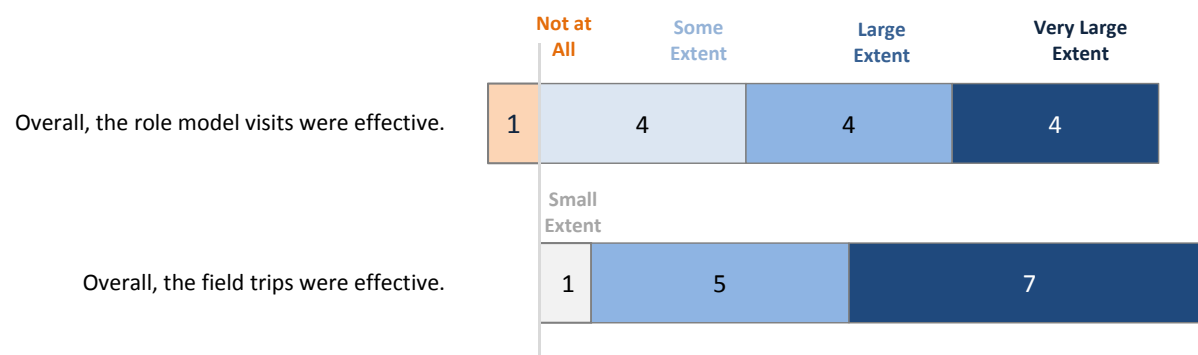
Source: Teacher Survey; n = 13

Other benefits teachers identified from role model visits and field trips included increasing students' interest and awareness in SET education and career pathways, feeling inspired, and helping them make connections between SET and the "real-world." Teachers commented:

- "[Students] learn ways to get there themselves, also seeing themselves in these career fields."
- "The role model visits and field trips made my students more enthusiastic about SET careers."
- "These visits and trips were very inspiring for them and helped to make the idea of a STEM career real."

Teachers offered recommendations on how to improve role models and field trips, including a longer day, making sure activities were developmentally appropriate, establishing a clear vision for a role model visit, and more role models who are women of color. Two teachers suggested more field trips or role model visits during the program year.

5.2   What is the effect of the program on role models' confidence and effectiveness in conducting outreach with Techbridge girls?

★   **Key Findings re: Techbridge's Impact on Role Models' Confidence and Effectiveness Conducting Outreach**

All but one role model agreed that serving as a Techbridge role model was worthwhile and 91% agreed they were more confident in conducting outreach due to Techbridge.

Role models generally offered very positive reviews of the program and their experience as a role model.

- "You folks are doing fantastic work here. It's so fun to see these young women explore tech!"
- "Techbridge has been a very positive and exciting experience for me. I will recommend to others."

Figure 54. Role model increased their confidence in conducting outreach due to their experiences with Techbridge.
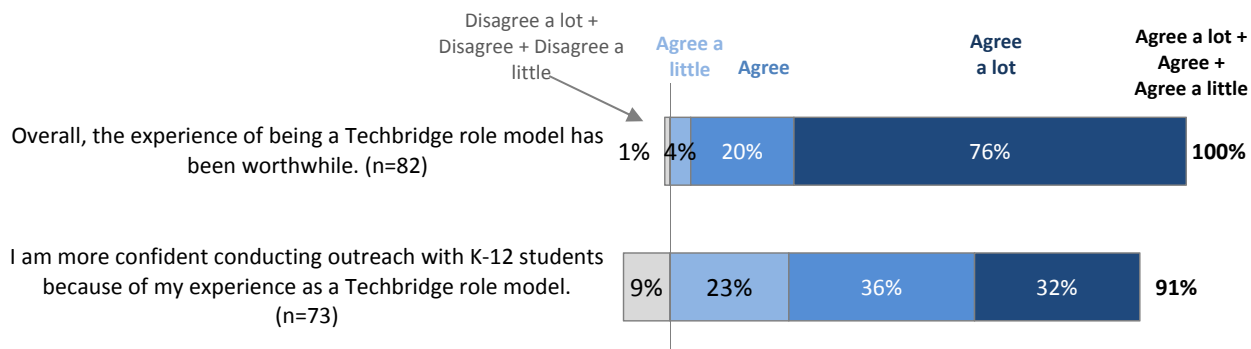
Source: Role Model Survey

"This is a fantastic program. I would love it if we could make Techbridge events happen at [my work place] at least annually, if not more often. It was super energizing for me to interact with the girls. I also think it's an extremely important effort for [my company] as we are trying to increase diversity."

Techbridge Role Model

6 Techbridge's Impact on Families

6.1   How do expansion sites engage girls' families?

> ★   **Key Findings re: Family Engagement Strategies in Expansion Sites**
>
> There are challenges to involving families in Techbridge, including language barriers and scheduling difficulties. Techbridge resources are reaching about three-quarters of all families. Family Nights are mentioned as a good strategy to engage parents. PCs also used other media such as text messaging and blogs featuring photos of the girls doing program activities to help keep parents updated. Techbridge has sought and secured more funding and partnerships to help find ways to better engage parents.

Teachers reported using a variety of tools to engage families of girls participating in Techbridge (see Figure 55). All 12 teachers who answered the survey questions reported that they shared information on Techbridge activities and created opportunities for girls to show their families what they have learned. Three quarters of the teachers shared information on why it's important to involve girls in SET, and two-thirds provided strategies on SET activities to do at home.

Figure 55. Teachers reported using a variety of strategies to engage Techbridge girls' families.

Strategy	Percentage
Shared information on Techbridge activities	100%
Created opportunities for girls to showcase what they had done or learned in Techbridge with their families	100%
Shared information on why it is important to involve girls in SET	75%
Shared ideas for SET-related activities to do at home	67%
Shared SET-related resources that could be accessed at home, electronically, or in the local community	58%
Shared other SET programs or educational opportunities for girls	58%
Shared information on career opportunities in SET fields	50%
Shared strategies on how to engage girls in SET	25%
Other	

Source: Teacher Survey; n = 12

EDC Learning transforms lives.

Techbridge teachers pointed to Family Nights as a successful strategy for engaging the families of girls participating in the program. In an open-ended question, seven out of 11 teachers responding mentioned Family Nights were a successful way to engage parents (including three teachers who mentioned the importance of providing food). The other four respondents mentioned areas that related to Family Nights but also could be more general, such as "students inviting parents"; "sharing information"; "texting, inviting them to school, free resources"; and "keeping in touch throughout the year and sharing pictures of girls during the activities."

Teachers also commented on barriers to engaging families, such as language issues (4 out of 11 teachers); scheduling/time availability of families (3 teachers); transportation (3 teachers); and other barriers such as sibling care and other commitments. Teachers' responses included:

- "Communication. Not all families were accessible by phone or email. There were some families who were always available, but we would've liked to reach more parents."
- "Context—if they didn't understand or couldn't relate, they were more likely to dismiss it."

Seventy-seven percent of Seattle parents and 68% of DC parents responding to the survey indicated that they received written materials from Techbridge. An open-ended question asked parents how they had used the resources. One-quarter of Seattle parents and 36% of DC parents indicated they had not received or used the materials. Other parents used Techbridge resources to learn about other SET programs for their daughter or for SET-related activities to do at home. A few parents mentioned learning about what the girls were doing in Techbridge. Responses included:

- "We signed up for a camp and I saved some toys in my Amazon cart for her b-day."
- "Use them for ideas on things for making learning science, math, engineering more interesting."
- "Discussed programs with my daughter, let her know if she is interested she could participate/sign up."
- "I have used the Summer Programs Guide to explore opportunities around DC area. My daughter got in at GEMS."

Techbridge staff have used a variety of strategies to engage and communicate with families. These methods differed by program and by PC. Multiple PCs commented that text messaging seemed to be an effective method of communication. One PC used Tumblr to make photos of the girls doing SET activities available to parents. While one PC had limited her communication with parents to phone calls or emails if a girl had been absent or to inform them of upcoming Family Nights, in the future she hoped to send text messages with information about what girls learned during the week and examples of prompts to ask their daughter based on program activities.

