Techbridge Broad Implementation

2014-2015 Evaluation Findings from Techbridge's First Year in Greater Seattle

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Executive Summary of 2014-2015 Evaluation Findings from Techbridge's First Year in Greater Seattle

Background

Techbridge's mission is to help girls discover a passion for science, engineering, and technology (SET). In August 2013, Techbridge was awarded a five-year National Science Foundation grant to scale up its after-school program from the San Francisco Bay Area to multiple new locations around the United States. In the fall of 2014, Techbridge began offering after-school programming at five elementary and two middle schools in the Highline Public School district, located near Seattle, WA.

Education Development Center is conducting the formative and summative evaluation of the project. To assess the implementation and impact of the first year of the expansion effort in Greater Seattle, qualitative and quantitative data were collected from a variety of stakeholders, including from the girls who participated in the new programs and non-participating comparison students from the same Highline schools; the parents or guardians of Greater Seattle Techbridge students; role models who visited the Greater Seattle programs and/or hosted Techbridge field trips at their companies; Techbridge teachers and principals from the Greater Seattle schools; Highline Public Schools district representatives; and Techbridge staff. The evaluation team also conducted observations of selected programs.

Techbridge's first year of implementation in Greater Seattle was successful.

- Highline Public Schools district leaders, principals, and teachers were eager to partner with Techbridge and had the capacity to support implementation of the program.
- School leaders, teachers, role models, girls, and their families all rated the Greater Seattle programs highly. Field trips, role model visits and Family Nights were identified as particular highlights of the 2014-2015 program year in Greater Seattle.
- The expansion programs in Greater Seattle differ from existing programs in the Bay Area in several ways. Highline Public Schools requested a tighter connection with Techbridge than Techbridge has had with most school districts in the Bay Area (e.g., Highline district representatives selected partner schools, helped to identify teachers to co-facilitate the programs, and had regular meetings with Greater Seattle Techbridge staff). Greater Seattle programs are shorter in duration than Bay Area programs (90 minutes per week versus two hours per week). The expansion sites also have a unique staffing model, where a regional Executive Director manages the programs and develops partnerships with local SET organizations and funders. These differences in context meant program implementation looked somewhat different than in the Bay Area.

> "I'm not being overly dramatic when I say that for many of these girls, this program will be instrumental, along with other things, in…potentially changing outcomes for them. I fundamentally believe that. That's exciting."
>
> Principal of Techbridge school in Greater Seattle

- The Greater Seattle Techbridge expansion site was successful in reaching girls from underrepresented groups. The Program Coordinators were also able to recruit a diverse group of women in SET to serve as role models.

Techbridge had a positive impact on girls and their families.

- Techbridge's hands-on activities gave girls opportunities to become more confident in themselves and their abilities in SET. 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. Several students said that the program was specifically empowering to them as girls.

- 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. At the end of the year, Techbridge girls were significantly more likely than comparison students to report they understood and used SET practices ($p < .001$).

- Techbridge girls were also somewhat more likely than non-participating students to report they understand and are interested in various SET career options; have improved collaboration skills and a growth mindset; and report greater family support in SET. However, these differences were not statistically significant.

- Teachers reported that Techbridge improved their knowledge and implementation of strategies for engaging girls in SET. Most of the teachers had used Techbridge curriculum or other resources during the regular school day.

- The majority of parents reported that because of Techbridge, they were more aware of SET resources and more likely to encourage their daughters to pursue their interest in SET. Some Techbridge girls reported that their families became (even) more supportive of their interests in SET.

In summary, Techbridge successfully expanded to its first city outside of the San Francisco Bay Area and is poised to continue scaling up within the Greater Seattle area as well as in Washington, DC.

> "[Techbridge] has helped me learn and be involved in new science, technology, and engineering activities that I may never have known about [otherwise]. Techbridge let me meet role models in the business that involves STEM. Techbridge took me on field trips to a tech company, where I can see what reality/jobs are like for those who work in the STEM career, and learn more about what they do. Techbridge inspired me to pick a career in the STEM field. Techbridge helps me discover and design many different inventions that are very fun. Techbridge encourages your interest in STEM. It explains to you the different careers that are available for you to choose from, and what that career is like."
>
> Greater Seattle Techbridge program participant

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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. In 2014-2015, Techbridge began operating after-school programs at seven elementary and middle schools in the Highline Public Schools, located near Seattle, WA.

Education Development Center (EDC) is conducting the formative and summative evaluation of the project. This report summarizes the findings from Techbridge's implementation in its first expansion site, the Greater Seattle Area, in 2014-2015.

2 Evaluation Overview

In January 2014, EDC met with members of the Techbridge executive team to develop a logic model describing Techbridge's activities and outcomes (see Appendix A) and establish the following evaluation questions 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?

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?

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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 3-5 evaluation reports after data have been collected from the second Techbridge expansion site.

- 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 trainings for teachers and staff, and reviewed relevant Techbridge documents. Table 1 (on the following page) 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 2014 (pre) and May 2015 (post)
	Comparison Student Pre/Post Annual Surveys	October/November 2014 (pre) and May 2015 (post)
	Participant Focus Groups	May 2015
	Embedded Assessments	Fall 2014 and Spring 2015
Teachers, Schools, & District	TB Teacher Survey	May/June 2015
	TB Teacher Interview	May 2015
	Principal Interview	May 2015
	District Leader Interview	May 2015
	Participant and Comparison School Records	Data requested from Highline Public Schools
Parents	Parent Survey	May 2015
	Parent Interview	May 2015
Role Models	Role Model Survey	June 2015
Techbridge Staff	TB Staff Interview (Main Office)	August 2015
	TB Staff Interview (Expansion Sites)	May 2015
Other	Dimensions of Success Ratings	November 2014 and May/June 2015
	Observe Expansion Site Training	July 2014 and July 2015
	Observe Teacher Training	August 2014
	Attend AISL TB Committee Meetings	March – June 2014
	TB-Specific Fidelity Rubric	November 2015
	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.

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?

Teachers used a variety of strategies to recruit and retain girls from underrepresented groups (see Table 2 below). The majority of teachers who responded to the survey (four of six) said they reached out to individual girls from underrepresented groups, created flyers or materials in multiple languages, and made sure those materials portrayed a diverse group of girls. Half the teachers (three of six) said they reached out to families from underrepresented groups, made activities relevant to girls from underrepresented groups, and made sure role models were diverse. Only two teachers said they asked other teachers to recommend girls or had ensured facilities and activities were accommodating for girls with disabilities.

Table 2. Teachers reported using a variety of strategies to recruit and retain girls from underrepresented groups
Teacher Survey; n = 6

What efforts did you make to recruit and retain girls from groups underrepresented in science, engineering and technology (e.g., girls who are African American, Hispanic/Latina, or who are English Language Learners) in your Techbridge program? Select all that apply.	Number of Respondents (out of 6) Who Reported One teacher = ●[3]	
Reaching out to individual girls from underrepresented groups	4	● ● ● ● ○ ○
Creating flyers or materials in multiple languages	4	● ● ● ● ○ ○
Portraying a diverse group of girls on flyers or Techbridge materials	4	● ● ● ● ○ ○
Reaching out to families of girls from underrepresented groups	3	● ● ● ○ ○ ○
Making activities/curriculum relevant to girls from underrepresented groups	3	● ● ● ○ ○ ○
Making sure role models are diverse and/or otherwise similar to girls from underrepresented groups in the program	3	● ● ● ○ ○ ○
Asking other teachers for recommendations of girls from underrepresented groups	2	● ● ○ ○ ○ ○
Ensuring facilities and activities are accommodating for girls with disabilities	2	● ● ○ ○ ○ ○
Working with other school clubs or groups that already serve girls from underrepresented groups	1	● ○ ○ ○ ○ ○
Other efforts (please describe): • Home visits	1	● ○ ○ ○ ○ ○

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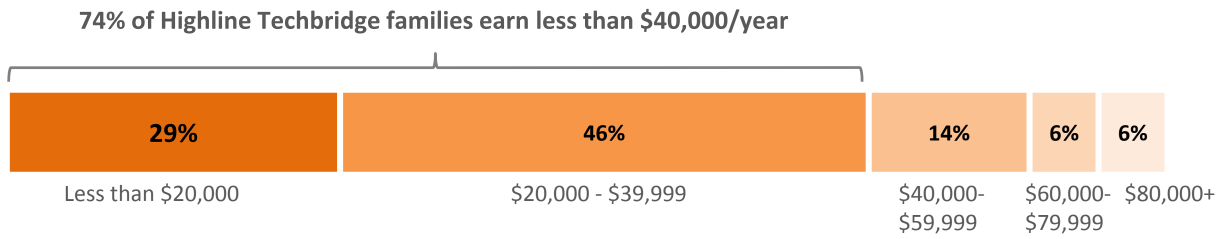
[3] Because there were only six teacher survey respondents, percentages are not shown for results from the teacher survey.

The Greater Seattle Techbridge expansion site was successful in reaching girls from underrepresented groups (low-income, racially diverse, and first generation). The majority of Greater Seattle Techbridge girls' families are low-income. Three-quarters (74%) of Greater Seattle Techbridge girls' parents earn less than $40,000/year; almost one third earn less than $20,000/year, which the U.S Department of Housing and Urban Development (HUD) defines as extremely low income. (The median income for King County, where the Greater Seattle programs are located, was $88,200 in 2014.)[4]

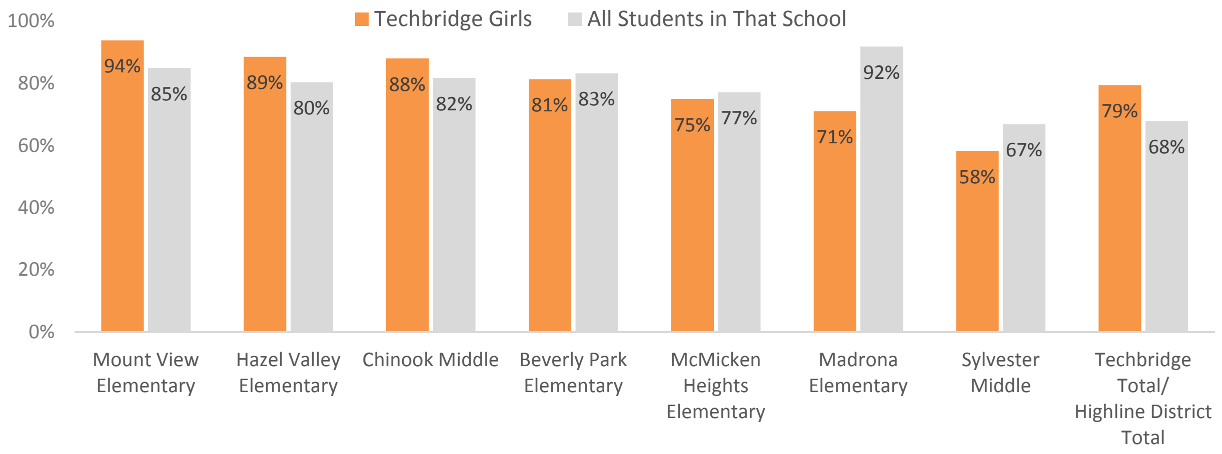
Figure 1. The majority of Techbridge girls' families are low-income
Techbridge Enrollment Form; n = 136



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

At six of the seven Techbridge schools, a similar (or higher) percentage Techbridge participants qualified for free or reduced-price meals compared to the percentage of all the students at that school (see Figure 2). For example, 94% of the Techbridge participants at Mount View Elementary qualified for free or reduced-price meals versus 85% of all the students at that school. Overall, 79% of all Highline Techbridge participants qualified for free or reduced-price meals, compared to 68% of all the students at the same seven schools which hosted Techbridge programs. The only exception was at Madrona Elementary, where 71% of the Techbridge participants qualified for subsidized meals versus 92% of all students at that school.

Figure 2. At all but one of the Techbridge schools, a similar (or higher) percentage Techbridge participants qualified for free or reduced-price meals compared to the percentage of all the students at that school



Sources: The Techbridge Parent Packet asked parents/guardians to indicate whether their daughter qualified for subsidized meals. Data regarding all students' subsidized meal status are from the Office of Superintendent of Public Instruction (OSPI) Washington State Report Card for the 2014-2015 school year: http://reportcard.ospi.k12.wa.us/summary.aspx?schoolId=104&reportLevel=District&orgLinkId=1235&yrs=2014-15&year=2014-15

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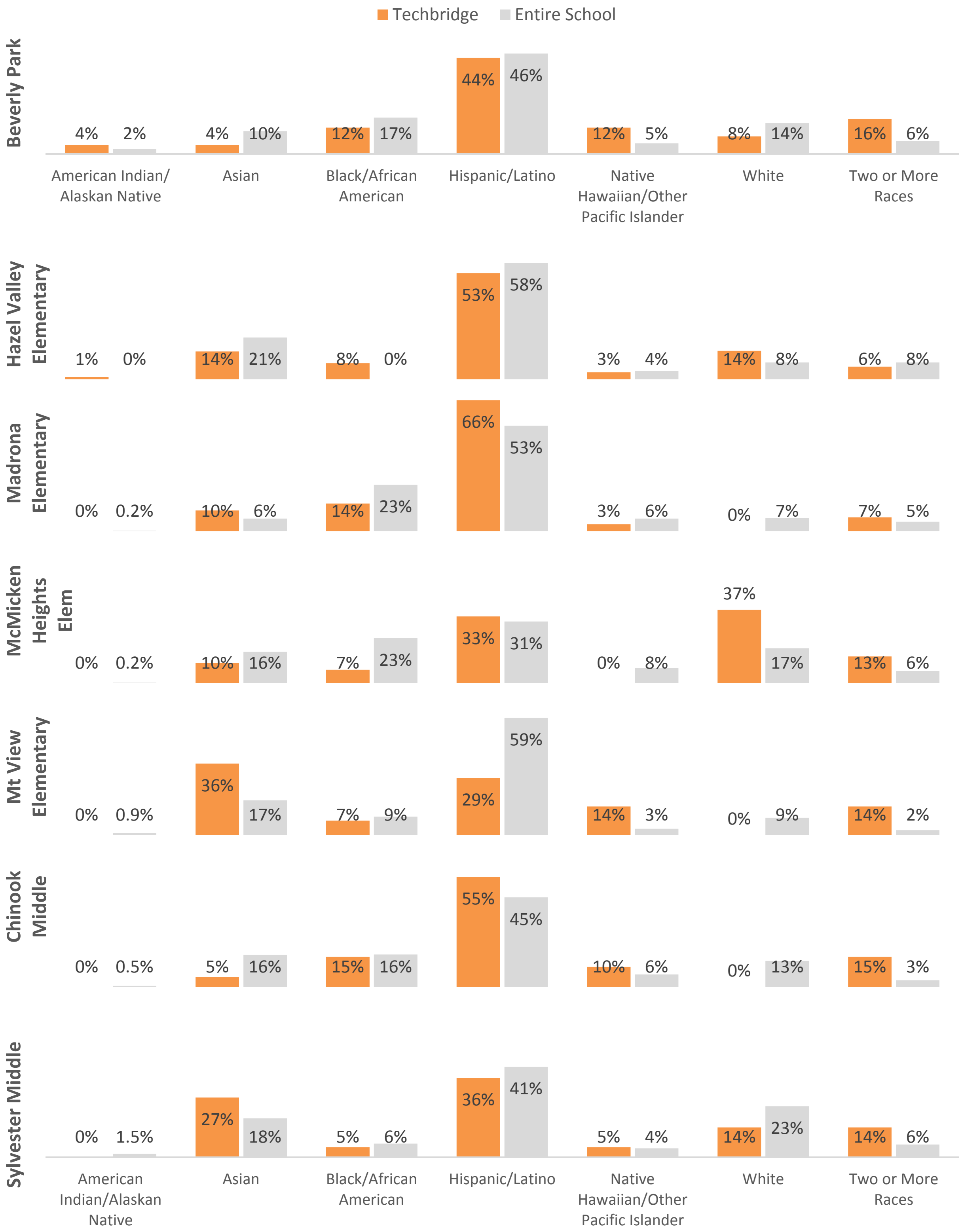
[4] The U.S Department of Housing and Urban Development's (HUD's) Office of Policy Development and Research. http://www.huduser.gov/portal/datasets/il/il2014/2014summary.odn?year=2014&states=%24states%24&data=2014&inputname=METRO42660MM7600*Seattle-Bellevue%2C+WA+HUD+Metro+FMR+Area&stname=%24stname%24&statefp=99&selection_type=hmfa&trueSubmission=yes

The expansion programs primarily served girls from racial and ethnic groups that are underrepresented in SET. Techbridge deliberately partnered with a school district which has a racially and ethnically diverse population. Figure 3 on the following page shows the Techbridge girls' race/ethnicity for each program and for the entire study body at that school. With only a few exceptions, the demographics of the Techbridge girls were similar to the demographics of the entire study body at each school.