A Techbridge expansion site staff member commented that engaging families was a continual challenge, but Techbridge may be doing so more effectively than the school or other school programs:

> "I would say in this is a recurring theme: how to get better parent engagement at the middle school level. Multiple people at our school had said to me, 'You know, you guys are doing a great job and you're doing as good as anyone can do, [but] middle school parents just don't come out.' Maybe because the middle schoolers are less interested in hanging with their parents, and less like, 'I'm proud of this thing and want my parents to come.' Parent engagement is lower at the middle school, which is a challenge."

In at least one school, the girls told the staff that their families would not attend, seemingly no matter what efforts Techbridge made to encourage or accommodate them.

> "I guess two or three of [the girls] were like, 'My parents are not going to come.' In a sort of like no matter what you do, they're not going to come. We need to dig into that more. I don't think it [is] because of language. I think it might be that they'd just don't feel at home at the school…. It sounded like those parents…were not working, but they just don't come to school. I feel like there's more that we can do there."

As one expansion site Techbridge staff member noted, reaching families is a predictable challenge based on the population they target to participate in the program:

> "The big takeaway I had from last night's Family Night—which was great—was that there's always going to be a set of families that we can't reach and if you're serving a…population that's hard to serve, they're hard to serve."

In DC, at least one charter school was commented to have high family engagement: "I would say, because I have worked in other schools, our families are definitely very engaged and very much participants and stakeholders."

The program has actively pursued other grants and partnerships to better engage families, including reaching a Somali community by basing a Techbridge program in a housing complex with an established afterschool program.

6.2   What is the effect of the program on participating girls' families, including their awareness of SET resources; their understanding of SET careers and career pathways; and their view of SET careers? To what degree do families encourage their daughters to participate in SET activities, and to pursue SET education and careers?

★   **Key Findings re: Techbridge's Impact on Participating Girls' Families**

At least nine out of ten parents agreed that, because of Techbridge, they are more aware of SET activities their daughter can participate in, they have encouraged their daughter to participate in more SET activities, and helped them learn about family activities related to SET. According to girls, the majority of their parents already supported their interests in SET prior to their involvement in Techbridge, but the levels of support still increased after Techbridge (especially in their encouragement of SET careers).

Results

- Parents reported that Techbridge increased their awareness of what SET is as well as activities and opportunities in SET (see Figure 56). At least 90% of parents agreed that they are more aware of SET activities their daughter can participate in because of Techbridge, have encouraged their daughter to participate in more SET activities, and helped them learn about family activities related to SET.

Figure 56. Parents said Techbridge helped them learn about how to support their daughter in SET.

	Disagree a lot + Disagree + Disagree a little	Agree a little	Agree	Agree a lot	Agree a lot + Agree + Agree a little
Techbridge helped me learn about SET activities my daughter can participate in (n=102)	1%	6%	49%	39%	**94%**
Because of Techbridge, I have a better understanding of the education needed for a career in SET (n=94)	7%	16%	30%	43%	**88%**
Because of Techbridge, I have encouraged my daughter to participate in SET activities outside of school (n=98)	9%	13%	35%	43%	**91%**
Techbridge helped me learn about family activities to do with my daughter related to SET (n=97)	12%	15%	41%	35%	**92%**
Because of what I learned from Techbridge, I am able to talk with my daughter about SET careers (n=98)	11%	15%	37%	36%	**88%**
Techbridge helped me learn about what a scientist, engineer, or technology worker actually does. (n=95)	11%	17%	31%	42%	**89%**

Source: Parent Survey

- Almost all parents reported positive attitudes about their daughters' potential interest in SET. Seventy-seven percent of parents strongly agreed that someone like their daughter could become an engineer, and 76% strongly agreed they would support their daughter if she chose to pursue a SET career (Figure 57).

Figure 57. Parents had positive attitudes about their daughters' interest in SET.
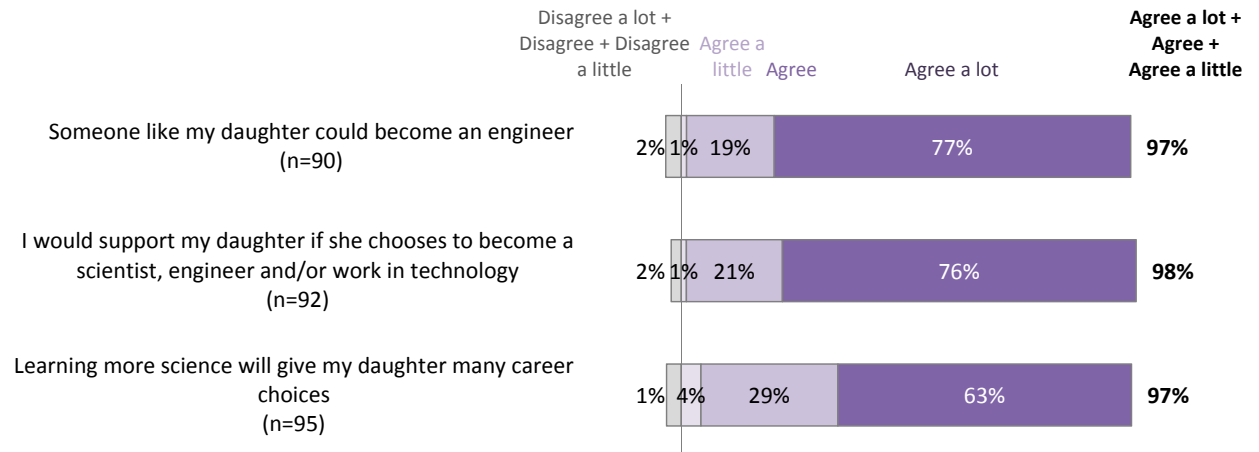
Source: Parent Survey

- While 96% of parents said they have told their daughter they want her to go to college, a somewhat smaller percentage (81%) said they have encouraged their daughter to study SET (Figure 58).

Figure 58. 81% of parents say they have encouraged their daughter to study SET.
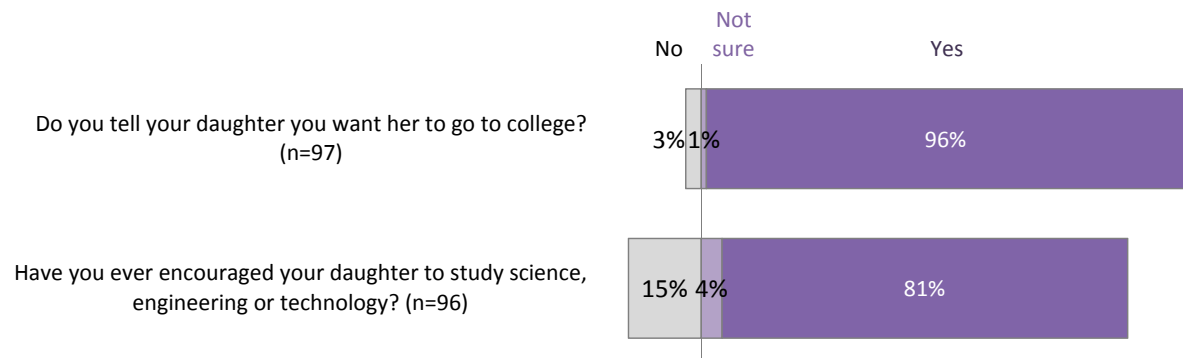
Source: Parent Survey

- Students were asked if their families had encouraged them to consider a SET career. At the end of the year, Techbridge girls were slightly more likely to report that their families encourage them to consider a SET career (increasing from 75% to 84%; see Figure 62 at the end of this chapter).

- Teachers said parents were impacted by their daughter's participation in Techbridge, including being excited or proud about seeing their daughter be interested in the program and the opportunities it provided. Teachers commented that families learned about SET career opportunities. Teachers' comments included:

  "Families also have become more open to the STEM field. Because their daughters continue to return each week, we know they enjoy what the program offers. Many days the students are able to take projects home to show their families what Techbridge is all about. Many

parents are then able to see that their daughter has a strong interest and is capable of achieving in the STEM fields."

"Families enjoyed that their students had these opportunities. They see the value in having access to these kinds of experiences."

Table 4. Families experienced different levels of impact from their daughter's participation in Techbridge.

Percentages are from open-ended question on the Parent Survey (n=70). Responses that included more than one response category were counted under each category.

Techbridge's Impact on Families …	Relevant Quotes
Created Family Interactions about SET and Career or Education Paths (21% of parent responses)	" She now has more interests in line with me and her brothers. She joins in with questions, comments and her experiences. " Yes, we talk about her desire to become an inventor. We suggest that scientific research can be inventive. I also save articles for her about science. " Yes, we are trying to learn through our daughter. And from you through the bulletins and through Family Night.
Increased Awareness of SET Knowledge/Opportunities (21% of parent responses)	" We parents also learned because they shared with us what they learned. " More options that I didn't even know existed! " Techbridge has changed our family's attitude/interest in STEM because our daughter's learning helped us thinking about the world differently. " Yes, we are more curious about science and technology, everything is very interesting, we will investigate more.
Prompted Planning for the Future (17% of parent responses)	" Yes, because now we know there is another option for her future and that is a good thing. " Makes us more optimistic of [our daughter]—that she is better prepared for academics in science and technology as she goes forward in high school and college. " Yes, we are looking for a high school related [to] science, technology and engineering for our daughter.
Not Much/No Change (26% of parent responses, with 10% mentioning prior interest in SET)	" No, we already had an interest in this things. " Not really. My daughter talks more about it, but it hasn't really changed the family attitude. Great work!

A Techbridge expansion site staff member commented how they must be impacting families that access Techbridge resources or attend Family Night by raising their awareness of SET opportunities:

> "Last night at the Family Night, there were stations—electrical, structural, environmental, and chemical engineering—and the parents had a passport. They went around and they ask questions. I don't think all those parents knew [about these SET topics]. Like one of them was saying, 'Oh, I never thought of chemical engineering as like developing skin products.'"

Results of Individual Survey Questions re: Impact on Girls' Families

Figure 59. Almost half of Techbridge girls have family members who work in a SET-related career.
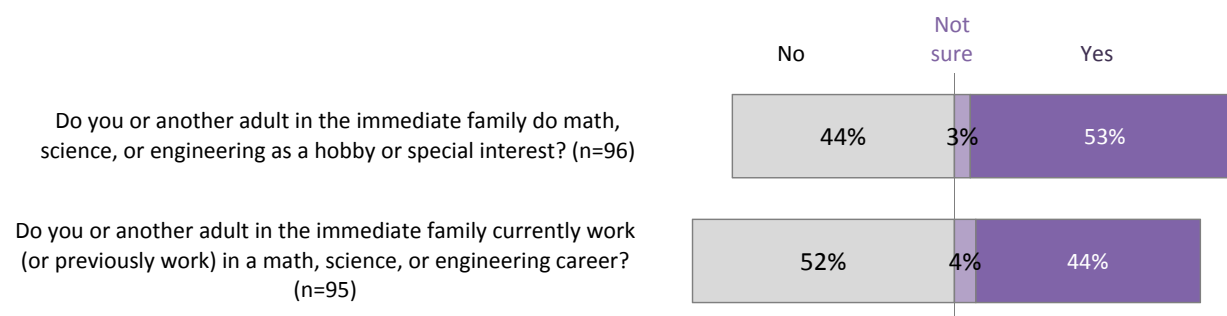
Figure 60. 90% of girls said they had talked with their family about the things they've done in Techbridge.
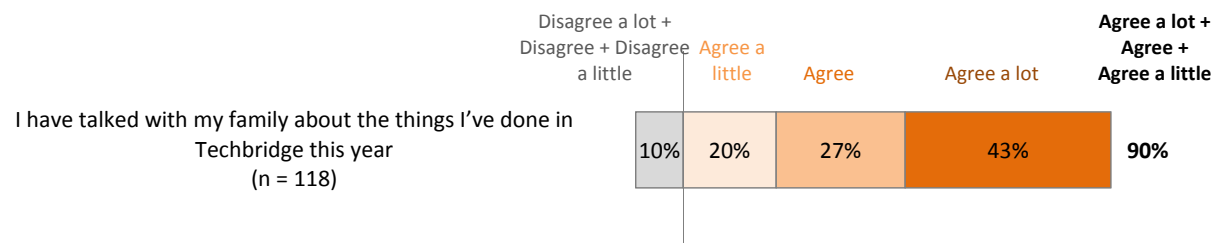
Source: Student Post-Survey

> "It was so beautiful to see that now [the parents] are learning. They're learning from their daughters. They're supporting that. They're excited by that. They were asking their daughters questions about the circuits that they were creating. I thought, 'This is a beautiful experience.' The daughters are the scientists. They are teaching their moms about the learning that they've had. It was overwhelming."
>
> Principal at Techbridge School

SET Interest Scale (Combined Results of Survey Questions)

Figure 61. At year-end, Techbridge girls said their families had become more supportive of their interest in SET compared to non-participants. The difference between the groups was not statistically significant.

Difference in Techbridge vs. Comparison
Mean Post–Pre Scale Scores

Family support in SET
Mean difference = 0.07
Not significant; α = .87

-0.60   0.00   0.60

Comparison girls +   Techbridge girls +
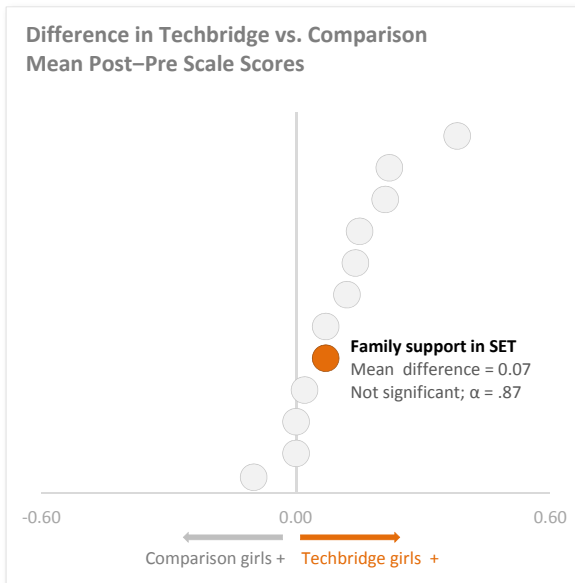
Figure 62. Some Techbridge girls reported that their families became more supportive of their interests in SET.

My family is interested in the courses I take

Agree a little ☐ Agree ☐ Agree a lot ■

	All Techbridge Participants (n = 88)		Comparison Students (n = 66)	
	Pre	Post	Pre	Post
Mean (1.0 - 6.0 scale)	5.10	5.06	5.03	4.82
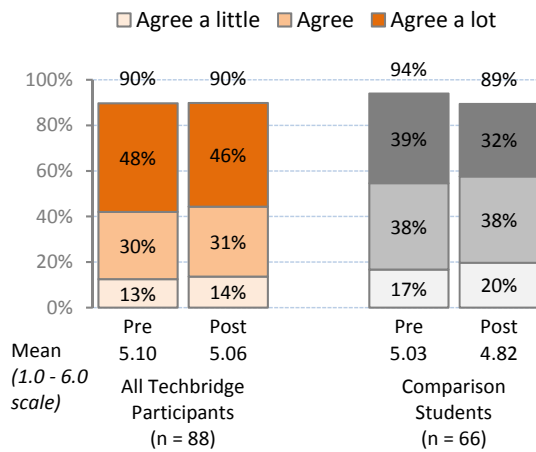
I talk about my career interests with my family

Agree a little ☐ Agree ☐ Agree a lot ■

	All Techbridge Participants (n = 88)		Comparison Students (n = 69)	
	Pre	Post	Pre	Post
Mean (1.0 - 6.0 scale)	4.86	4.69	4.94	4.57+
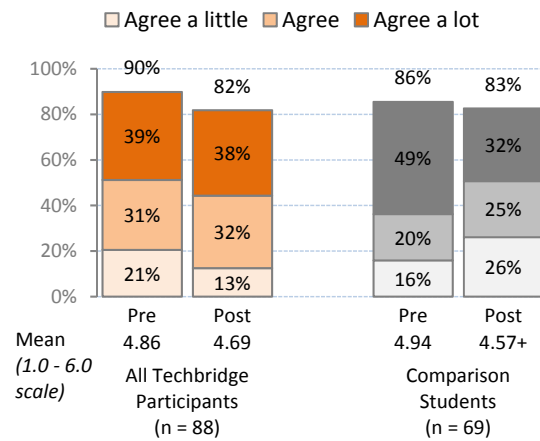
My family would like it if I became a scientist, engineer, or had a tech career