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 (see Table F in Appendix C). Only about 15% have earned a four-year college degree and/or advanced degree.

Figure 3. In general, Techbridge students' race/ethnicity reflected that of their schools



Sources: The Techbridge Parent Packet asked parents/guardians to provide their daughter's race/ethnicity. Data regarding all students' are from the OSPI Washington State Report Card for the 2014-2015 school year.

Most of the Greater Seattle Techbridge programs marketed the program broadly and solicited applications from all girls who were interested. However, one school decided to initially recruit by invitation-only and try to target girls who might not self-select to participate in a SET after-school program.

At one school, many of the girls who enrolled were part of the honors program (the honors teachers were credited with successful recruitment strategies). While the girls in Techbridge were ethnically diverse, the teacher did not feel like their program reached a high percentage of the academically disadvantaged students at the school.

> "Who wants to join? Everyone! Recruitment was not a problem. We had 40-50 applicants for 30 spots."
>
> Techbridge teacher

A teacher doing home visits to fifth grade students (a usual practice of the school) talked to parents about Techbridge and got a lot of interest and enrollment as a result:

> "I personally told the parents about the program, and that's why I think we had [about] 26…fifth-grade girls... That's most of our [school's] fifth-grade girls...When we go on our field trips, there's one girl left in each class who's not in the program. I feel like that was really powerful. I know that every school can't do that. I remember parents saying, 'Oh my gosh, I want my kid in a program like that,' so when they heard what it was and the great opportunity that it presents their child, a lot of them were like, 'Yeah, I want that...' Those parent packets, which are pretty hefty packets, came back completely filled the next day after I pass them out, and parents are calling me, 'Does my kid have a spot?'"

The same school had a booth at an all-school open house, which generated a lot of interest.

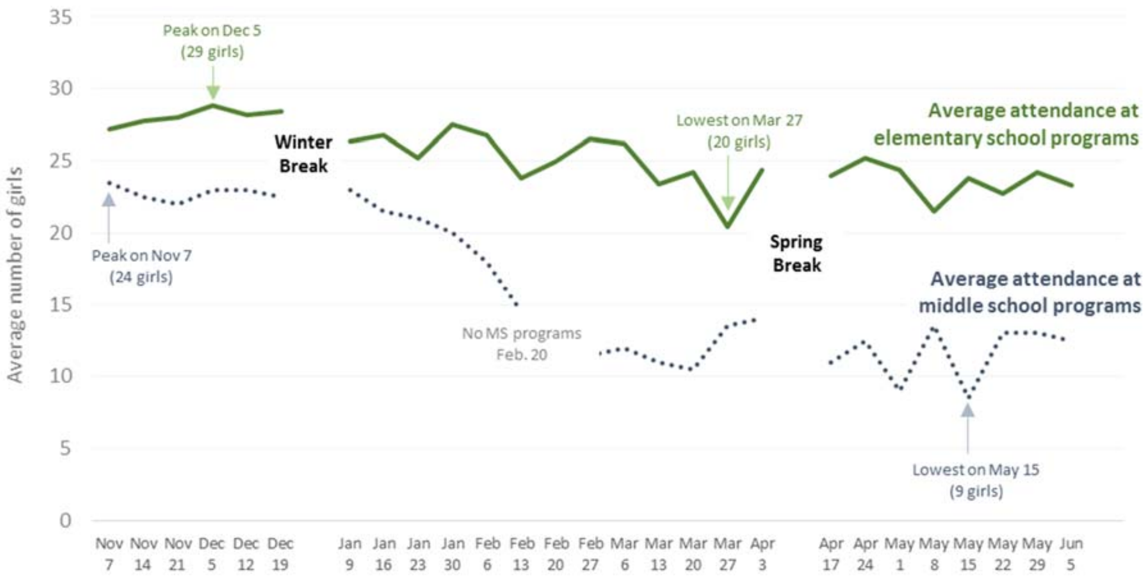
> "[The Techbridge Program Coordinator (PC)] had literature to hand out, just talking about all of the exiting things we're going to be doing, showing them some projects we're going to be working on, talking about some potential field trips and generating excitement around it."

The teacher also talked about Techbridge in her own fifth grade classroom and visited the sixth grade classrooms to talk to students she had in the previous year. She felt that one reason that more than 40 packets were returned was because she had an existing relationship with the students she was asking to sign up.

Once they started attending Techbridge, girls helped recruit their friends to join. One teacher said, "I think they were sort of talking to their friends about it [Techbridge]. They were like, 'You should join, it's so cool.'" In at least one school, the PC and teacher encouraged students to "bring a friend" to Techbridge in the middle of the year when attendance had declined in order to try to recruit more participants.

Looking at retention, attendance at the elementary schools tended to be higher and more consistent than attendance at the middle school programs (see Figure 4). In general, attendance declined gradually over the course of the year, after a high point in the winter of an average of 29 girls in the elementary school programs, and an average of 24 girls in the middle school programs. At the last Techbridge meeting, attendance was about 23 students in elementary schools and about 13 in middle schools.

Figure 4. 2014-2015 attendance at the 5 Greater Seattle elementary school programs was higher and more consistent than at the 2 middle school programs



Source: Techbridge attendance data

Retaining students was particularly a challenge at middle schools. Girls dropped out due to a variety of factors, including the start of after-school sports part-way through the year or parents needing girls to take care of their younger siblings. Low attendance rates could disrupt the curriculum flow and constrain what activities could be implemented. One teacher said, "It's hard on days when there's only 12 girls. You're like, 'Okay, that kind of limits [things].' Then from week-to-week, the continuity of projects gets affected."

Due to positive word-of-mouth about the Techbridge program, one Techbridge facilitator anticipated that recruitment next year would be easier: "[Students] are already asking about Techbridge for next year. I anticipate that we will still do the same things, but I think we have the upper hand now because there has been more word of mouth from the girls and how excited they are."

Table 3 on the following page shows factors that helped and hindered enrollment.

Table 3. What factors affected student attendance and retention in Techbridge?

⬆ Factors that increased attendance/retention		⬇ Factors that decreased attendance/retention	
Consistent, individual reminders and follow-up	“Personal, one-on-one harassment…. It helped that I knew a lot of the girls. Just being present a lot and reminding them.”	**Being a year-long program**	“The [school] culture doesn't support a year-long commitment.”
A positive relationship with the Techbridge teacher	“The girls who are in the program, and who have been most consistent, are the ones that I have the closest relationships to.” “They (the girls attending) are also the ones who probably built a lot closer relationships with me. There haven't been very many [teachers from my ethnic group] in this building, and so I know among that demographic [girls of the same ethnic group], a lot of those students have gravitated towards me. Building up those relationships over the years has resulted in so many of them being a part of Techbridge.”	**Other after-school activities (including sports)**	“We do have some competing programs at times that Techbridge occurs… Kids are thinking about what's more fun, 'What can I play around with more?' There are a number of girls who have chosen some of those after-school opportunities, which is great, because it suits their personality. I think in schools where this was the sole opportunity, or it was the only that was happening on a certain day, we would have much better numbers.” “Some kids, their parents wanted them to join a sport.” “As the year went on, there were some new clubs that started that weren't an option at the beginning of the year. And as those clubs started we lost a few girls to those as well.”
Family support	“The girls [who most consistently attend are] those whose families really re-enforce education as being very important.”	**Other competing responsibilities**	“They [students] are doing some church commitment thing, so kids had to drop out for various reasons. Or their parents said, 'You need to be home to watch...your siblings.'”
Keeping a waitlist to fill spots as they become available	“I had kids waiting in the wing to fill it up.” “We have a pretty fluid population; people coming and going. Being able to add kids, even midway through the year, I think would benefit. I would hate to not give that opportunity to someone who didn't understand maybe (missed) the application process or the deadline, or who came in later in the year.”	**Decreasing student interest**	“We have had a few girls who had lack of interest and dropped out and decided to come back.”

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?

Girls, teachers, and parents generally reported that the majority of Techbridge participants:

- found Techbridge's SET activities to be engaging
- became more knowledgeable about SET careers and educational pathways
- became more interested in science, engineering, and technology careers
- improved their understanding and use engineering design practices
- improved their teamwork skills
- improved their ability to persevere in the face of challenges.

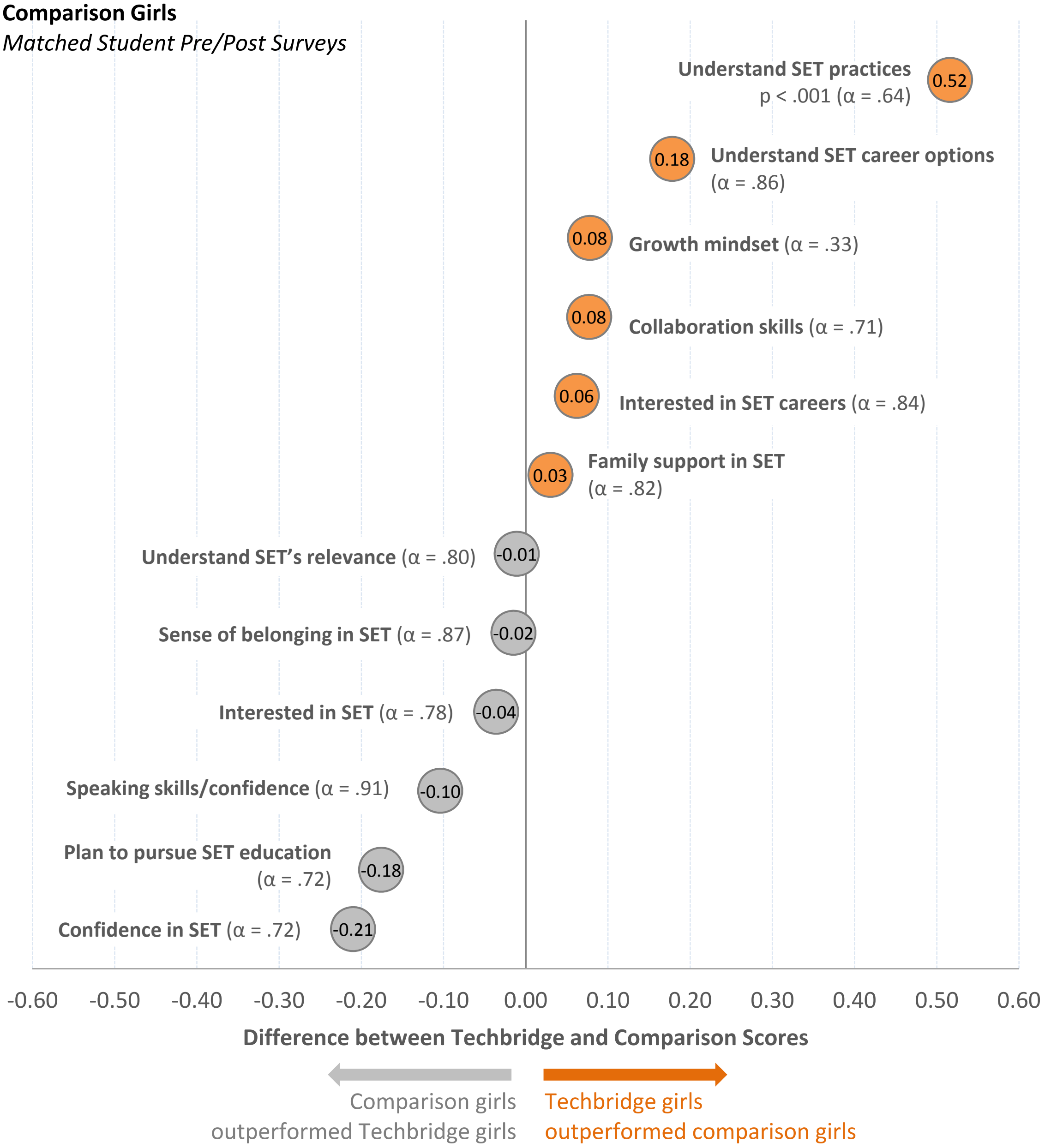
Many girls also:

- felt they belong and can succeed in SET
- better understand how SET is relevant and important to their lives
- better understand gender inequities in SET and how to overcome them
- have improved their public speaking skills
- say they are more likely to study engineering in college
- became active science learners and increased their participation in additional informal SET activities.

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 5 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) ($p < .001$).** Techbridge girls were also somewhat more likely than non-participating students to better understood SET career options and be interested in SET careers; to have improved perseverance (growth mindset) and collaboration skills; and to report greater family support in SET.

In contrast, comparison girls showed greater increases in their understanding of SET's relevance; sense of belonging in SET; interest in and confidence in SET; speaking skills and confidence; and plans to pursue SET education. However, none of these differences was statistically significant.

Figure 5. Differences in Pre/Post Survey Scores for Techbridge Girls vs. Comparison Girls
Matched Student Pre/Post Surveys



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.

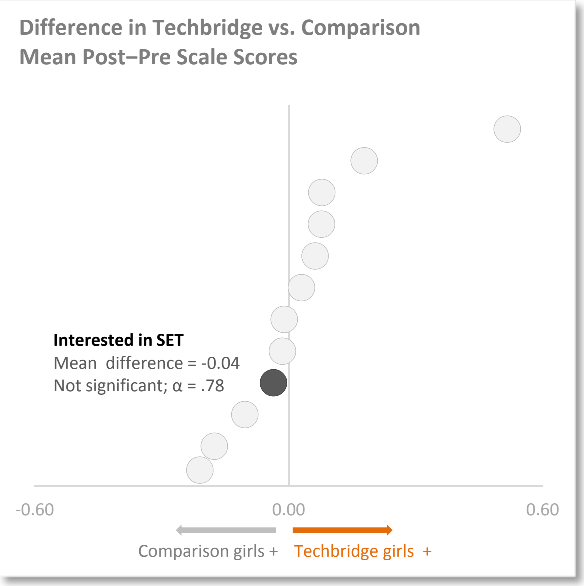
The following sections present findings for each Techbridge participant outcome. Related findings are presented together from the student surveys, teacher surveys, and parent surveys, as well as from the student focus groups and teacher and parent interviews. (Tables with results from each survey instrument are included in the appendices. Appendix C has results from the student surveys, Appendix E has results from the teacher survey, Appendix F has the results from the role model survey, and Appendix G has results from the parent survey.)

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

Survey results suggest that the majority of Techbridge girls in Greater Seattle were already interested in SET before participating in the program and remained interested in SET following participation in Techbridge. There was little room for Techbridge girls' SET interest to increase following participation in the program (as measured by the student surveys).

The student pre- and post-surveys had five questions asking participants and comparison students about their interest in SET-related activities. Students were asked to indicate how much they agreed with each survey statement, from "disagree a lot" to "agree a lot." (Figure 6 on the next page shows the results of each question.) At the end of the year, Techbridge participants were significantly less likely to "agree a lot" that they like science ($p < .001$), creating things with technology ($p < .10$), or computer programming ($p < .05$). 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.

It is important to note that comparison students' interest in each of these topics also declined from the beginning to the end of the year. Comparison students tended to have less interest in SET than Techbridge participants at both the beginning and end of the school year. For example, only 79% of comparison students agreed on the pre-survey that they like creating things with technology and 73% agreed on the post-survey that they like creating things with technology.