Agree a little ☐ Agree ☐ Agree a lot ■

	All Techbridge Participants (n = 87)		Comparison Students (n = 68)	
	Pre	Post	Pre	Post
Mean (1.0 - 6.0 scale)	4.87	4.91	4.47	4.34
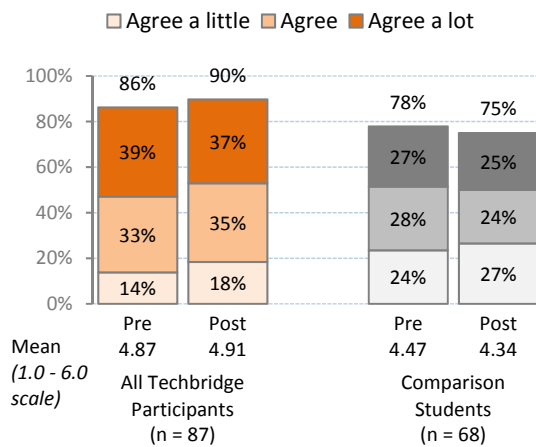
My family thinks science is interesting

Agree a little ☐ Agree ☐ Agree a lot ■

	All Techbridge Participants (n = 86)		Comparison Students (n = 66)	
	Pre	Post	Pre	Post
Mean (1.0 - 6.0 scale)	4.76	4.60	4.17	4.11
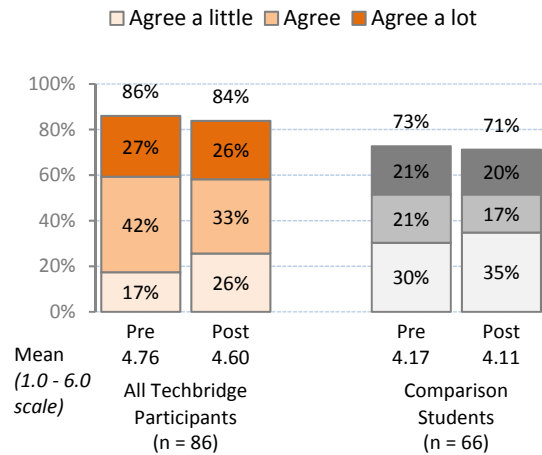
My family encourages me to think about a career in SET

Agree a little ☐ Agree ☐ Agree a lot ■

	All Techbridge Participants (n = 88)		Comparison Students (n = 69)	
	Pre	Post	Pre	Post
Mean (1.0 - 6.0 scale)	4.48	4.55	4.23	4.30
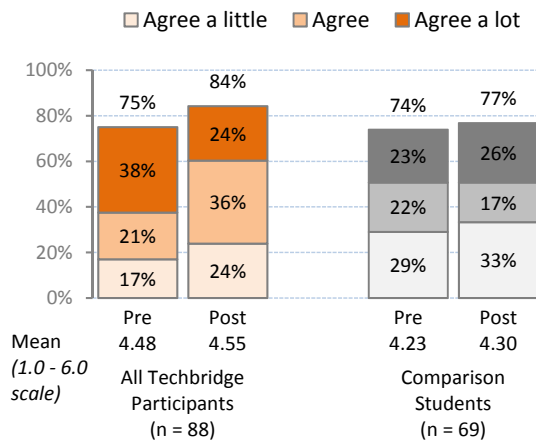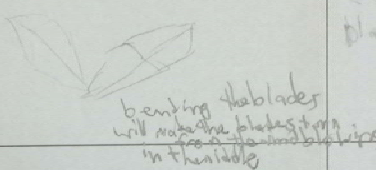
Source: Matched Student Pre/Post Surveys

7 Implementation and Fidelity

Windmill Blade Designs

Your goal is to design windmill blades that can catch the wind. Use the chart below to help design your blades!

	Blade Material	# of Blades	Shape (draw your blade design here)	Observations
1	Index cards	#5	bending the blades will make the blades spin from the wind blowing in the middle	If we bend the blad
2				
3				

In the following section, findings are presented regarding the degree to which the first expansion site implemented the Techbridge program model, and differences between the expansion sites and Bay Area programs.

7.1   To what extent does each new program site implement the Techbridge curriculum?

★   **Key Findings re: Fidelity**

Based on external observations and self-reports by Techbridge teachers and staff, the Techbridge expansion sites generally implemented the Techbridge program model with a high level of fidelity. Along with using the hands-on activities from the Techbridge curriculum, the expansion programs also used strategies that are part of the Techbridge model: consistently emphasizing the engineering design process, fostering positive relationships, and promoting a growth mindset. Programs showed room for growth in the degree to which they made connections between the activities and students' lives, and in discussing gender inequities in SET (and how to address them).

Observers from the evaluation and research teams used the Dimensions of Success (DoS) observation tool to observe a total of ten Techbridge expansion site programs in the fall of 2015 and/or spring of 2016.[10] Figure 63 on the next page shows the mean ratings on the eight DoS dimensions that the evaluation/research teams and Techbridge leadership identified as being key elements of Techbridge. Each element was rated on a scale of 1 to 4; DoS guidelines are that ratings of "3" or "4" indicate high quality.

The ten observed programs showed **compelling evidence** (an average rating of ~4 on the DoS) of the following three dimensions:

- using **materials** that were appropriate and engaging to the students
- having positive **relationships** between the facilitators and students and amongst the students
- offering **purposeful** activities (where the activities clearly relate to STEM learning goals).

The observed programs showed reasonable evidence (an average rating of ~3 on the DoS) of the following four dimensions:

- using **inquiry** approaches (where students had the opportunity to engage in STEM practices like observing, testing, and building explanations)
- having consistent and equal **participation** of all the students throughout the activities
- fostering explicit time for **reflection** and meaning-making during the activities.
- **STEM content learning** (indicating STEM content was presented accurately and that students' comments, questions and performance during activities indicated they accurately understood the STEM content).

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[10] A total of 10 expansion site programs were observed in fall 2015 and spring 2016: 3 Techbridge programs located in Washington, DC in November/December 2015, 3 Techbridge programs located in Washington, DC in May 2016 (2 of which were also observed in the fall), and 4 Techbridge programs located in Greater Seattle in April 2016.

The observed programs showed **inconsistent evidence** (an average rating of less than 3 on the DoS) of the following dimension:

- **relevance** (showing evidence that the facilitators and students were making connections between the STEM content and activities and students' everyday lives and experiences).

Figure 63. The figure below shows the *average* Dimensions of Success ratings for the 10 expansion site programs that were observed in 2015-2016; the eight dimensions that were identified as important elements of the Techbridge model are shown. Observed programs were consistently strong in offering STEM activities with clear learning goals, good materials, and that fostered positive relationships. However, observed programs made relatively few connections between the activities and students' lives (relevance).

Materials
Appropriate & appealing — 4.0

Relationships
Positive student-faciltiator & — 3.8
student-student interactions

Purposeful Activities
Activities relate to STEM learning goals — 3.8

Inquiry
Students engage in — 3.2
STEM practices

Participation
All students participate — 3.2
equally throughout

Reflection
Time for explicit reflection — 3.0
& meaning-making

STEM Content Learning
Presented accurately & students — 3.0
understand content

Relevance
Connections made btwn. — 2.6
activities & students' lives

1	2	3	4
Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence

Source: Observations of a total of 10 expansion site programs in fall 2015 and spring 2016: 3 Techbridge programs located in Washington, DC in November/December 2015, 3 Techbridge programs located in Washington, DC in May 2016 (2 of which were also observed in the fall), and 4 Techbridge programs located in Greater Seattle in April 2016

Figure 64. The figure below shows the *number* of programs that received each Dimensions of Success rating on all 12 DoS dimensions. DoS guidelines are that ratings of **"3"** or **"4" indicate high quality**. The majority of observed programs were rated as high quality. Programs received especially high ratings on "Features of the Learning Environment" and "Activity Engagement." Ratings for "STEM Knowledge and Practices" and "Youth Development in STEM" were generally high, although varied somewhat. For example, two programs received a rating **of "1" (evidence absent)** for relevance.

Number of Programs Receiving Each Type of Rating
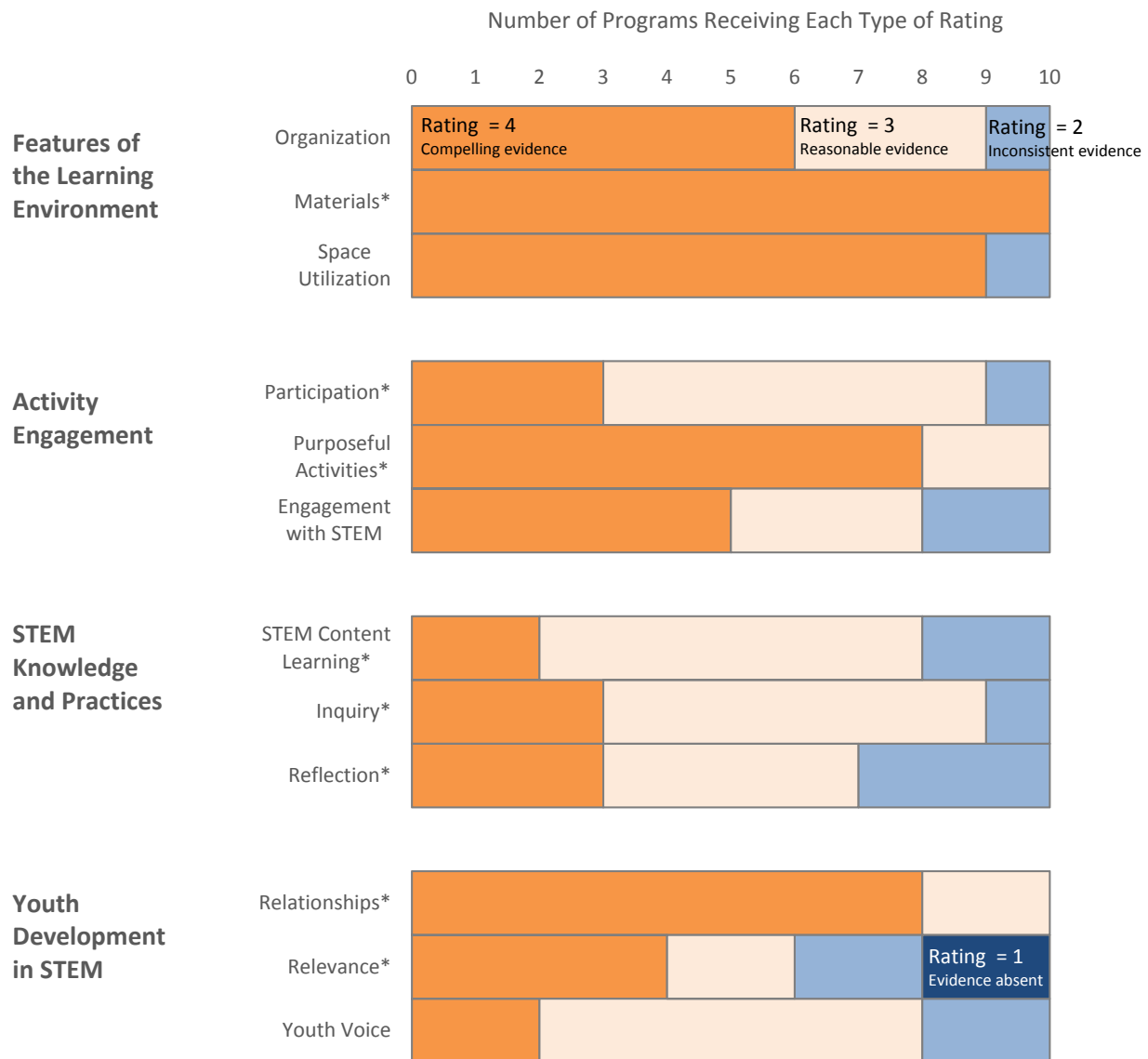
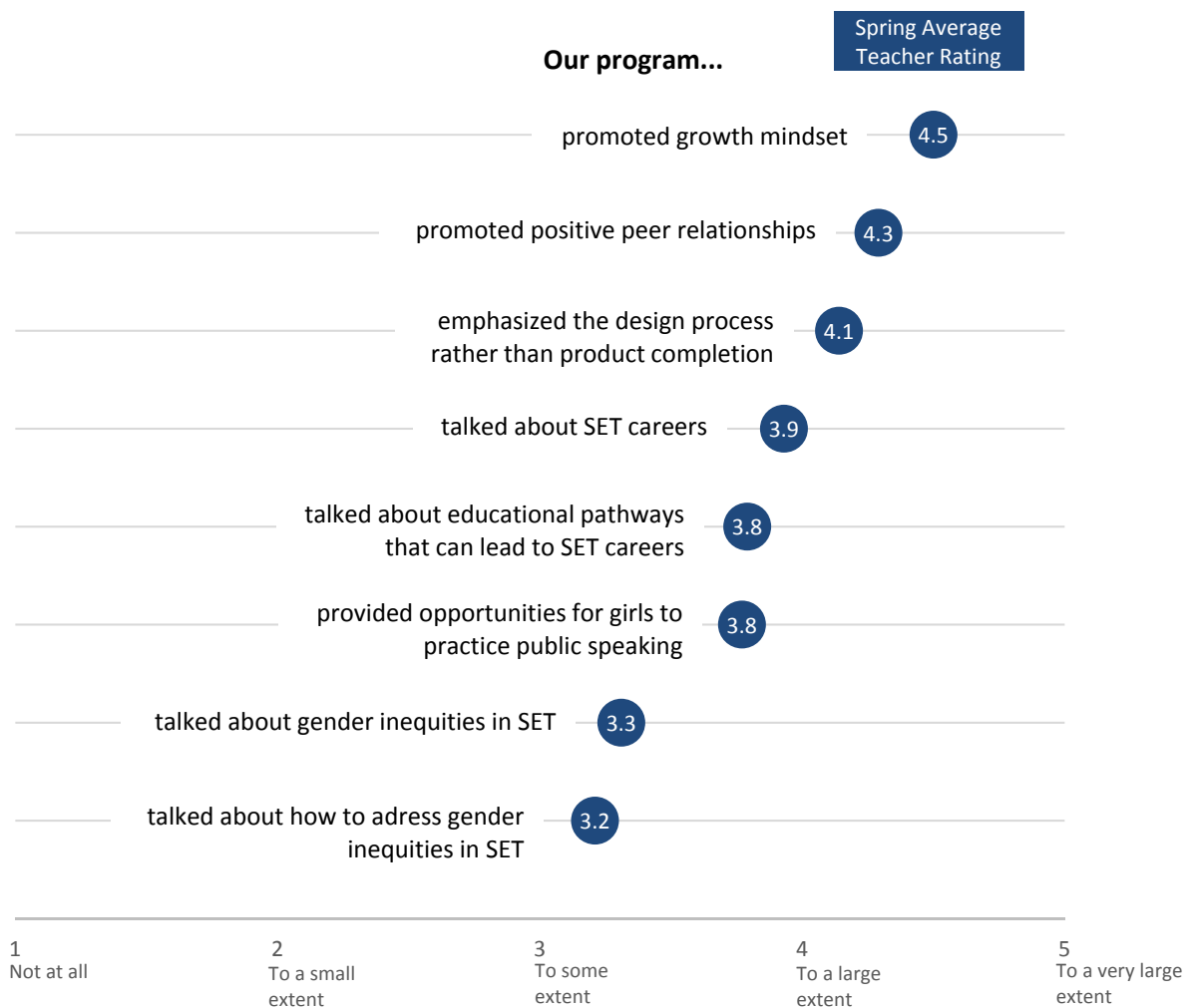*Starred dimensions are included in the Techbridge Implementation Rubric*

Source: Observations of a total of 10 expansion site programs in fall 2015 and spring 2016: 3 Techbridge programs located in Washington, DC in November/December 2015, 3 Techbridge programs located in Washington, DC in May 2016 (2 of which were also observed in the fall), and 4 Techbridge programs located in Greater Seattle in April 2016

Techbridge teachers were asked to describe the extent to which various Techbridge-specific elements that were not specifically addressed in the DoS were implemented in their program (see Figure 65 below), including discussing SET educational and career pathways, the engineering design process, growth mindset, peer relationships, public speaking, and gender inequities in SET. With the exception of discussing gender inequities in SET (and how to address them), the majority of the teachers said they implemented each of the Techbridge program elements either to a "large" or "very large" extent.