Techbridge and comparison students' mean scores on each survey question were compared to determine whether Techbridge students became relatively more interested in SET than comparison students.[5] Techbridge students showed slightly greater gains (or smaller declines) on two of the questions, while comparison students showed smaller declines on two of the questions. (There was no difference between the groups on one of the questions.) However, none of the differences between Techbridge participants and comparison students was statistically significant. Mean SET interest scale scores were calculated by averaging students' mean responses across the five post-survey items that asked about their SET interest. The figure on the right is a scaled down version of Figure 5, which appeared at the beginning of the student impact section. The dark gray dot shows the difference between Techbridge and comparison students' scores on the interest in SET scale (post-survey minus pre-survey average scale scores). The average Techbridge student's mean SET interest scale score was very slightly lower than the average comparison student's (0.04 points). However, this difference was not statistically significant.

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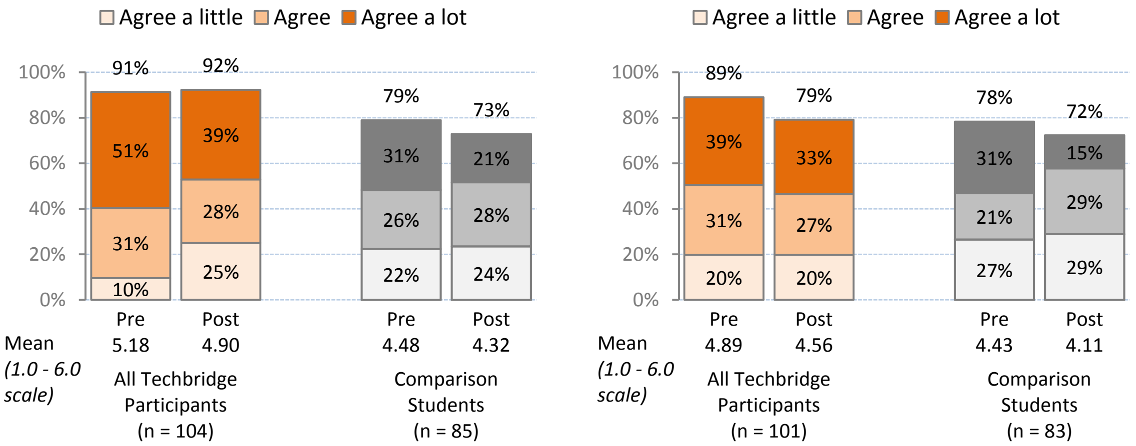
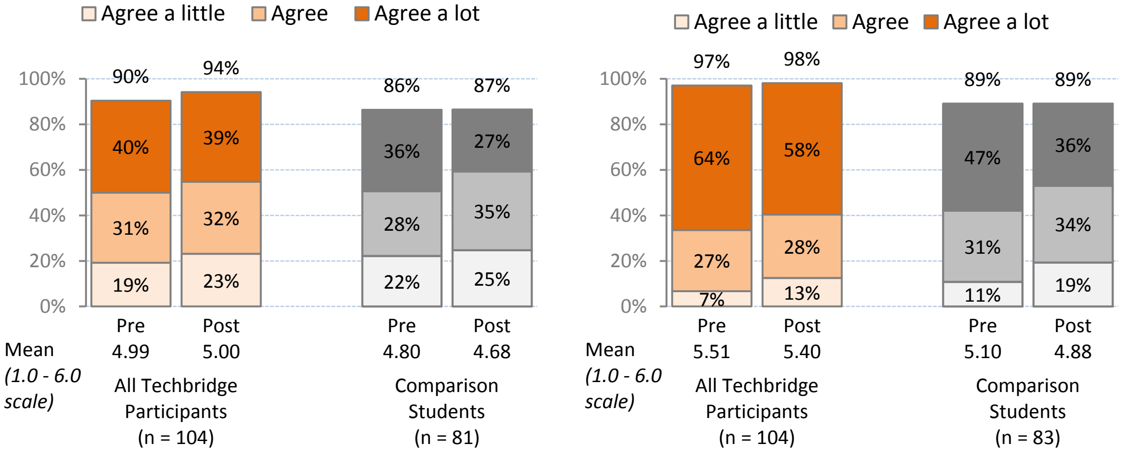
[5] The difference was calculated as follows: [Mean Techbridge post-survey score – Mean Techbridge pre-survey score] – [Mean Comparison post-survey score – Mean Comparison pre-survey score].

Figure 6. The majority of Techbridge girls already had a strong interest in SET at the beginning of the year
Matched Student Pre/Post Surveys



I like creating things with technology

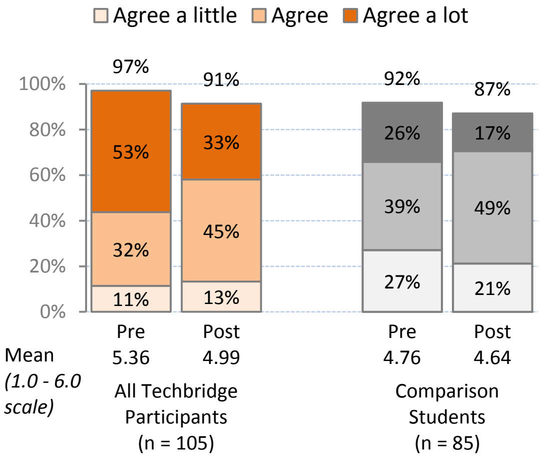
I like computer programming



I like figuring out how things work

I like building, designing, and/or putting things together

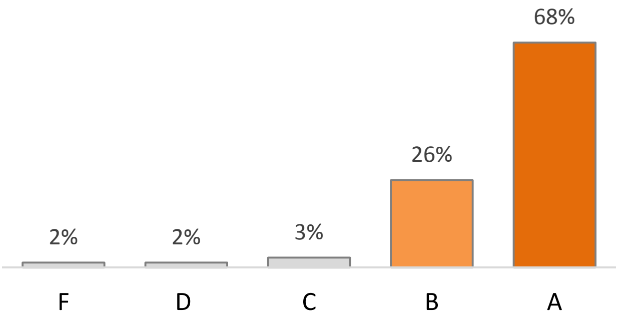
I like science



What Girls Liked About Techbridge

Girls gave the Greater Seattle Techbridge programs high marks, saying Techbridge made learning about SET fun.

The majority of girls (68%) gave Techbridge a grade of "A"
(mean = 4.57 on a 5-point scale)
Student Post-Surveys; n = 133



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 (93%), with 68% of them giving Techbridge an A.

In response to an open-ended question asking students to explain the grade they gave Techbridge, students explained that they rated the program highly because they had the opportunity to learn and improve their skills (29%); found it fun (26%); had an opportunity to learn about SET careers and educational paths (18%) and think about future career options (10%); and had an opportunity to do hands-on projects and try new things (10%). Many girls said they improved their communication skills (11%) and formed positive relationships with their Techbridge program coordinator, teacher, and/or role models (5%). Some girls said the program increased their confidence (6%), their interest in SET (5%), and their understanding of the importance of hard work (5%). Several students said that the program was specifically empowering to them as girls (7%). A handful of girls said Techbridge helped them do better on their schoolwork (2%). Examples of girls' comments included:

- "I gave Techbridge an 'A' because it is a wonderful program. I learned so many new things and saw so many new things. Techbridge inspired me to work at some awesome places such as Moz and I've seen and done so many new awesome things that I would never of even thought of."
- "Because Techbridge really helped me from being a quiet girl in class...now, Techbridge helped me confident to be in the front of the whole class, and Techbridge helped me be a better engineer. Also Techbridge gave me ideas about what careers I can be."
- "I gave Techbridge an A because Techbridge gave me a chance to know and see that I can have a career in technology and it will be a fun job. Techbridge also helped me understand how the role models got to their job and how the role models got help and that I can get help with getting to my career. I really hope I can work in a place like #tagboard. Thank you, Techbridge, for helping me with what I want to do in the future and a way to get my career started."
- "I gave Techbridge an 'A' because I was able to understand the engineering cycle and how it works. I also learned to work together with different people to make something that could do something useful. I made new friends that had the same interests and was able to share interests that I had with the class. I learned that there were many different types of engineers and different types of scientists."
- "Because Techbridge helped me be able to be able to feel more comfortable in a group and while talking to a group or in a class."
- "The activities, they really helped me understand the struggles in science like when the design doesn't work and you have to redesign to make it work."

- “Techbridge helped me become myself and realize that you only live once. It also made me become more engaged in science and technology. I realized that science is fun and everyone should be doing science, even women.”
- “This is one of the few places where I feel accepted.”
- “This program helps girl learn that not only boys can be engineers or scientists but girls can be anything boys can be, and they showed me what I want to be when I grow up and Techbridge has given me help to prepare for the future.”
- “Because Techbridge helps girls see that it’s not just boys who have a chance at STEM jobs and overall gives girls a fun and exciting exposure to women who have worked hard to reach their goals.”
- “I gave Techbridge this grade because it has made me realize that no matter if you are a girl or a boy, both genders can do the same things if we put or minds to it.”
- “I like that Techbridge is focused on girls because you don’t see many girl scientists and stuff. They also make it fun to learn STEM.”

Girls were also asked to explain what they liked most about Techbridge. The most frequently cited response—given by half the girls (50%)—were the hands-on projects. Girls appreciated that the projects were fun and collaborative. Many girls said it was powerful to be amongst a group of like-minded peers who are also interested in SET. Several girls said Techbridge gave them the opportunity to do what scientists and engineers do, including learning how to use technical equipment. Girls’ comments included:

- “I like the activities that we do because they are fun and we learn a lot.”
- “The projects because they are very interesting and collaborative.”
- “I really enjoyed working with the solder iron because I made something that worked (the circuit) and I also understood how it worked.”
- “The activities—they really helped me understand the struggles in science like when the design doesn’t work and you have to redesign to make it work.”
- “I really like that we build things. Because some things you can keep and I feel really proud that I actually build things like that.”
- “Something that I really like about Techbridge is that I got to try new things. I like this because I learned how to make and build things that I never tried before. So it’s a new experience.”
- “I like trying new things the most. I like trying this the most because I learn so much stuff I would of never thought of and I’ve done things I thought I would never do.”

Girls also said they particularly the field trips (33%); learning about SET careers (15%); and the Techbridge role models/mentors (6%). Students’ survey comments included:

- “[Techbridge] has helped me learn and be involved in new science, technology, and engineering activities that I may never have known about [otherwise]. Techbridge let me meet role models in the business that involves STEM. Techbridge took me on field trips to a tech company, where I can see what reality/jobs are like for those who work in the STEM career, and learn more about what they do. Techbridge inspired me to pick a career in the STEM field. Techbridge helps me discover and design many different inventions that are very fun. Techbridge encourages your interest in STEM. It explains to you the different careers that are available for you to choose from, and what that career is like.”
- “What I like most about Techbridge, is that you get to go experience many difference places, and learn about them, when you are on the field trip. You get to work on many hands-on activities. You

get to interact with role models, and tech companies, to learn about what's it's like to work in that career. You get to get creative on your inventions. You get used to public speaking."

- "I think I mostly liked the field trips and all of the projects, and how in the beginning we did an icebreaker and all of it gave me a chance to learn new things, like communicate with other girls and get along with them. The field trips helped me meet the people who make stuff possible like google is helping this computer that I'm using work. The projects helped me experience new things."
- "The field trips because it's fun hearing role models persuade us to become something great in life."
- "The field trips because I got to see how people got to make thing about technology and engineering and it was fun and it gave me confidence to be more like a leader."
- "The fieldtrips because they were really exciting and we also got to explore some different resources that maybe we have never been exposed to."
- "What I liked the most is when there are role models coming because it made me feel excited when they tell us what they do."
- "Experimenting with different things was probably what I liked most about Techbridge because now I know more about science, engineering, and technology. Techbridge helped me think more about my future and career."

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). A few girls mentioned that they wanted to pick their own partners. Comments included:

- "I gave Techbridge this grade because it was fun and really enjoyable. But sometimes I didn't really understand something or was confused, but that was only a few times. And most of the time it was enjoyable."
- "Because sometimes I wish the experiments that we do could go further or be extended. Like when we made a rocket ship—why did we only get to test it out once? Let's do more than simple stuff. It's like Techbridge is on a script and has to follow [it]. Express yourself be creative and crazy and do more things. Not making lights—that's the basics. What about microscopes and water? Hands-on things; not making lights and sounds. All I'm asking for is MOREEEE."

Two girls gave Techbridge a grade of F. However, both girls wrote positive comments about Techbridge:

- "I gave Techbridge this grade because it's just fun and cool to build things with other people we don't know and we get to know them, like 6th graders and 5th graders. But something it's just boring."
- "I gave Techbridge an 'F' because it's fun."

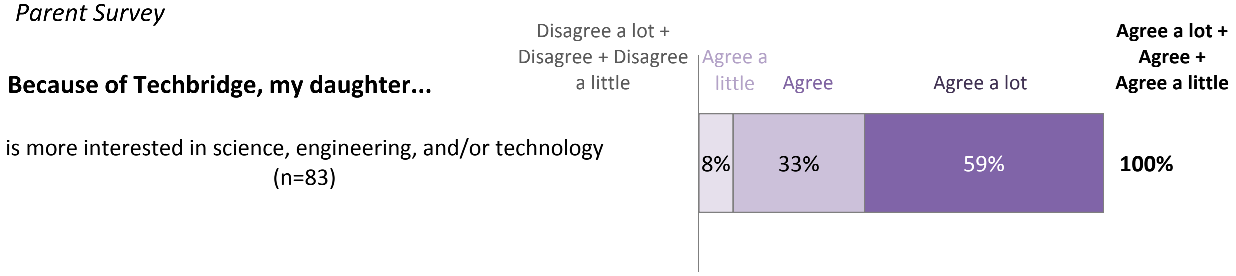
Girls from all six student focus groups said the Techbridge curriculum and the Techbridge facilitators made the program fun. Girls commented that they learned things in a "fun way" and that it was "entertaining." The more relaxed social atmosphere, compared with the regular school-day, and the opportunities for social interaction contributed to girls' enjoyment of the program. One girl said, "I usually have fun whenever I'm doing the project work, especially with another person. The rules here aren't as strict as they are in the classroom; like when you're working you can chat."

In four of the six focus groups, girls mentioned having a pre-existing interest or curiosity about SET, and that they joined Techbridge because of the opportunity to become engaged in SET. One girl described how Techbridge helped her realize the multitude of opportunities in SET and hone in on her own interests and strengths:

> "Seeing things from a different perspective and understanding my ability to do detail-oriented things...I used to want to be a technology engineer, and once I had the Techbridge experience of learning, I feel like there's more inside the technology part. You can either be a software or hardware engineer. There's many people involved."

As shown in Figure 7 below, all the parents who completed the parent survey said that their daughters were more interested in SET because of Techbridge: 59% of parent "agreed a lot," 33% "agreed," and 8% "agreed a little" that their daughter became more interested in SET.

Figure 7. Every parent said their daughter is more interested in SET because of Techbridge
Parent Survey



In an open-ended question about how Techbridge made a difference in their daughter's lives, nearly half (46%) of the parents mentioned their daughter's interest and awareness in SET increased. Parents commented:

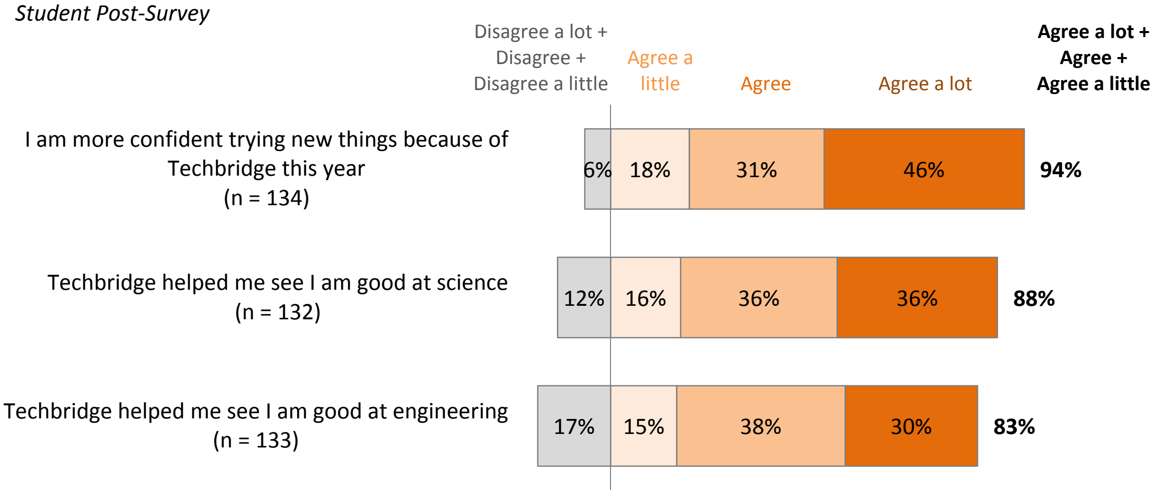
- "[Techbridge] got her more interested in STEM and excited about STEM."
- "Learning more about what tech and engineering [are]; being creative and challenged and empowered."
- "Made her more interested in technology."
- "[She] seems excited about working and learning more in science and technology."
- "She has much more confident leading and has fallen in love with science, technology and building."