Figure 65. Of the various Techbridge program elements, teachers were most likely to report that their program promoted a growth mindset and positive peer relationships, and least likely to report their program talked about gender inequities in SET or how to address them.

Our program...

| Spring Average Teacher Rating |

promoted growth mindset	4.5
promoted positive peer relationships	4.3
emphasized the design process rather than product completion	4.1
talked about SET careers	3.9
talked about educational pathways that can lead to SET careers	3.8
provided opportunities for girls to practice public speaking	3.8
talked about gender inequities in SET	3.3
talked about how to adress gender inequities in SET	3.2

| 1 Not at all | 2 To a small extent | 3 To some extent | 4 To a large extent | 5 To a very large extent |

Source: Teacher Survey; n = 14

EDC Learning transforms lives.

7.2   How does implementation at the expansion sites vary from the original program model (fidelity and innovation)?

★   **Key Findings re: Variations to the Original Techbridge Model**

As in Year 2, the expansion sites and Bay Area programs differed in a number of ways related to staff structure and responsibilities, program implementation, and school district involvement.

The Year 2 evaluation report (covering data from the 2014-2015 school year) described the differences between the expansion sites and Bay Area programs in some detail. In brief, these differences include:

- The expansion sites have fewer staff (3-4 staff at each location versus ~15). The small office size means fewer people to interact with and receive support informally, as well as potentially fewer opportunities for advancement. On the other hand, the expansion sites were more insulated from the staffing transitions and associated stress that occurred in the Techbridge Oakland office during Year 3, including changes in the professional development and the development and communications staff.
- The expansion site Executive Directors (and PCs) are also responsible for cultivating relationships with local STEM partners, including businesses, educational institutions, funders, and donors. In addition, both PCs from Greater Seattle have helped draft grant proposals for funding and participation in other activities (e.g., an exposition at the Museum of Flight).
- The expansion site programs are 90 minutes long, while the Bay Area programs are 120 minutes.
- The Greater Seattle expansion site has had a tighter connection to the school district than the Bay Area programs or Washington, DC programs. The Highline Public Schools decided which schools should have Techbridge programs, helped identify partner teachers, met with Techbridge staff regularly, and dropped in to visit programs and attend Family Nights.

7.3   How does the scale-up influence Techbridge processes in the Bay Area?

Data were not collected to address this evaluation question in Year 3 of the AISL project (2015-2016). Due to turnover in Techbridge staff (the retirement of the Techbridge Executive Director, departure of the Chief Growth and Strategy Officer, and elimination of the Research & Evaluation Manager position), the evaluation team did not conduct an annual interview with senior Techbridge staff from the Oakland office in Year 3 (normally scheduled for the summer following the end of the program year).

8 Organizational Capacity
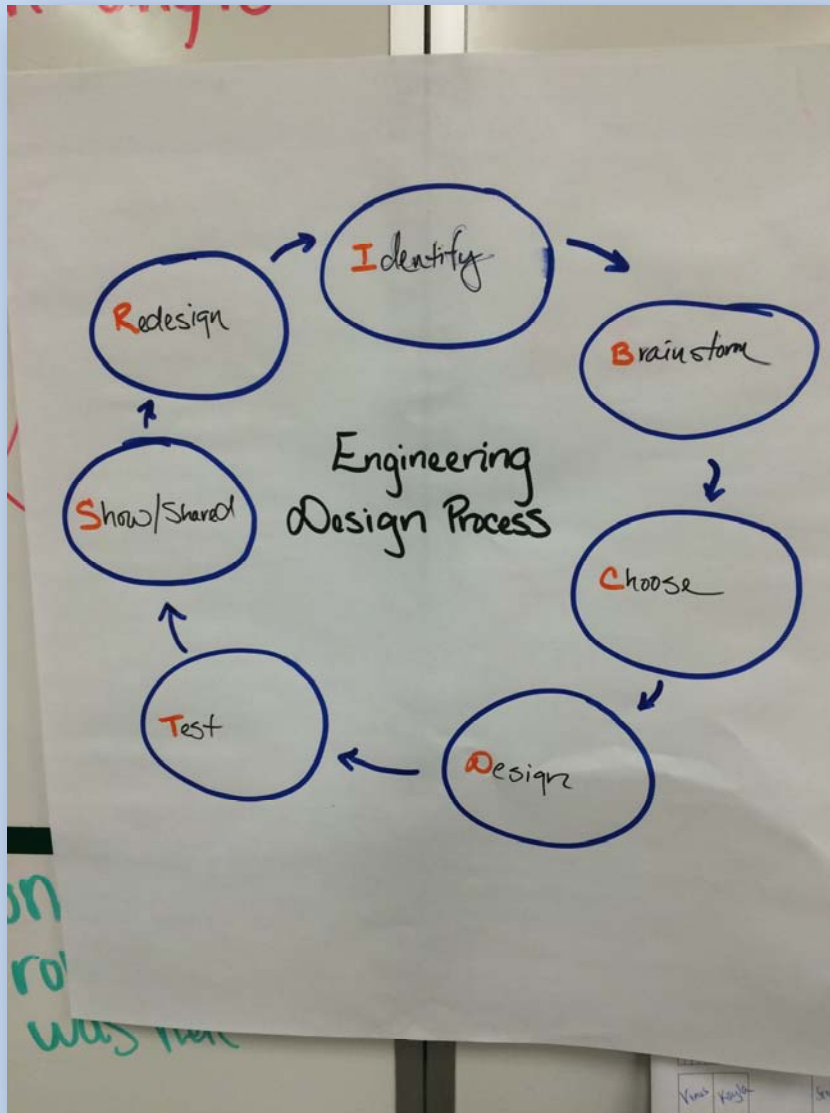
8.1   What does Techbridge need to pay attention to as it expands? What factors emerge as important for the scale-up effort (e.g., vision, resources, knowledge/skills/abilities, incentives, ownership, structure)?[11]

★   **Key Findings re: Factors for Techbridge to Pay Attention To**

Based on findings from Year 3, Techbridge may wish to (1) ensure the expansion sites have sufficient staffing and support; (2) continue to facilitate strong cross-site communication and collaboration; and (3) make extra efforts to ensure that staff from expansion sites feel sufficiently connected to senior leadership.

After two years of expansion, a few factors are emerging that may be important for Techbridge to pay attention to as it scales up:

- **Staffing and support for the expansion sites.** Expansion site staff described the feeling of their work as entrepreneurial. One said, "Make no mistake, it's a startup. That's what it feels like to me…We're totally, as everyone says, building the plane as we fly it." That sort of atmosphere can foster creativity, encourage strong collegial bonds, and create opportunities for professional growth. In fact, the PCs and EDs in Greater Seattle and Washington, DC universally described the relationships with their colleagues as very positive, collaborative, and supportive. The staff at the expansion sites seem to thrive on challenge (a good quality to have given Techbridge's current stage of development). However, a startup environment can also lead to stress and burnout given the constant high workload, the need to create new systems, and the occasional ambiguity and uncertainties that are typical in developing organizations. Staff at both expansion sites raised concerns about the workload and sustainability of the current staffing model. One staff member said:

    > "I think that as a remote office, we have a lot more on our plate than home base. We have to do a lot more things that aren't program related, and that can be taxing. It takes away from our capacity to deal with a functional, effective, fun program. Sometimes just bare bones, and I'm going, 'Oh, we have this other thing to do,' or 'I don't have anyone to help me with this,' so the program today is not what I would love for it to be, whether we're maxed out or we don't have a person dedicated to this one thing that Oakland might have."

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[11] The following evaluation questions regarding organizational capacity were addressed in the 2015 evaluation report and are either not addressed again in this report or are addressed within the other evaluation questions in this section:

- What are the incentives for each of the stakeholders to participate (including project leadership, new program sites, teachers, role models)? Are the incentives sufficient? What are the barriers?
- What resources do project leadership and program partners each provide and are they sufficient (including funding, equipment, space, human capital, leadership, and time)?
- How does Techbridge develop monitoring, evaluation, quality control, and feedback mechanisms (and feedback loops)? How is project feedback (including evaluation results) used to improve the program?
- What's considered to be "working" and "not working" as the expansion unfolds?

Another staff member said:

> "I feel like the three-person model isn't sustainable.…I just feel like there's still too much work for three people, because our stress is always, mostly on high, it's always on high. We're always doing something."