3.2.2 What is Techbridge's impact on girls' confidence in SET?

Girls reported that Techbridge helped them improve their confidence in science, engineering, and technology as well as more generally. Three retrospective questions on the student post-survey asked students to indicate whether Techbridge had an impact on their confidence. As shown in Figure 8,[6] 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 science (88%) and at engineering (83%).

Figure 8. The majority of girls said Techbridge helped them become more confident

Student Post-Survey



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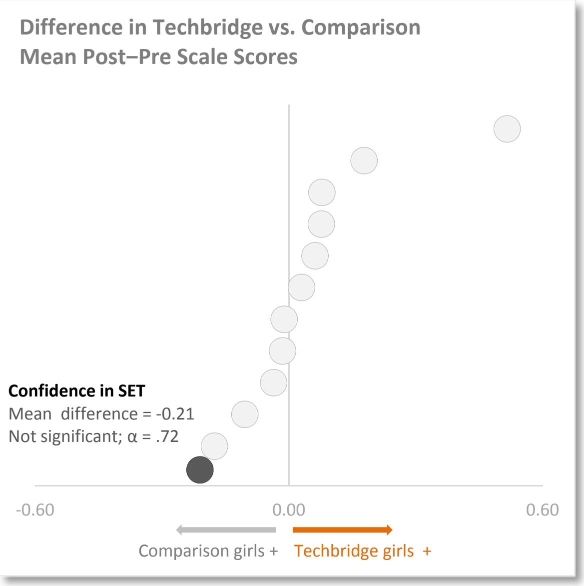
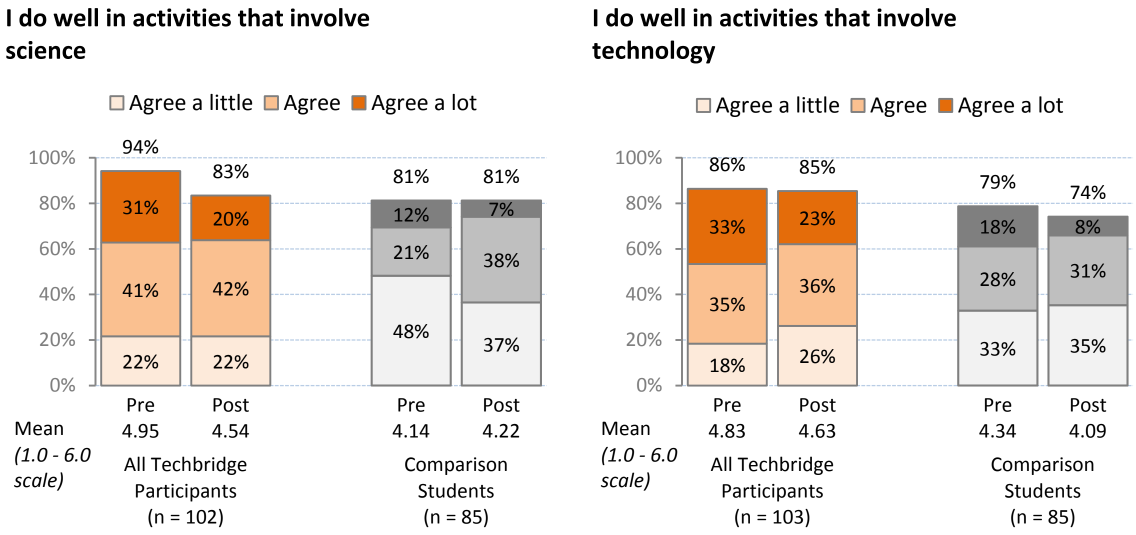
[6] The combined percentages shown in the figures like Figure 8 for "Agree a lot + Agree + Agree a little" (e.g., 94%) were calculated from the original survey data. Due to rounding, adding the individual percentages shown in the figures for "agree a lot," "agree," and "agree little" may result in a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



Two questions on the pre- and post-surveys asked students to indicate whether they do well in activities involving science and technology (see Figure 9 below). **Techbridge girls were less confident about their science abilities at year-end than comparison students, while their confidence in technology activities remained the same.** Fewer Techbridge girls agreed they did well in science activities at the end of year than at the beginning of year, decreasing from 94% to 83%. (In contrast, the percentage of comparison girls who said they did well at science activities remained the same at 81%.) Techbridge girls' confidence in their technology abilities was high at the beginning of the year, and remained high at the end of the year (86% agreed they did well at technology activities at the beginning and 85% agreed at the end of the year). (In contrast, the percentage of comparison girls who said they did well at technology activities declined from 79% to 74%.) As shown in the above figure, the average Techbridge student's mean SET confidence scale score (which includes both questions below) was -0.21 points lower than the average comparison student's. However, this difference was not statistically significant. It is unclear why some Techbridge girls' confidence in science declined; the evaluation did not surface additional data that might explain the change.

Figure 9. Techbridge girls' self-reported confidence in science declined slightly while confidence in technology had little change

Matched Student Pre/Post Surveys


I do well in activities that involve science

I do well in activities that involve technology

Girls' confidence in SET was not well explored in participant focus groups, though it did arise in responses to related topics more directly covered in other evaluation questions, such as confidence stemming from improved communication skills, and practicing perseverance and problem-solving. These focus group data will be covered under the relevant sub-questions.

Two Techbridge teachers said Techbridge had a particularly strong impact on girls' confidence. They noted girls were more willing to share their ideas and "speak their mind." Teachers described how girls led activities during Techbridge and at a Family Night:

- "I've noticed girls like to take on the roles that [the PC] and I used to take, like taking a reflection time and shout-outs. They like to be a part, [so they] jump up and take that responsibility."
- "I would look out during the Family Night as the girls are leading different parts or running different stations, and their families are smiling at them. Seeing their daughter standing up and taking on a leadership role, I think, is not something that they're used to seeing. Because a lot of these family events are teachers or admins up on stage with the mic and students down with their families, and that's it. I think it's been really good for girls and families and, like I said, some more than others, but that's natural."
- "[One participant] attended our parent night and she was fabulous at manning one of the booths. She had to explain what we did and answer questions to a variety of parents—seeing her being so confident and talking to people and also being confident with her ideas."

Teachers said girls were stepping up to be leaders in their classes:

- "A lot of girls that were extremely quiet, shy, didn't say much throughout the year, and I've seen them really come out and be stepping forward, take charge... They would quietly go about their business, they would do very well, but now they're becoming more vocal about stuff. When we do partner activities, they're kind of leading the group, like, 'I've got this, let's go.' They're very, 'Let's organize,' wanting to structure that... Generally you see a lot of those girls, at least here in my class, when we do projects and partner work, that they're taking charge…they're speaking up more for themselves and sharing, not just letting things happen to them."
- "I've seen a few of these girls grow tremendously in their being willing to share their ideas, which I think is a leadership quality right there, being able to stand up and say 'I think this, because this. What do you think of my idea?' And being able to have those conversations with people."

One Techbridge girl asked her teacher for a recommendation for a leadership class because she believes she knows "more about technology that some other students." The teacher said, "I think they [the Techbridge girls] feel more confident because they not only know more about these different engineering fields, but they know what they can do with it, whether that's projects or careers."

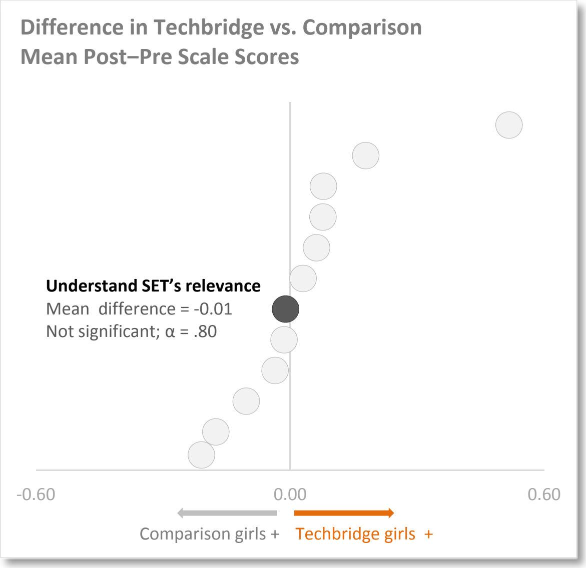
> "I've seen girls who used to be a little more quiet and shy be willing to have a voice when they're working with a group of people.
>
> For example, at the beginning of the year, in class, not even just Techbridge, you could not get five words out of [one girl]. She was shy, and she even admits, 'I'd be afraid to talk. I'd be afraid to talk. I'd be afraid to talk.'
>
> Now, she's always wanting to share her ideas. She's wanting to work with big groups, and she takes on leadership roles of facilitating and discussion, or keeping people on track. And her parents actually will say it's because of Techbridge."
>
> Techbridge teacher

Parents commented on their surveys that their daughters were more confident because of Techbridge. Parents said their daughters were more willing to try new things, and were less shy and more confident with peers:

- “It has given her confidence in learning and trying new things.”
- “She feels more confident about what she has learned.”
- “She is more confident with learning new things.”
- “She seems to have more confidence with her peers.”
- “[My daughter] is less shy and more interested in building things.”
- “[Techbridge] allowed her to become more confident in her work and explore options for her future.”

One principal noted how girls feel comfortable in Techbridge and that has spread to greater confidence that is visible during the school day: “You see those same [Techbridge] girls in the lunchroom and moving on campus, and they just seem like they have a different edge than some of the other girls.”

3.2.3 What is Techbridge's impact on girls' understanding of SET's relevance to their own lives?

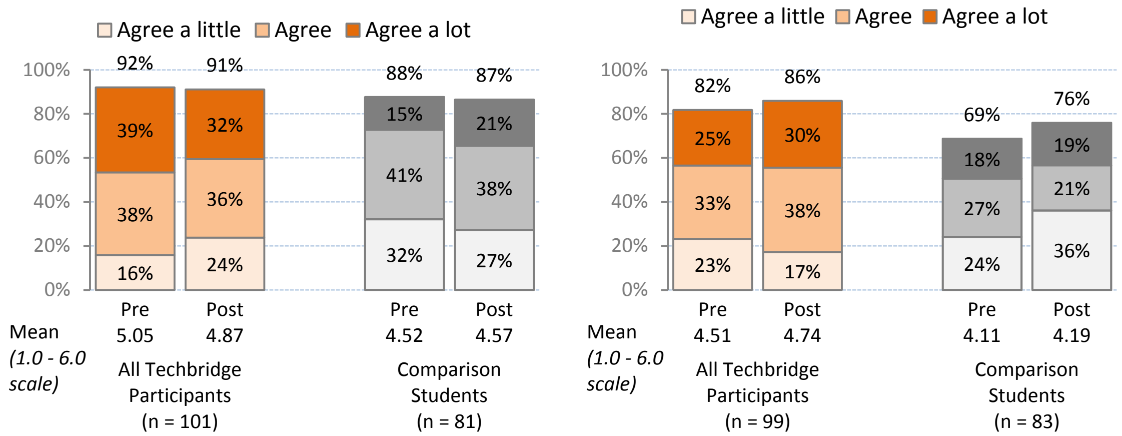


The majority of Techbridge girls said they understood SET's relevance and importance prior to participating in Techbridge. The pre- and post-surveys had four questions asking students about SET's relevance and importance in their lives (see Figure 10 below for the results of each of these questions). Techbridge girls' responses suggest that they already understood SET's relevance and importance at the beginning of the school year. For example, on the pre-survey, 92% of Techbridge girls agreed that most people should study some science. As can be seen in the figure to the left, there was essentially no difference between Techbridge and comparison students' mean SET relevance scale scores (which include all four items below).

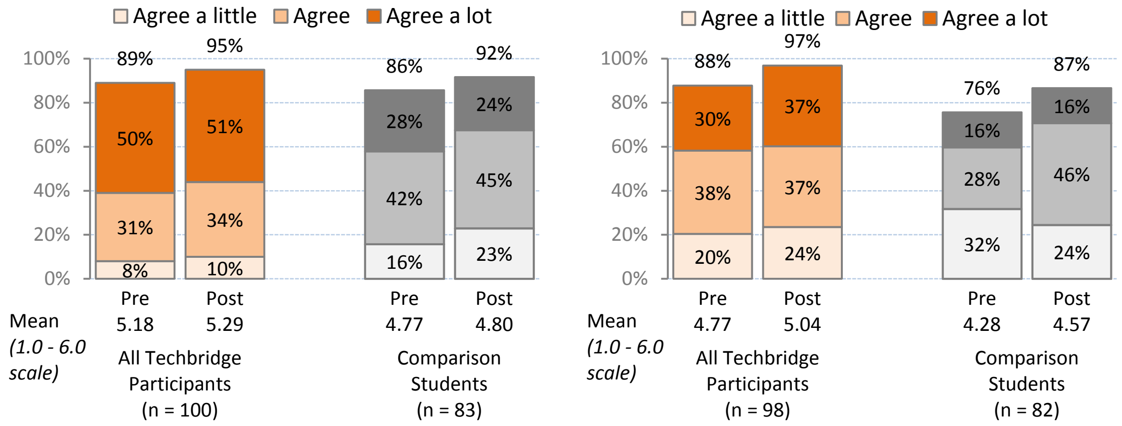
Figure 10. Most Techbridge girls already understood SET's relevance and importance prior to Techbridge

Matched Student Pre/Post Surveys

Most people should study some science **I see how science is part of my life**

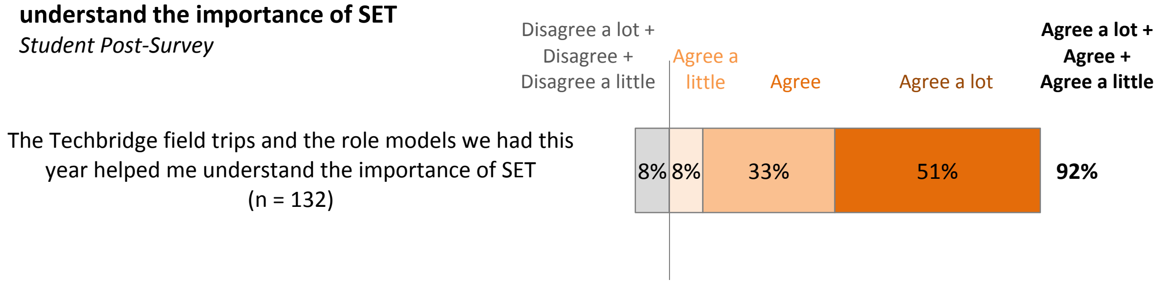


Engineers make a meaningful difference in the world **Engingeering is useful for solving the problems of everyday life**



Although there was little room for improvement in girls' pre/post 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 (92%) agreed that the field trips and role models helped them understand SET's importance, with about half the students (51%) agreeing "a lot" (see Figure 11).

Figure 11. 92% of girls said the field trips and role models helped them understand the importance of SET
Student Post-Survey



In addition, more than one third of the girls said the field trips and/or role models were what they liked most about Techbridge. Many of these girls said that seeing SET workplaces and meeting women who work in SET helped bring SET to life. For example, one girl commented that the field trips were her favorite part about Techbridge "because they were really exciting and we also got to explore some different resources that maybe we have never been exposed to."

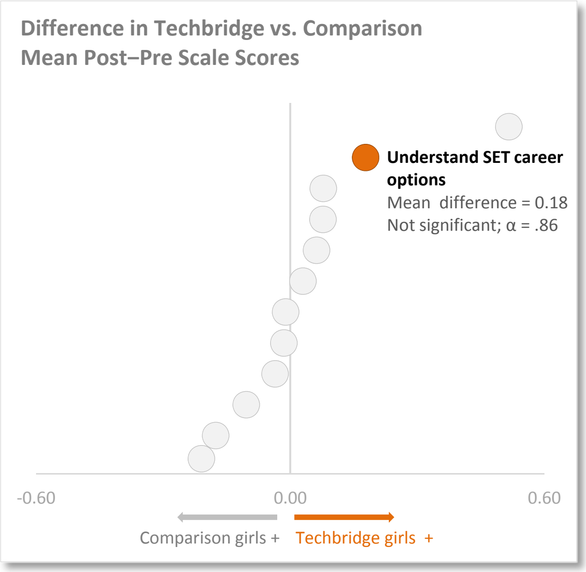
In focus groups, girls said that they particularly enjoyed learning about the work environment and seeing the benefits that some high-tech companies offer. Many of the girls vividly remembered the beautiful building facilities, in-house food services, and other perks the companies they visited on the field trips offered, like allowing employees to bring their pets to work. While learning about these potential benefits is important, it was noted that the work done in the workplace was often forgotten, or less clear after the fact than the workplace perks.

As shown in Table 4 below, four of the six teachers who completed the teacher survey said Techbridge helped the majority of their girls understand how SET is relevant to their own lives "to a large extent."

Table 4. Teachers reported that Techbridge helped girls understand how SET is relevant to their lives
Teacher Survey; n = 6

Because of Techbridge, the majority of girls participating …	**Not at all**	**To a small extent**	**To some extent**	**To a large extent**	**To a very large extent**
Understand better how SET is relevant to their own lives.			🧍 🧍	🧍 🧍 🧍 🧍	

3.2.4 What is Techbridge's impact on girls' understanding of SET career options and educational pathways?



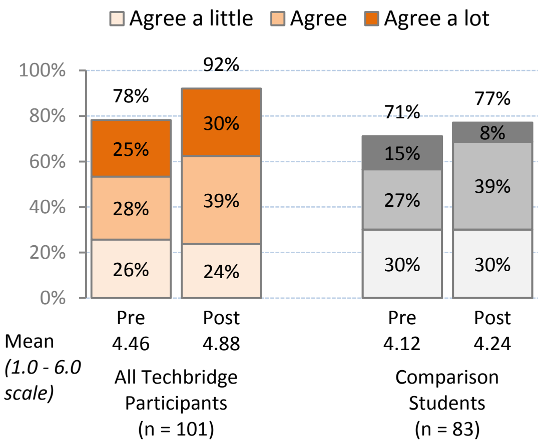
Techbridge helped girls understand various career options in science, engineering, and technology and begin to learn about the pathways toward these careers. After participating in Techbridge, girls were significantly more likely to agree that they know what technology workers do (mean difference = 0.43, p < .01) and what engineers do (mean difference = 0.33, p < .05), and marginally more likely to know what scientists do (mean difference = 0.20, p < .10; see Figure 12 on the next page). In contrast, comparison students' self-reported knowledge of what SET workers do increased only slightly.

Students were also asked whether they thought knowing various SET subjects would give them career choices. The vast majority of Techbridge girls (more than 88%) agreed at both the beginning and end of the year that knowing technology, engineering, and/or science would give them many career choices. Because Techbridge participants' attitudes about SET careers were already so positive at the beginning of the year, there was little room for improvement after participation in the program.

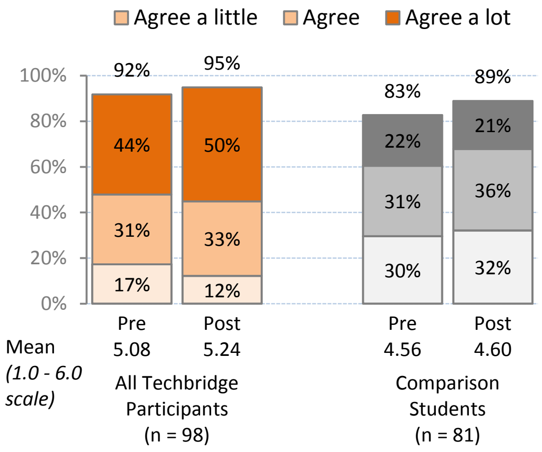
As shown in the figure above, the average Techbridge student's mean understanding SET careers scale score (which includes all six questions shown on the next page) was 0.18 points higher than the average comparison student's. **Of the various outcomes measured by the student surveys, knowledge about SET careers was one of the top two areas in which Techbridge appeared to have the greatest impact.**

Figure 12. Many Techbridge girls increased their knowledge about what SET workers do
Matched Student Pre/Post Surveys

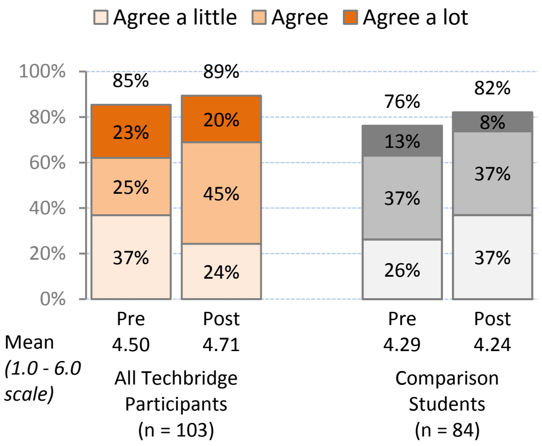
I know what people who work in technology do



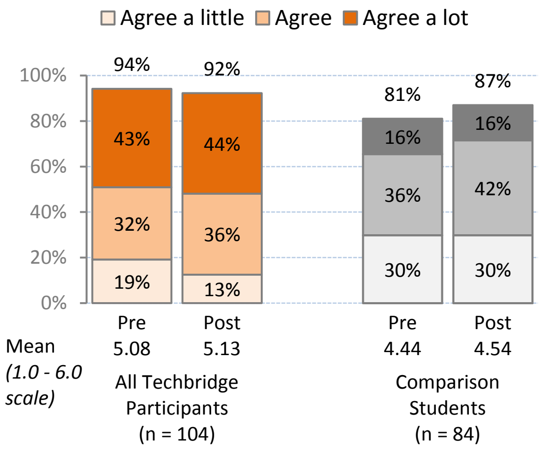
Knowing technology will give me many career choices



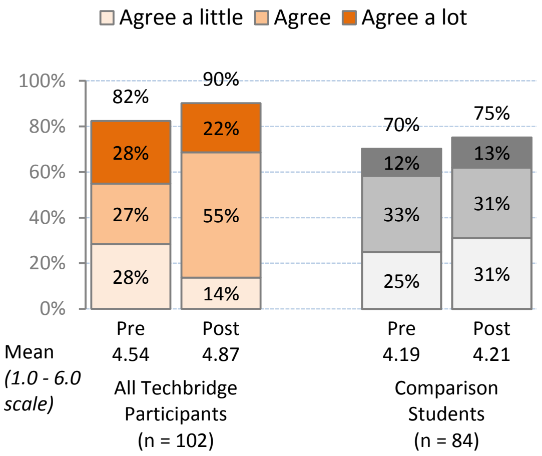
I know what scientists do



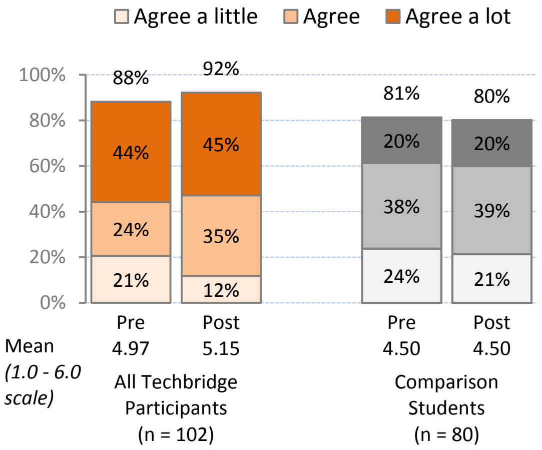
Knowing science will give me many career choices



I know what engineers do

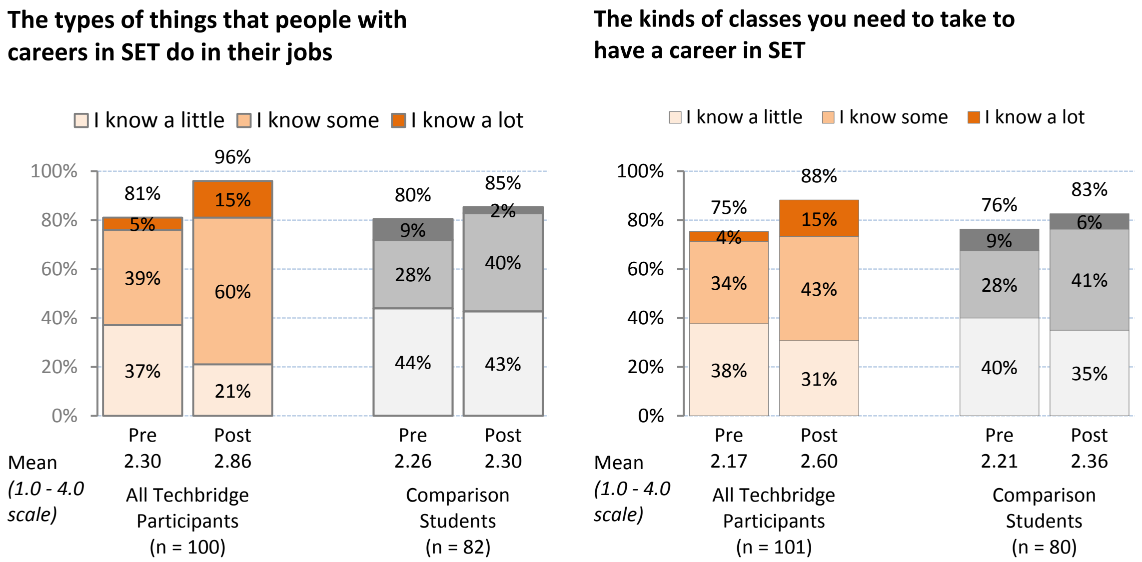


Knowing about engineering will give me many career choices



The pre- and post-surveys also 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 question topic on the post-survey. For example, the percentage of Techbridge students who said they know the type of things that people with SET careers do increased from 81% to 96%. Techbridge students made statistically significant greater gains in their self-reported knowledge regarding SET jobs and SET classes than comparison students (p < .001 for knowing things people in SET careers do, and p < .05 for knowing the kinds of classes you need to take for a SET career).

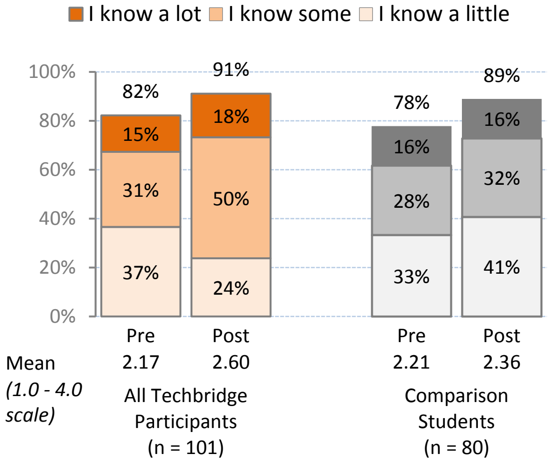
Figure 13. More Techbridge girls said they understand SET careers and career pathways after participating in the program
Matched Student Pre/Post Surveys



The types of things that people with careers in SET do in their jobs

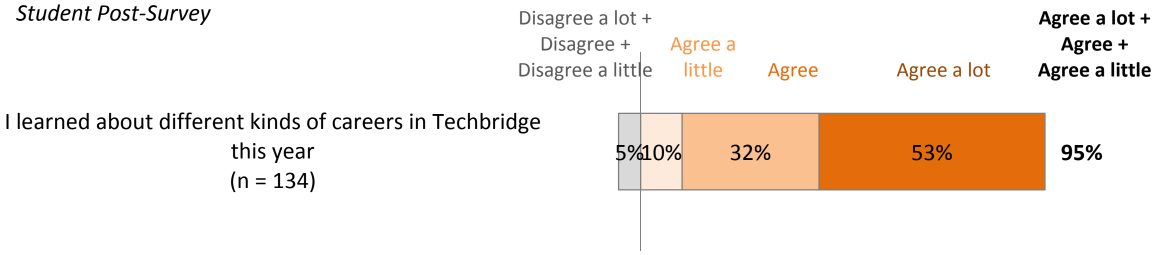
The kinds of classes you need to take to have a career in SET

How to find information about careers in SET



The vast majority of Techbridge girls (95%) agreed on the post-survey that Techbridge increased their knowledge about various careers, including 53% who agreed "a lot" (see Figure 14).

Figure 14. 95% of girls said they learned SET careers in Techbridge
Student Post-Survey



In focus groups with Techbridge participants, girls demonstrated that they understand characteristics of those who worked in SET. They identified the following qualities of engineers, and their descriptions show their understanding of the nature of SET and SET careers:

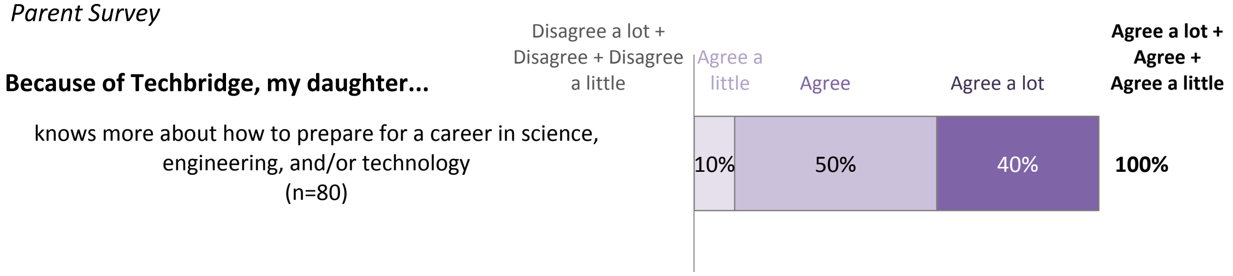
- **Persistence:** "Some of the projects, when we don't understand and you just give up, but if you ask questions and look at demonstrations and you try again, you can get better at that one thing that you're doing."
- **Creativity:** "In [a company] there was a bunch of people who got to design things. They told us it was kind of like art, but with more science and engineering."
- **Helpfulness:** "The Facebook role model said that whenever she walks in a room, she thinks about how to make things better."
- **Attention to detail:** "I would tell a girl working on a Techbridge project to take her time and follow the steps."
- **Problem solvers:** "There's a lot of problems in engineering that you have to actually think about and analyze to know or solve."
- **Risk takers:** "You've got to take the opportunity, a chance. If you take it, the probability is that you get one out of whatever that it is. But if you don't try it, you lose."

Teachers also thought Techbridge helped girls become more knowledgeable about SET careers and education pathways (see Table 7). All or almost all of the teachers reported that girls were more knowledgeable about what SET workers do and what education they need for a SET career to a "large" or a "very large" extent.

Table 7. Teachers said Techbridge helped girls learn about SET careers and educational pathways
Teacher Survey; n = 6

Because of Techbridge, the majority of girls participating …	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Are more knowledgeable about what SET professionals actually do.				🧍 🧍 🧍 🧍 🧍	🧍
Have increased knowledge of what education they need for a career in science, engineering, and/or technology.			🧍	🧍 🧍 🧍 🧍 🧍	

Figure 15. Every parent said their daughter knows more about how to prepare for a SET career
Parent Survey



All of the parents said Techbridge had helped their daughter know how to prepare for a SET career (see Figure 15). In response to an open-ended question asking parents about how Techbridge made a difference for their daughters, several parents commented that Techbridge showcased the nature of work in science and engineering and increased their daughters' knowledge about SET careers. Parents commented that Techbridge gave their daughters "the opportunity to study science more than the school curriculum" and "a more 'hands on' approach to science."