The Greater Seattle office is the process of increasing the number of its staff (as it expands to serve a new school), with openings for a third PC position and a program assistant. The new staff will likely help ease the sense of feeling overloaded for this site.

- **Communication processes among and between the expansion sites and main Techbridge office.** Techbridge has developed a number of formal and informal communication processes to facilitate communication amongst and between the Oakland, Greater Seattle, and Washington, DC offices (described later in this chapter). As mentioned in the 2015 evaluation report, the Techbridge main office will need to continue to be vigilant about facilitating cross-site communication and collaboration— especially as people and their positions shift.

- **Distribution of resources amongst Techbridge sites.** Staff in each site may have different perceptions regarding how equitably resources are distributed amongst the three sites—including staff workload and access to senior Techbridge leadership (such as through in-person visits). It is important to emphasize these are perceptions, and that the workload and resources may be similar across sites, and staff at one site are simply not aware of what resources other sites have. But perceptions matter. If not addressed, they could lead to misunderstandings and discontent down the road. The senior leadership team may wish to make extra efforts to ensure that staff from all sites feel included, attended to, and connected.

8.2 What formal and informal communication structures evolve between the Techbridge Bay Area office and the expansion offices?

★ **Key Findings re: Communication Structures**

A number of formal and informal communication structures have evolved (and continue to evolve) between the Bay Area office and the expansion sites, including formal staff training, scheduled check-in meetings, technology infrastructure, and informal communication between staff at different locations.

Formal structures include:
- One-week staff onboarding held in the summer in Oakland. Three of the four PCs from the expansion sites participated in the July 2015 trainings together with PCs from the Bay Area programs. The trainings covered parts of the curriculum, student recruitment and retention, family outreach, integration of career exploration, support for role model visits and field trips, training for teachers, and evaluation processes, as well as training on technology tools and operations. The training also offered explicit (and implicit) opportunities for teambuilding and learning about Techbridge's culture. One of the Greater Seattle PCs left her position in the summer of 2015 and her replacement started just as the 2015-2016 program year was beginning. This new PC did not receive formal training due to the timing of her hire.

- Monthly teleconferences for all after-school staff during the program year.
- Biweekly teleconferences between the Greater Seattle ED, Washington, DC ED, and the Bay Area Programs Manager.
- Central online repository for sharing Techbridge documents.

- Salesforce database software to manage participant and partner information.

Informal structures include:

- The EDs and the PCs from the expansion sites reached out to one another to ask for advice, discuss ideas, and receive support. Some of the PCs also communicate with the PCs in Oakland.
- PCs reported occasionally contacting the Director of Curriculum to ask questions.

8.3 How is Techbridge connected to and affected by larger systems in its environment (e.g., school priorities, district policies, proximity and priorities of tech companies and educational institutions)?

★ **Key Findings re: External Factors that Have Impacted Techbridge**

The district Greater Seattle is partnered with continues to have an influence on Techbridge's programming. The Highline Public Schools advocated strongly for Techbridge to add a high school program, and Techbridge will do so beginning in fall 2016.

Techbridge was affected by external factors, including district priorities and schools' prior relationships with parents:

- The Highline Public Schools advocated strongly for Techbridge to add a high school program. Staff from the district would like students to have the opportunity to participate continuously in Techbridge from elementary school through high school graduation. Techbridge made the decision to add a high school program beginning in 2016-2017. With input from the district, Techbridge eliminated one of the middle school programs that does not feed into the high school, and added an elementary school that feeds into one of the two remaining middle schools where Techbridge will continue to offer programming.

- While several school administrators said that Techbridge has been unusually successful at getting parents to attend its events (Family Nights) compared to other school and afterschool programs, some parents may have negative associations with school that make it more challenging for Techbridge to get parents involved because they are associated with schools.

> "I do think one of the difficulties…is because they are a program that's being provided on school grounds, they are just de facto associated with the school. If the school doesn't have strong family engagement because I'm actually rather impressed with her family engagement more so than maybe some other school's efforts. Just being connected from the outside perspective that they have enough hill battle to climb because they are just tied to a parent or a family member's perception of how they feel about the school."

8.4   What unanticipated issues and opportunities emerge that affect Techbridge's expansion? How do they affect the expansion? How does Techbridge address these issues and opportunities?

★   **Key Findings re: Unanticipated Issues**

The Techbridge curriculum was designed to be implemented in two-hour sessions, while both expansion sites only have 90-minute programs. Techbridge staff and teachers reported that it was sometimes challenging to keep fidelity to the Techbridge model and to address all of Techridge's hoped-for outcomes for girls.

Techbridge experienced multiple staffing changes during 2015-2016 which both gave rise to new opportunities, and also put greater strains on remaining staff and systems.

Several issues and opportunities emerged that affected Techbridge's implementation in the expansion sites.

First, as described in the 2015 evaluation report, the expansion site programs are 90 minutes long instead of 120 minutes, as in the Bay Area. The Techbridge curriculum was designed for two-hour sessions, with time for an opening icebreaker activity, time for participants to iterate on their designs, and time for reflection at the end of the activity. PCs and teachers adapted the curriculum, but found that iteration and reflection time—key parts of Techbridge's model—were often cut short. One PC said:

> "I think what I struggle with a lot and what I still am struggling with is...the goals of the programs. There's so many goals that I had a really hard time meeting all of them. So I was trying at the beginning of the year and still now, I kind of have prioritized them, and some I didn't do as well this year. I tried to do some of them really well, and then I can build on the other things later.
>
> "I think, for me, the confusing part was, 'What are priorities? Is it the STEM content, community building, is it the exposure to careers?' Obviously, all of those are important, but we have shorter programs than Oakland, and I don't feel like I can really do all of them really well. I can touch on them all, but is that as important as going deep into a few. I think that that is something that I'm still struggling with, but I've gotten, based on what I've learned this year, I have some strategies for how to approach it next year. It's not that I'm confused on the goals or the values, it's just, 'How do you do it all?'"

Second, Techbridge experienced multiple staffing transitions during the last year. Staffing changes can create opportunities for fresh ideas to be introduced, and can also lead to confusion and the loss of important institutional knowledge.

- Techbridge's founding Executive Director retired in December 2015. An interim CEO served part-time from December 2015 – June 2016. A new CEO/Executive Director took the reins of Techbridge in July 2016.

- As described in the 2015 evaluation report, the original Greater Seattle Executive Director resigned in February 2015. The Greater Seattle Area was behind its original external fundraising goals, and the new

Greater Seattle ED (who started in July 2015) made developing partnerships and exploring funding sources a priority.

- One of the two Greater Seattle PCs departed Techbridge in early fall of 2015, which delayed the start of four of the 2015 Greater Seattle programs by a few weeks. Techbridge was able to quickly hire a highly qualified replacement PC, although she missed the opportunity to participate in the staff onboarding.

- A number of other Oakland-based staff who played a key role in supporting the Techbridge expansion sites departed.

    o The Chief Growth & Strategy Officer, who oversaw implementation of the expansion grant, resigned her position in June 2016. Shortly thereafter, the Washington, DC ED became the Interim Head of Programs, while also retaining her responsibilities of managing the Washington, DC expansion site.

    o The Research and Evaluation Manager position—which was created in July 2015 and had responsibility for interfacing with the AISL research and evaluation teams—was eliminated in June 2016.

    o Multiple staff in the Development and Communications department, who help support the expansion EDs in fundraising, left the organization over the course of the year. A larger portion of grant-writing responsibilities fell to the expansion EDs, who, in turn, delegated more responsibilities to their PCs (including, in some cases, giving them the opportunity to help write grants).

- Techbridge began a strategic planning process at approximately the same time that the AISL grant began. With the departure of the CEO and the maternity leave of the Chief Growth & Strategy Officer (prior to her departure), Techbridge put the strategic planning process on hold. The expansion site EDs needed to make decisions regarding the scope and structure of their programs without the guidance of an overall plan, such as reaffirming the decision to begin high school programing in Greater Seattle.

With the addition of the Washington, DC programs in 2015, the total number of Techbridge after-school programs has increased more than two-fold, from 14 programs located in the Bay Area in spring 2014 to 29 programs located in three different regions of the country in fall 2015. The sudden growth strained the operations side of the organization (e.g., accounting), which has worked on ways to streamline and add capacity to support the growth.