A principal mentioned that a reason why Techbridge was so appealing to their school was due to its focus on building awareness of SET career opportunities:

> "To have Techbridge or to have one more type of learning that could inspire some of our kids of color, I think is even more reason to be able to inspire them. If you look at the workforce it's still predominantly white. It's not what our nation as far as the breakdown. If we can inspire these kids so as an elementary student they go into middle school and then into high school with a deeper and a more almost inspiring lens to be able to want to do those fields. I know I didn't have it. Then we could have kids hopefully eventually start to become part of those bigger Boeings and Microsofts. The kind of workforce that I would hope these kids in this community will have the opportunities."

Role model visits and field trips were two main strategies to increase girls' knowledge of SET careers and educational pathways. The majority of teachers rated both the field trips and role model visits highly.

Table 5. Most of the teachers reported that the field trips and role model visits were highly effective
Teacher Survey; n = 6

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Overall, the field trips were effective.			●	●	● ● ● ●
Overall, the role model visits were effective.		●	●	●	● ● ●

An open-ended question on the teacher survey asked teachers how their students benefited from the role models and field trips. Teachers described a number of benefits, from seeing people working in SET who look like they do, being inspired, and learning more about careers in SET and how to get there (also see Table 6). Teachers felt that the role model visits and field trips were powerful ways to show girls from underrepresented groups what their future may hold. Comments included:

- “I believe girls have become inspired and empowered. Many have seen a place and a face that they can aspire to be or be like.”
- “Seeing women who are interested in learning and feeling that it is okay for them to be both intelligent and attractive.”
- “They got to see women who look like them and possibly have similar experiences/backgrounds to them in educated, successful fields. They got to know actual possible careers in SET and hear from/see what actually happens in those jobs.”
- “They have heard more about what it takes to achieve that level of success.”

Table 6. hat did students gain from field trips and role model visits?

Benefits	Quotes
Exposure to different careers 	“I don’t know that they [Techbridge girls] would have an opportunity outside of this program to even realize what’s out there, what the possibilities are. When we have these role models, I think the girls are like, ‘I don’t even understand what this is. I’ve never heard of this type of job before. I don’t even know that was the thing.’ Showing them that, yeah, these are things, and just things that you can do.”
Put a face with a career title 	“Because it was a role model visit and then an activity related to whatever field that person’s in, I feel like it just kind of put a face, like, ‘hey, here’s a job, here’s the name, structural engineer,’ but then being able to say ‘a software engineer, and here’s somebody who does that, and here’s what their job looks like,’ I think makes it a little more real.”
Visit an office space 	“To learn about the careers, the field trips are great because you’re there, you get to see a lot of things. I think the field trips are really beneficial for them because a lot of them have never been in an office building. I’d bet you that was their first time in an office building like that. You could tell kids were afraid to ride the elevator.” “I think it’s really empowering…when we visit the college, or when we visited Google. Like, ‘Woah! I did not know it would be like this!’ I mean, it’s a huge eye-opener for them, I think it’s a great opportunity, and they need it.”
See SET workers in action 	“They got to take a tour of the facilities and watch the workers actually working. They would invite them over to their computer screens and say, this is what I’m working on, here’s what I’m doing, so they got to actually see it, not only talk to the people but then actually see them doing the designs, whatever they were doing.”
See diversity in SET 	“I love that they have the role models come in that are female… Just showing them that yeah, that could be me. We had a field trip last week to [a company], and there were like 10 role models there that worked with us and several of them were of diverse cultural backgrounds. Obviously, our school is highly diverse, so it was great for them to see. Not only are girls doing this, but girls that look like me are doing this.”

Role models who are similar to the girls made a particularly strong impression on girls. In one example, a field trip to Google was led by a woman who could speak Spanish with the girls:

> "We had one stellar, so engaging, inspiring role model and one that was pretty good. They talked about the first one for weeks. Not just her and what she said, but they remembered things about being an electrical engineer and could connect to what she had said weeks later. Then today, none of them wanted to come home. They wanted to stay at the field trip... I think their life experience is so limited by a variety of things at this point in their life that either they have presuppositions about what it looks like to be an engineer or to have a job or to work in an office, or they have no idea. Kind of grounding them in a little bit of reality, I think, gives a lot of them something to aim for. Especially when you see a diverse workplace. Google is a very diverse workplace, and so girls can identify with women that they see... A Mexican immigrant led the whole thing today. A couple of girls didn't understand the engineering thing. They just talked it out in Spanish. The girls were like, 'I feel so important.' I feel like they could see themselves there. It was very cool. I think that work can be fun is important because so many of their parents have jobs that are laboring jobs, and they work because they have to get money. They don't necessarily work because they enjoy their jobs."

Teachers were asked to share their recommendations for improving the role model visits and the field trips. Three teachers recommended that Techbridge do more to help role models learn and use strategies that are effective with students. As one teacher said, it is important to make sure role models can use language that is well understood by students:

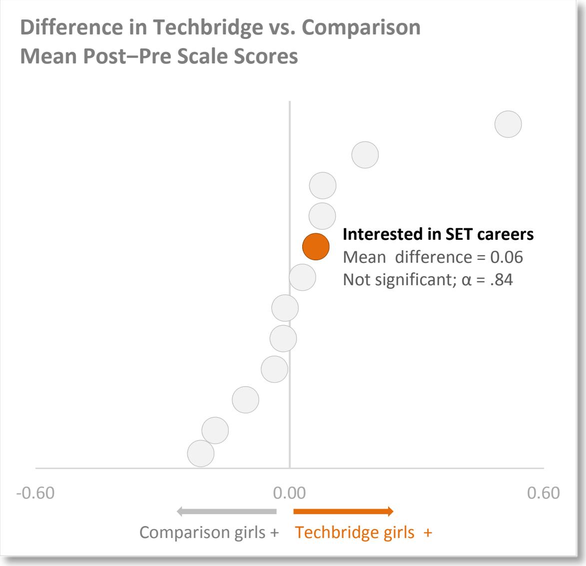
> "They offer a Q&A afterward. That's where I would step in and say, 'Hey, you said something about this. It didn't seem like a lot of us might have understood what you meant. Could you say more what that means?' Even as myself, when I came in to teaching, it was really a struggle to use 10-, 11-year-old words, to really speak in their language so they can understand. I still catch myself. I'm like, 'You guys don't get what I said, do you?' They're like, 'No, I don't understand that word.' Now I'm more mindful of that so when I hear people use words that I'm thinking, 'They might not have heard this or seen this,' because scientific words, job specific words aren't used in everyday conversation that they may have heard. Vocabulary can be a challenge; that's where you can lose them if they don't understand the word you're using."

Teachers believed the impact of the role models and field trips to be so great that one teacher suggested adding another role model visit, one teacher suggested an additional field trip, and another teacher requested that both happen earlier in the year.

- "I wish there was a way to have more role models. Two in the whole year seems minimal, given the huge impact it had on many of the girls."
- "One more field trip throughout the course of the year (one in the fall, one in the winter, and one in the spring). Many girls wanted to see or experience one more place!"

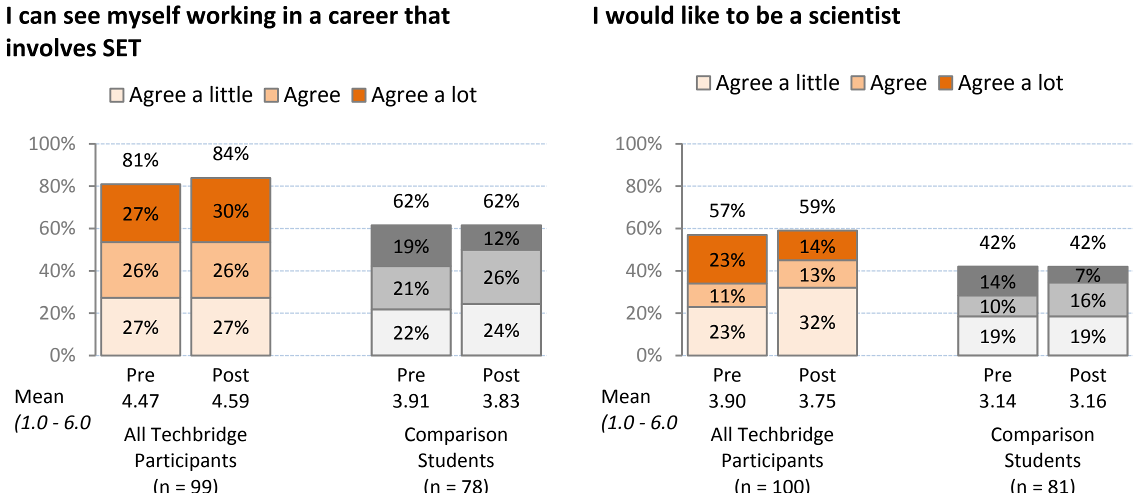
> "I really think both empowering the girls to see themselves, to even understand what do we mean by STEM, and to see down some roads that they never knew existed—that has just been really inspiring. For some of these girls, they now are saying they want to study STEM-related areas when they go to college. These are girls whose parents have never gone to college. Unless we help them in fifth or sixth grade think about college, they're not really looking towards that yet. So just opening their minds up."
>
> Techbridge teacher

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



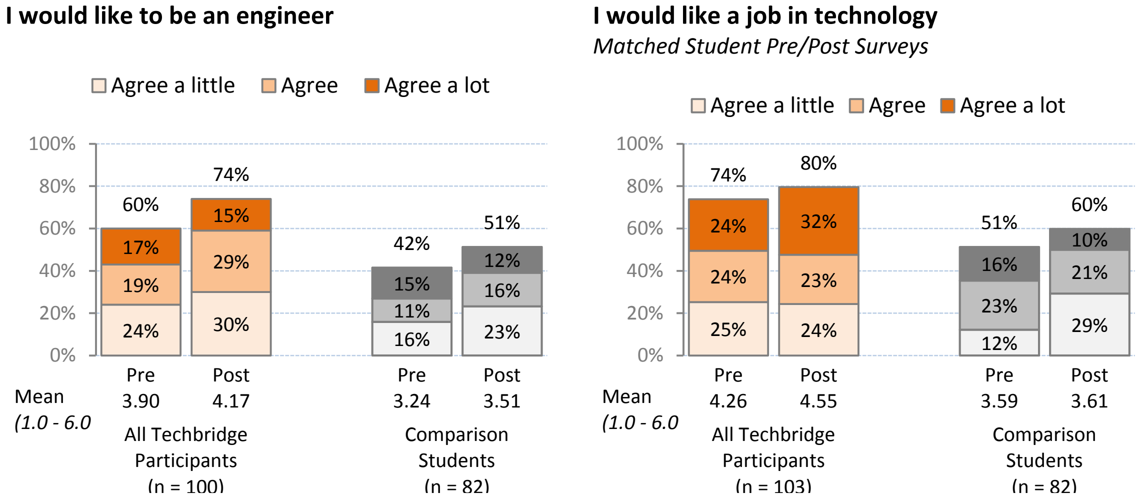
One of Techbridge's goals is to encourage girls to consider pursuing a career in science, engineering, or technology. After participating in Techbridge, girls were more likely to agree that they would like to be an engineer (increasing from 60% to 74%) and would like to have a job in technology (increasing from 74% to 80%; see Figure 16 below). Comparison students' interest in these types of careers also increased, but not to the same degree as Techbridge participants'. As shown in in the figure to the left, the average Techbridge student's mean SET career interest scale score (which includes all four questions shown below) was 0.06 points higher than the average comparison student's. However, this difference was not statistically significant.

Figure 16. More Techbridge girls said they were interested in engineering and technology careers after Techbridge *(Matched Student Pre/Post Surveys)*



I can see myself working in a career that involves SET

I would like to be a scientist

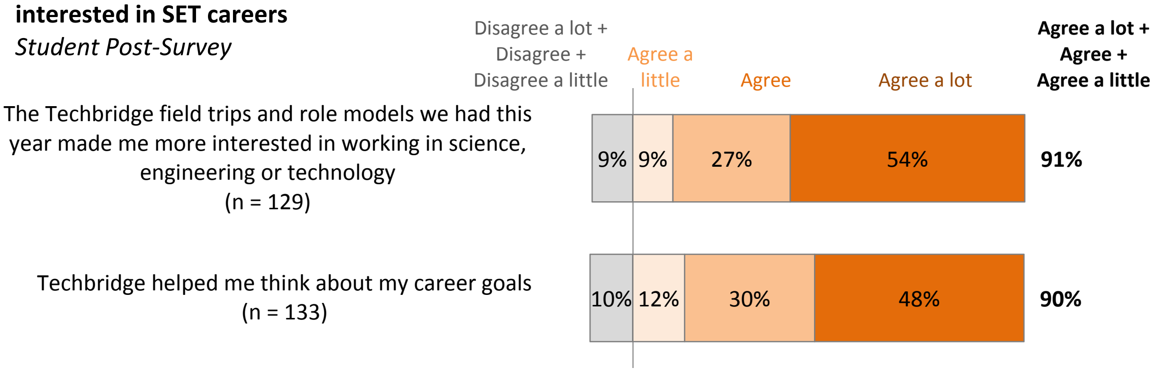


I would like to be an engineer

I would like a job in technology
Matched Student Pre/Post Surveys

Two retrospective questions on the post-survey asked girls about Techbridge's impact on their interest in working in SET (see Figure 17). Ninety percent of girls (90%) said that the Techbridge helped them think about their career goals, and 91% said the field trips and role models made them more interested in working in SET.

Figure 17. The majority of girls said Techbridge helped them become more interested in SET careers
Student Post-Survey



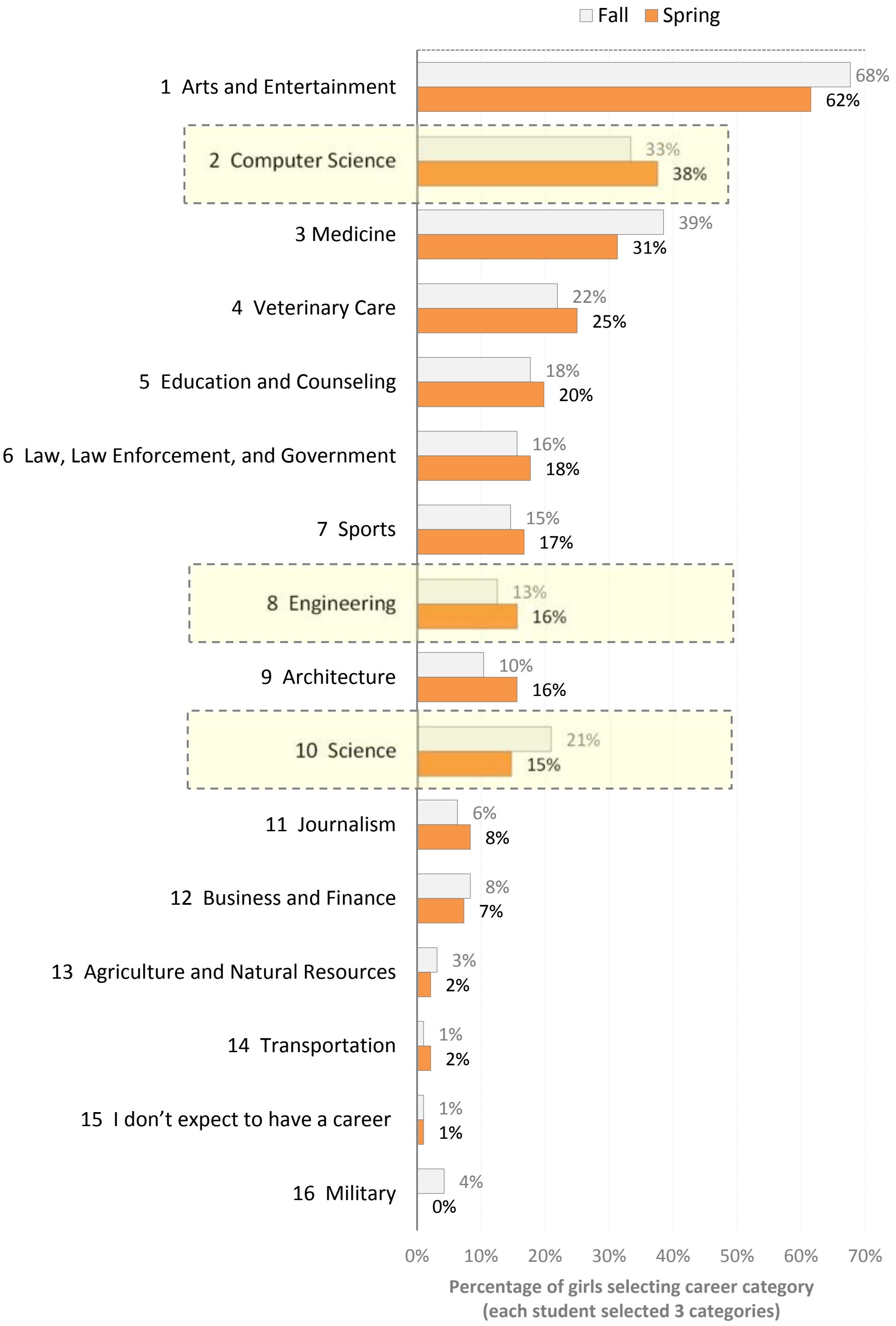
The pre- and post-surveys asked students to choose three career categories they expected to have when they grow up from a provided list of 15 categories (see Table 8). Students were also given the options to select "I don't expect to have a career" or "I don't know," and a place to write in a career(s) if it was not included in the provided categories.

Table 8. Techbridge girls were most interested in computer science as a SET career
Matched Pre/Post Student Surveys; SET careers shaded

"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."	**Techbridge Participants (n = 174)**		**Comparison (n = 199)**	
	Fall	**Spring**	**Fall**	**Spring**
Agriculture and Natural Resources	3%	2%	3%	1%
Architecture	10%	16%	3%	9%
Arts and Entertainment	68%	62%	63%	67%
Business and Finance	8%	7%	12%	12%
Computer Science	33%	38%	25%	21%
Education and Counseling	18%	20%	20%	20%
Engineering	13%	16%	11%	13%
Journalism	6%	8%	8%	9%
Law, Law Enforcement, and Government	16%	18%	19%	23%
Medicine	39%	31%	33%	45%
Military	4%	0%	11%	8%
Science	21%	15%	9%	9%
Sports	15%	17%	25%	20%
Transportation	1%	2%	1%	3%
Veterinary Care	22%	25%	21%	23%
I don't expect to have a career	1%	1%	1%	0%
I don't know	7%	4%	5%	3%
Other	0%	0%	1%	1%

Figure 18 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. More Techbridge girls indicated they were interested in careers in computer science and engineering after they had participated in Techbridge, while slightly fewer girls were interested in careers in arts and entertainment, medicine, or science.

Figure 18. Computer science careers were amongst the most popular careers Techbridge girls said they were interested in
Matched Student Pre/Post Surveys (n = 96)



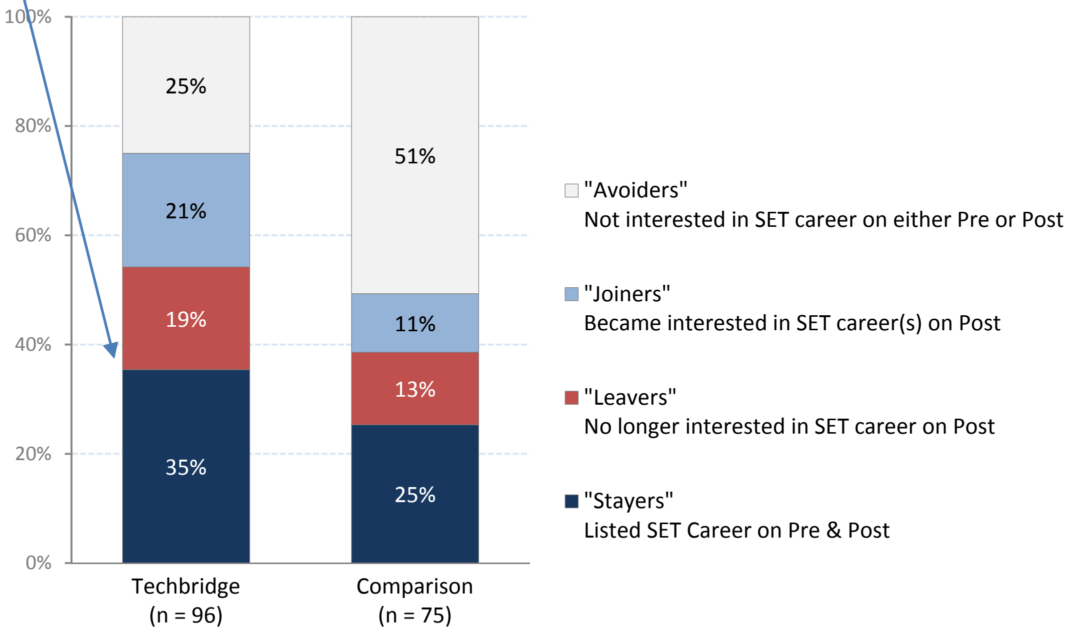
Girls' responses on the pre- and post-survey were coded to indicate whether at least one of the categories was a non-health-related SET career (science, engineering, or computer science). Some girls listed at least one SET career on both the pre- and post-survey, while others changed their interests from the beginning to the end of the year. Depending on whether (and how) girls' SET career interests changed, girls were classified as being in one of four categories:

- "Stayers" listed at least one SET career on both the pre-survey and the post-survey
- "Leavers" listed a SET career on the pre-survey but did <u>not</u> list one on the post-survey
- "Joiners" did <u>not</u> list a SET career on the pre-survey but did list one on the post-survey
- "Avoiders" did not list a SET career on either the pre-survey or the post-survey

A substantial number of Techbridge girls were "Stayers," already interested in having a SET career at the beginning of the year, and remained interested in having a SET career at the end of the year. More than a third of the Techbridge girls (35%) said on both the pre- and post-survey that they expected to have a career in science, engineering, and/or computer science (see Figure 19). (In contrast, only 25% of comparison girls selected science, engineering, and/or computer science on both the pre- and post-survey.) Looking at the remaining Techbridge girls, 19% identified a SET career on the pre-survey but not on the post-survey (the "Leavers"), 21% listed a SET career for the first time on the post-survey (the "Joiners"), and 25% did not list a SET career on either survey (the "Avoiders").

Figure 19. In response to pre- and post-survey questions asking students what type of career they like to have they grew up, the largest group of Techbridge students (35%) listed at least one SET-related career in both the fall and the spring

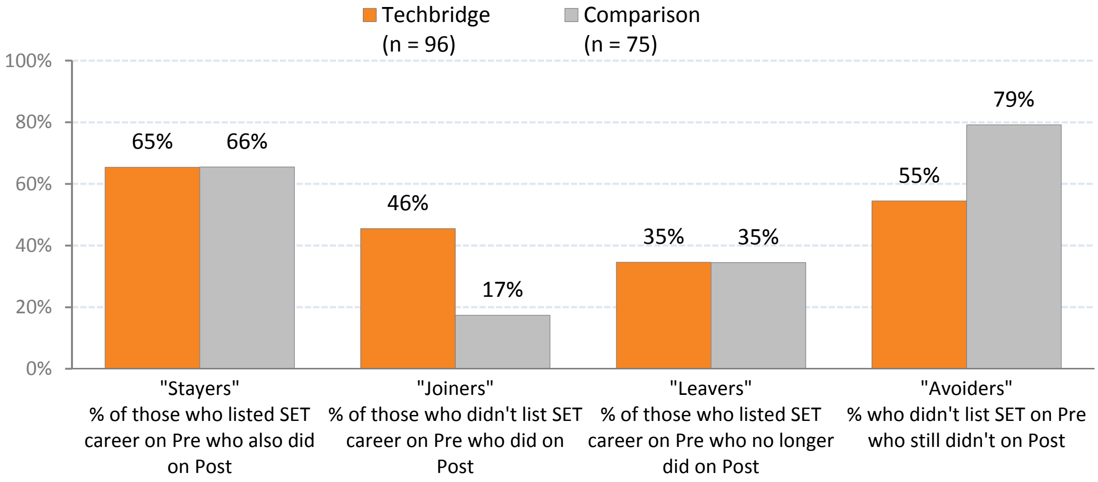
Matched Stude



The figure below shows girls' year-end career choices depending on whether they started the year interested in a SET career or not interested in a SET career. Examining the data in this manner shows that two thirds of the Techbridge girls who listed a SET career on the pre-survey (65%) also listed a SET career on the post-survey (i.e., were "Stayers"). Similarly, 66% of comparison girls who listed a SET career on the pre-survey also did so on the post-survey. Thus, Techbridge girls and comparison girls were approximately equally likely to remain interested in a SET career once they had expressed interest in a SET career.

Furthermore, almost half of the Techbridge girls (46%) who had <u>not</u> listed a SET career on the pre-survey did list at least one SET career on the post-survey (i.e., were "Joiners"). This percentage was much higher than the rate at which previously uninterested comparison girls became interested in SET careers. Only 17% of comparison girls who did not list a SET career on the pre-survey listed one on the post-survey.

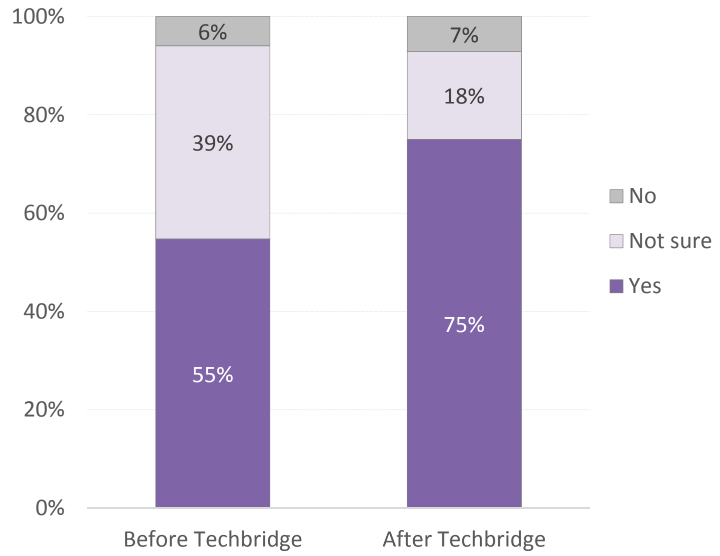
Figure 20. 65% of the Techbridge students who listed a SET career on the Pre-Survey also listed a SET career on the Post ("Stayers"), and 46% of students who didn't list a SET career on the Pre-Survey did on the Post ("Joiners")
Matched Student Pre/Post Su



Many parents reported that their daughters began talking about having a career in SET after attending Techbridge. When asked if their daughters talked about SET careers *before* attending Techbridge, 55% of parents said "yes." When asked if their daughters talked about SET careers *after* attending Techbridge, parents reported that 75% of the girls now spoke about having a job in SET, a difference of 20% (see Figure 21).

Figure 21. Parents reported that girls more were likely to talk about having a job in SET after participating in Techbridge

Did your daughter talk about having a job in SET?
Parent Survey; n = 84



Parents indicated that participation in Techbridge further encouraged their daughter to potentially pursue SET education and future opportunities. Parents commented:

- "She learned how she can use technology better and is motivated to continue learning."
- "She is very open to the idea of going to college and studying science."

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

The teacher survey included several questions about the degree to which they had implemented various Techbridge elements in their program, including promoting growth mindset, collaboration, public speaking, and the engineering design process. Two questions asked teachers if they discussed SET gender inequities in their program, and whether their students' understanding of gender inequities increased as a result. **Of all the program elements that teachers were asked about implementing in their Techbridge program, teachers were least likely to say that their program talked about gender inequities in SET.** Only one teacher said their program talked about gender inequities to a "large" extent or talked about how address this issue to a "large" extent (see Table 9).

Table 9. Techbridge teachers were relatively less likely to say their program addressed gender inequities in SET compared to other program elements
Teacher Survey; n = 6

Because of Techbridge, the <u>majority</u> of girls participating …	**Not at all**	**To a small extent**	**To some extent**	**To a large extent**	**To a very large extent**
Our program talked about gender inequities in science, engineering and/or technology.			🧍🧍🧍🧍🧍	🧍	
Our program talked about how to address gender inequities in science, engineering and/or technology.		🧍🧍	🧍🧍🧍	🧍	

Teachers were also relatively less likely to say that Techbridge had an influence on girls' understanding of gender inequalities within SET compared to other student outcomes. Four out of the six teacher respondents said the majority of their girls had more knowledge of gender inequities in SET or strategies to overcome them to "some" extent.

Table 10. Teachers were relatively less likely to say that Techbridge helped their girls understand gender inequities in SET relative to other student impacts
Teacher Survey; n = 6

Because of Techbridge, the <u>majority</u> of girls participating …	**Not at all**	**To a small extent**	**To some extent**	**To a large extent**	**To a very large extent**
Have more knowledge of gender inequities in SET.		🧍	🧍🧍🧍🧍	🧍	
Have more knowledge about how to address gender inequities in SET.		🧍	🧍🧍🧍🧍	🧍	
Have more knowledge about strategies to overcome gender inequities in SET.		🧍	🧍🧍🧍🧍	🧍	

During interviews, teachers touched on how gender equity was covered during the program and how girls were encouraged to persist in SET despite being underrepresented.

- "Yes, I think it's been talked about quite a bit. I remember especially at our college visit, one of the professors, [who] was a math professor, came in and talked to the girls specifically about how she was one of the only girls in her program and how everyone was telling her, 'You should go do something else,' but she stuck to it. I thought that was pretty eye-opening and cool for the girls to hear, like, "Oh hey, even if you are the only girl in this field, stick to it."
- "Most of the videos and things that we find, we try to find women of color. We have acknowledged, yes, there can be bias, and there can be gender discrimination. Some of the ways we've approached topics is…framing it as, as a women you have a unique perspective because of your own experiences. When you're creating…maybe you're making a new prototype or you're developing a new idea…as a woman, you would look at it differently. [We're] always trying to frame it positively and in an encouraging way, so that they see it more as an asset."

> "They're told every single day in Techbridge, 'Hey, you can do this. This is a job you could do. You like this? You interested?' I think it just opens doors and empowers girls to take advantage of the opportunities that are in front of them."
>
> Techbridge teacher

Two teachers thought the current gender inequity in SET was motivational for girls as a challenge they could try to overcome:

- "I've heard them have little discussions about it here and there, and I feel like it's actually a motivational thing. They want to prove people wrong. They want to prove that they can do it too, and they're being told that they can do it, so I think them knowing, hey, this is how it is right now, but you can change that, I think is a good thing."
- "I know a lot of the girls are starting to get pretty vocal about, 'Yeah, there are a lot of boys in science, but there should be more girls in science.'"

Further, principals at Techbridge schools said that part of the program's appeal was its focus on diversifying SET:

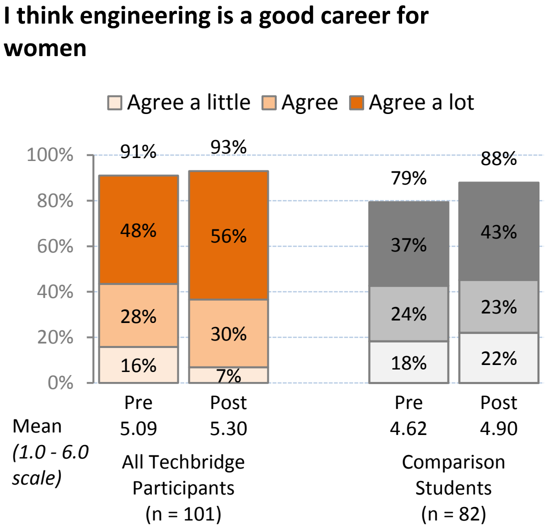
- "The reason why I continued to support it or loved on it was a desire to see more female representation in STEM fields, like looking at what the research is showing, getting some interests without it being skill and drill. We have a really intensive math program in the district and just the area of Common Core. We need to cover a lot of content. It doesn't always leave room for the creative exploration with the skill set, so the engineering perspective or even like the real world application aspect of it [is valuable]."
- "I really think both empowering the girls to see themselves, to even understand, what do we mean by STEM, and to see down some roads that they never knew existed, that has just been really inspiring. For some of these girls, they now are saying they want to study STEM-related areas when they go to

> college. These are girls whose parents have never gone to college. Unless we help them in fifth or sixth grade think about college, they're not really looking towards that yet. So just opening their minds up, and then also, like I said, getting the parents involved, which has both been really awesome."