8.5 **What capacity-building activities occurred to enable project sustainability? How does the level of support from Techbridge's main office change over time? How and to what extent do expansion sites develop a plan for sustainability?**

★ **Key Findings re: Sustainability**

Partly due to changes in the Oakland-based development staff and Greater Seattle leadership, fundraising has taken more time to develop than originally anticipated. Both Greater Seattle and Washington, DC have established advisory councils that will have a role in helping to secure local sources of support. Greater Seattle has secured funding to expand its work in the 2016-2017 year.

Techbridge originally planned for the expansion sites to become self-sustaining within three years. The original expectation was that the local EDs would be responsible for raising almost all of the funds needed to support the programs beyond the end of the NSF grant, with the assistance of their local advisory council (who would have personal connections to individuals and companies with resources) as well as the support of Techbridge's national Development Director. In part due to staffing changes at the Oakland and Greater Seattle offices, fundraising has taken more time to develop.

The EDs of Greater Seattle and Washington, DC have recruited and formed advisory councils whose primary role will be help them recruit supporters and develop a local funding base. This work is still in the early stages.

The Greater Seattle Area ED collaborated with the Highline Public Schools on their Race to the Top renewal application which included a plan to implement a pilot family engagement program with the Somali Youth and Family Club (SYFC). This program will be launched in 2016-2017. A district representative said:

> "They've turned out to be one of our stronger partners in terms of what they're bringing to the table and being able to expand of course with the funds that we're supporting. But I appreciate that they've gone out and looked for additional funds to sustain programming because that doesn't always happen with our partners. For me, that exceeded [my] expectations because most partners are, 'Either you give me the money or I can't provide programming.' I appreciate [the ED's] willingness to work in collaborating and continuing to find opportunities to fund the programming."

9 Summary

9.1 Areas of Consideration

The following recommendations were offered by girls, parents, teachers, school leaders, role models, and Techbridge staff, or emerged based on the 2015-2016 findings from Techbridge's second year of implementation at sites outside of the Bay Area.

Girls

Consider strategies to address the challenge of recruitment and retention of girls at middle schools. Some stakeholders suggested Techbridge allow girls the option to participate in the program on a quarterly or semester-by-semester basis rather than commit for the entire year. For example, one school teacher said, "I would like to suggest a change in the schedule. It was hard to keep girls during the spring because they are ready for some other activities (soccer, [running], etc.)." If Techbridge plans to serve girls for multiple years (including as they advance from elementary school to middle school to high school), it may also need to identify additional strategies to retain girls. Techbridge might consider interviewing other afterschool organizations to gather ideas for effective ways to retain students over multiple years.

Focus on areas where students' SET-related attitudes, skills, and interests have the most potential for growth. Girls demonstrated positive outcomes in many areas. However, there are opportunities for growth in other areas, including understanding how SET is relevant to their own lives. Evidence from the DoS observations suggests that facilitators made relatively few connections between the STEM content of the activities and students' everyday lives and experiences.

Offer additional, optional activities to girls who want more challenges. Some girls said they found some of the activities boring or repetitive. One parent wrote on the parent survey, "Push the students further" while another said, "[My daughter] at one point vented some frustration that this year was a rehash of last year. She wanted new challenges."

Identify areas of the curriculum where girls may need additional scaffolding. A few girls said they sometimes felt lost or thought they could have learned more with additional staff support. Similarly, one teacher said, "Some of the lessons/curriculum didn't seem to anticipate student misunderstanding. Sometimes students needed more guidance or instruction in order to be able to complete the task they were asked. I would like to see more of this side of the curriculum planned out to alleviate some of the frustrations the students felt during those times." Teachers may be able to help weigh in on the curriculum and identify areas that could prove to be problematic for their students, language issues, etc.—especially if they have a chance to review materials prior to their implementation.

Teachers/Schools

Consider providing additional professional development to Techbridge facilitators about specific ways they can talk about gender inequities in STEM and how to address them. According to teachers, programs spent little if any time explicitly talking about gender inequities in

STEM and that girls showed relatively growth in this area. Techbridge might also consider asking role models to address gender equity issues.

Role Models

Consider adding more field trips (including longer ones) and more role model visits, which were particularly powerful ways of introducing girls to SET careers and career pathways. Teachers also suggested working with role models to ensure activities were developmentally appropriate and to ensure a clear vision for each role model visit. Field trips were thought to be especially valuable and "mind-opening" opportunities that most students did not have outside of Techbridge.

Tailor the information and preparation to role models' needs: make more information available to role models who request it (and less to those who are already well-prepared). Role models requested that Techbridge provide more details about the logistics of their visit or field trips, provide more information about the Techbridge girls to help the role models prepare their materials at the appropriate level, and share examples or slides of activities from previous role model visits. A number of role models wanted a quick, general overview of Techbridge (e.g., a video). On the other hand, one role model felt that that the training was unnecessary for experienced facilitators, and another had similar comments about the preparation, noting that there seemed to be a lot of expectations and demands.

Continue to work on recruiting role models who are women of color. Stakeholders noted that it is especially powerful for girls to see and interact with women who share their backgrounds and experiences.

Families

Continue to experiment with various platforms for communicating with families. PCs said they have had varying success with using social media (Tumblr), calling, emailing, and texting families to invite them to Family Nights and keep them apprised of Techbridge activities. Texting seemed to be most consistently effective and efficient, but timing and content could be further tested and refined. Techbridge could also consider other formats. For example, photographs are an easy way to overcome language difficulties. Programs could each get a Polaroid camera and send girls home with a picture after meetings.

Program Design, Curriculum, and Professional Development

Revise the curriculum to explicitly accommodate the 90-minute length of the programs. The PCs and teachers reported that it was challenging to make sure girls had time to iterate on their designs and reflect on what they were learning. While the facilitators were flexible and found creative ways to adjust the curriculum—designed for two-hour-long sessions—Techbridge may want to make more deliberate and consistent choices about what can be eliminated from the curriculum and what is essential to keep, using the knowledge and experience of the expansion site PCs.

The senior leadership team may wish to make extra efforts to ensure that staff from all sites feel included, attended to, and connected to the organization and staff. One staff member said, "The [annual] meeting that we have is super helpful…because otherwise, you feel so isolated when you're in a satellite office." Continue to be vigilant about facilitating cross-site communication and collaboration—especially as people and their positions are shifting.

Ensure the expansion sites have sufficient staffing and support. Staff at expansion sites have many roles and are often overwhelmed with the amount of work that they have to do, which often includes simpler organization tasks such as updating spreadsheets and packing materials. As Greater Seattle expands next year with the addition of two new staff, Techbridge leaders will undoubtedly be monitoring to weigh the costs and benefits of adding staff who focus on providing administrative support, freeing the ED and PCs from some of their current responsibilities.

9.2   Conclusion

In summary, in 2015-2016 Techbridge successfully added a second expansion site outside of the Bay Area, and implemented a total of 15 after-school programs for elementary and middle school girls in Washington, DC and near Seattle, WA. The programs were able to recruit a diverse group of girls to participate in the program, although participation at the middle school level remained a challenge.

Techbridge's supportive learning environment and hands-on SET activities gave girls opportunities to become more confident in themselves and their SET abilities. A number of participants said the Techbridge curriculum, role model visits, and field trips helped them learn about careers in SET that they had not previously heard of, and motivated them to consider pursuing a SET career. The program appeared to have an especially strong influence on girls' understanding of practices and process commonly used in SET, such as the engineering design process. Techbridge girls were also somewhat more likely than non-participating students to become more interested in SET; understand various SET career options and plan to pursue a SET education; have a growth mindset; and report greater family support in SET.

Girls, families, teachers, role models, and school leaders all rated Techbridge highly and were eager to see it continue and grow.

Both expansion sites have begun to implement infrastructure and systems to increase their sustainability—including establishing advisory councils to help with fundraising and applying for and securing grants. With two years of strong support and involvement from the Highline Public Schools, Greater Seattle has been particularly successful in establishing itself and a future direction.

As an organization, Techbridge is at an important junction with recent changes in leadership and staff responsibilities. The next year will be important one for Techbridge to deepen its roots in Greater Seattle and Washington, DC and hone in on the most effective methods to support expansion sites as it searches for a third site to launch in in 2017.