The student surveys did not specifically ask students about their understanding of gender inequities in SET. However, the pre- and post-surveys asked girls to indicate their agreement with the statement that "engineering is a good career for women." **Techbridge students were slightly more likely to view engineering as a good career option for women at the end of the year.** At the beginning of the year, 91% of the girls agreed that engineering is a good career for women (with 48% agreeing "a lot"). At the end of the year, this percentage had increased to 93% (with 56% agreeing "a lot") (see Figure 22). Comparison students' also reported more positive attitudes toward engineering as a good career options for women at the end of the year (increasing from 79% to 88%). Thus, Techbridge students' and comparison students' attitudes were not statistically significantly different.[7]

Figure 22. A slightly higher percentage of girls agreed strongly that engineering is a good career for women after participating in Techbridge

Matched Student Pre/Post Surveys



The topic of gender inequity arose in all six participant focus groups, with girls talking about the female role models they were exposed to through role model visits and videos of female engineers. One girl shared an example from school when students were asked to draw pictures of doctors. Many students (mostly boys, according to one girl) drew men as doctors. Another Techbridge participant said that was not the boys' "fault" because they only see male doctors "out there" in the real world. The first girl responded and said that this is the reason for Techbridge: to give girls opportunities to see female role models in science.

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[7] 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.

Similarly, another participant described how Techbridge offers exposure to SET careers that she said would be valuable for other girls who do not think they are interested in SET. Her response implies that this group is not necessarily participating in Techbridge at her school:

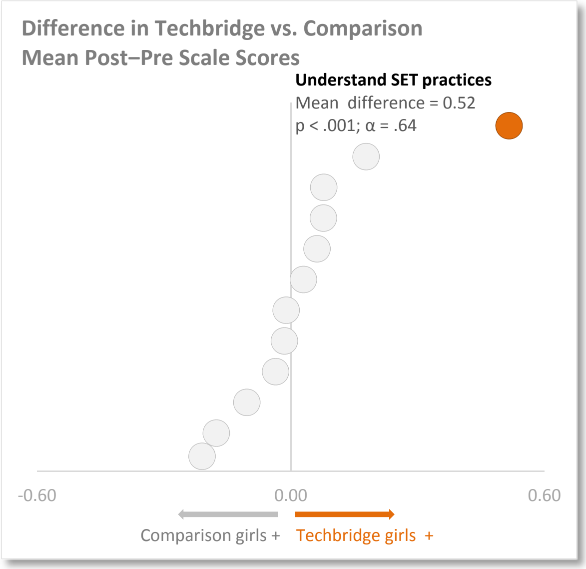
> "[My friends] might just not be interested in this type of career. Maybe they want to do something different so Techbridge isn't especially useful to them, but I think that's why this program is so good, because it gives girls that exposure. I think that just more girls need that little push to see, well, you can do this, and it's possible. So many other people have already done it, so if they can do it, you can, too."

Techbridge enables some participants to see themselves as capable in SET. In the past, one girl seems to have believed that computing was for boys, but she found she enjoyed it:

> "Girls can do things a lot. Not just boys. Like the tech-ish things. I thought computer science was like, oh it's too much, you know. Now I actually really kind of like it."

At least one parent thought Techbridge had helped to prepare their daughter to overcome gender inequities in SET. The parent explained, "Maybe they think a woman can't do it, but that's good that they teach to girls that they can."

3.2.7 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)?



Techbridge helped girls understand various processes and practices commonly used in SET. 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. For example, the percentage of Techbridge girls who said they know what the engineering design process is increased from 55% at the beginning of the year to 88% at the end of the year (mean difference = 1.12, p < .001). Similarly, the percentage of Techbridge girls who agreed they know how to use the engineering design process to build something increased from 50% to 86% (mean difference = 1.20, p < .001; see Figure 23 on the following page). (In contrast, less than half the comparison girls said they knew what the engineering design process is or how to use it at the end of the year.)

As shown in the figure above, the average Techbridge student's mean SET practice scale score (which includes all five questions on the following page[8]) was 0.52 points higher than the average comparison student's (p < .001).

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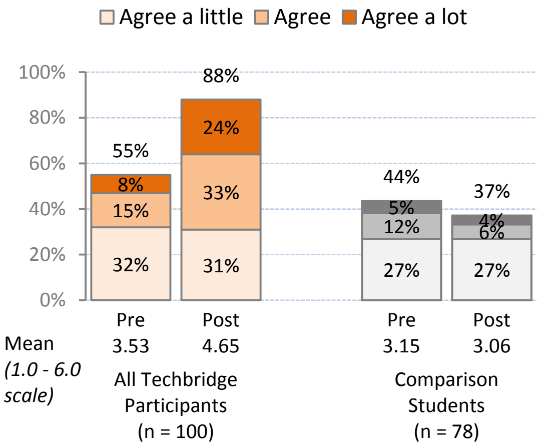
[8] The question "Engineers design things perfectly the first time" was reverse coded to match the direction of the other four questions on the scale.

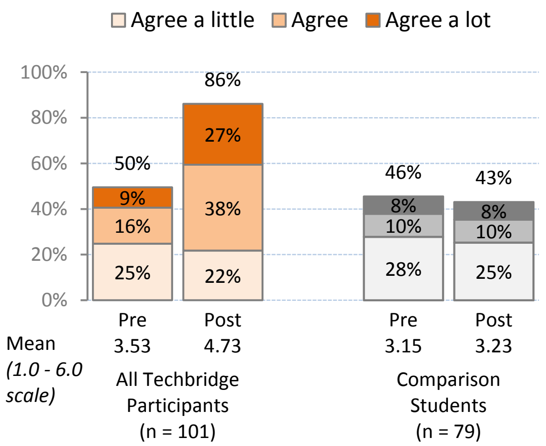
Figure 23. More Techbridge girls understood SET practices after participating in the program

Matched Student Pre/Post Surveys

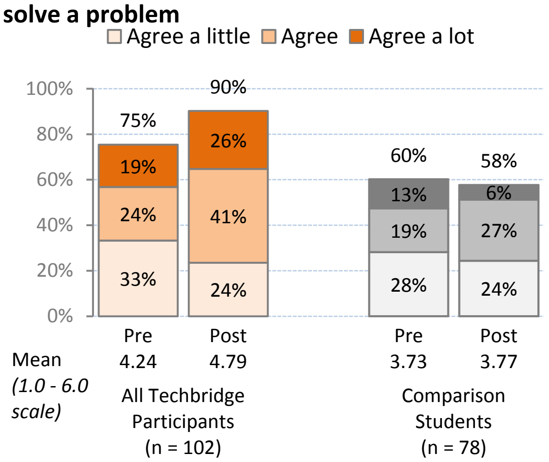
I know what the engineering design process is



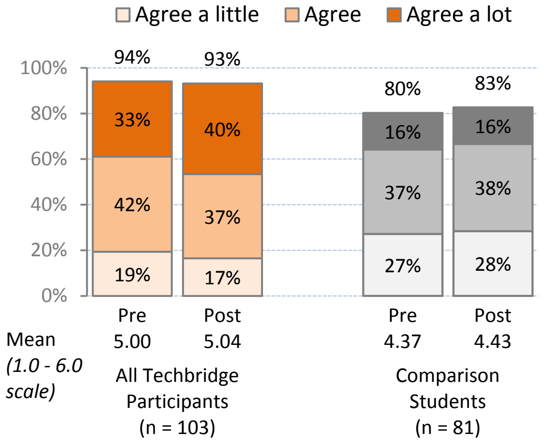
I know how to use the engineering design process to build something



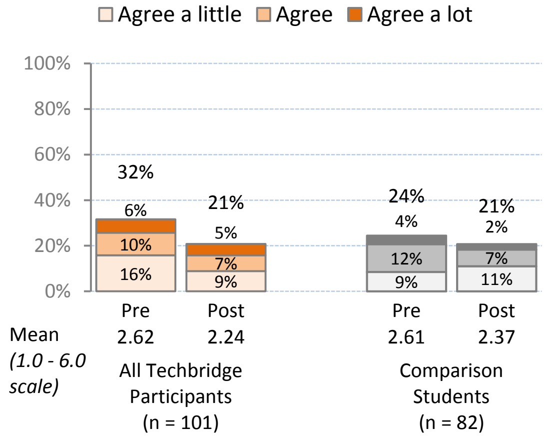
I know how to compare different designs to figure out the best way to solve a problem



If a project is not going well, I am able to make changes as needed



Engineers design things perfectly the first time



Embedded assessments were piloted in the fall and spring of 2014-2015, during which girls filmed one another as they reflected on what they had done and learned while working on Techbridge activities. Average ratings regarding students' engineering habits of mind increased from fall to spring. Almost all the girls understood and described the design process as cyclical and ongoing, and the majority of girls described how they had thought about improving their work. Many girls also showed improvement in their ability to evaluate competing design solutions and to analyze data.[9]

As Table 11 shows below, teachers agreed that girls learned how to use the engineering design process. All six of the teacher survey respondents said the majority of their girls increased their ability to use the engineering design process to a "large" or a "very large" extent.

Table 11. All the Techbridge teachers said the program helped girls understand the engineering design process
Teacher Survey; n = 6

Because of Techbridge, the majority of girls participating …	**Not at all**	**To a small extent**	**To some extent**	**To a large extent**	**To a very large extent**
Increased their ability to use the engineering design process.				🧍 🧍 🧍 🧍 🧍	🧍

Teachers and PCs said they emphasized the design process during each program meeting. At one site, they had a laminated poster that they referred back to all year.

> "Just having it up, teaching it explicitly, we spend time talking about what this looks like, and then it's always referenced every time, most every program the girls get an opportunity to design something and then either reflect on what they would do to redesign or redesign themselves. I think just having it up there and reinforcing it and talking about why the different steps."

One teacher described how a role model brought it up and girls were able to review it with her. The teacher explained, "When my role model asked if [the girls] were familiar with the process, they all said 'yes' and they pointed to it on the wall. And they were able to explain the different parts of it."

In one interview, a teacher suggested breaking down the steps of the design process even more for the girls.

> "I still feel like they struggle with it because it is a new concept. I mean, sometimes I can't even remember all the steps. I think we could do a better job of implementing the engineering design process. I know we have even talked about...in the first couple of weeks of a year, doing a flex activity that really pushes the girls to learn about the engineering design process and what it is and how to use it."

In focus groups, girls were able to clearly articulate what the engineering design process is and how they used it in Techbridge. One girl described the methods of planning, making and testing something during a Techbridge activity:

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[9] Colorado Evaluation & Research Consulting. (2015.) "Embedded Assessments: Girls' experiences designing engineering projects in Techbridge, Seattle."

> "First, usually [the program coordinator] makes us come to her with ideas, like brainstorm. Then, we write them down. Not create, just draw, and then she gives us the materials to make it, and then we test it by ourselves."

Girls also talked about dealing with time constraints, presenting their work, and reflecting. One girl said:

> "Almost every day, we do Techbridge and we're done with the activity we've done, when we build stuff. We'll all go and everyone will have a turn to go up and share what we've done and what was challenging and what was fun about it."

Teachers and PCs observed students becoming more effective at the stages in the design process over the course of the year:

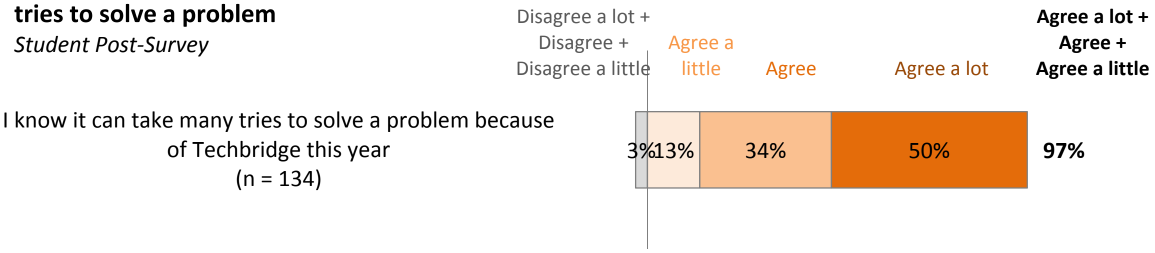
- "They got a little bit better at the pre-write ups like when they had to draw out what their first design would be or sketch it out. The first time we did it nobody wanted to draw anything. They just wanted to get started and it was really hard to get them to put their ideas on paper. And then this last one we did, it wasn't hard at all… I think they understood why it was important because in the beginning they didn't understand why they needed to draw it out first. Why not just get going and then fix it later? Then they realized later on that it actually saves time if you try and design it first and talk about it and then you build it. It gets rid of some of the confusion that the girls would have."
- "I remember I really liked how [the PC] had actually drawn out her model of what she wanted to do and why is that important? Another student raised her hand and said, 'It's so that she can build it again if she wants.' The kids know why each part is important. I think it's because it's been a continual process of they've seen and heard and talked about over and over and over again throughout the year, but it's now nice hearing them like, 'Well, what about redesign?' Or 'I didn't have enough time to plan,' or 'My partner didn't let me plan. She wanted to get started.' So just that continual exposure to it being taught explicitly and the exposure over and over and over again has been really powerful for them."
- "Part of the Techbridge model is using 'shout outs and glorious goofs' as part of the reflection process. At the beginning, we would never get glorious goofs. They were like, 'Why would I want to be excited about being wrong?' Not it's about 50/50. They can say, 'Oh, I really messed this up, but I learned this from it or so and so helped me.'"

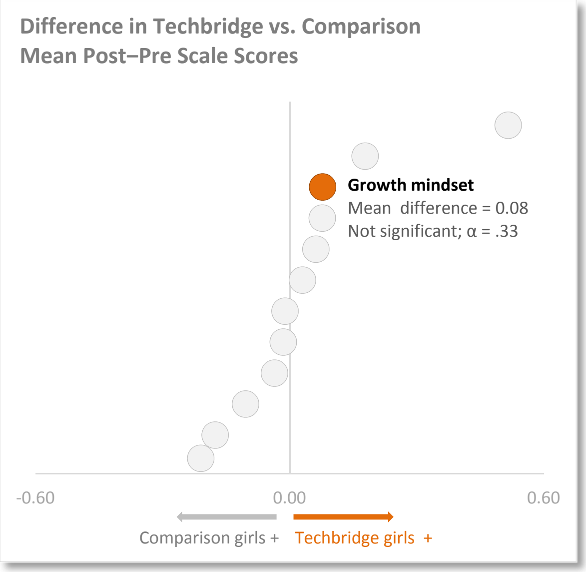
3.2.8 What is Techbridge's impact on girls' growth mindset orientation, problem-solving skills and perseverance?

Techbridge girls, teachers, and parents believed that Techbridge helped girls become better problem-solvers and persevere in the face of obstacles. In response to a retrospective post-survey question, 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 50% of girls who agreed "a lot" with this statement.

Figure 23. 97% of girls said Techbridge helped them understand it can take many tries to solve a problem

Student Post-Survey





The majority of girls said they already had a growth mindset prior to participating in Techbridge. The pre- and post-surveys had five questions designed to measure the degree to which students understood the value of making mistakes and persevering in the face of challenges (see Figure 24 on the next page for the results of each of these questions). Techbridge girls' responses suggest that most of them already had a growth mindset at the beginning of the school year. For example, on the pre-survey, 99% of Techbridge girls agreed that if they work hard, they will be more successful (including 84% who agreed with this statement "a lot"). One exception to this pattern is that Techbridge girls were significantly less likely at the end of the year to agree that they can't change how smart they are ($p < .01$). While the majority of Techbridge participants (61%) agreed on the pre-survey that intelligence is immutable, less than half the participants (43%) agreed with this statement on the post-survey. (Comparison students also were less likely to agree with this statement at the end of the year, but the difference was not statistically significant.)

As shown on the figure above, the average Techbridge student's mean SET growth mindset scale score (which includes all five questions shown on the next page[10]) was 0.08 higher than the average comparison student's. However, this difference was not statistically significant.

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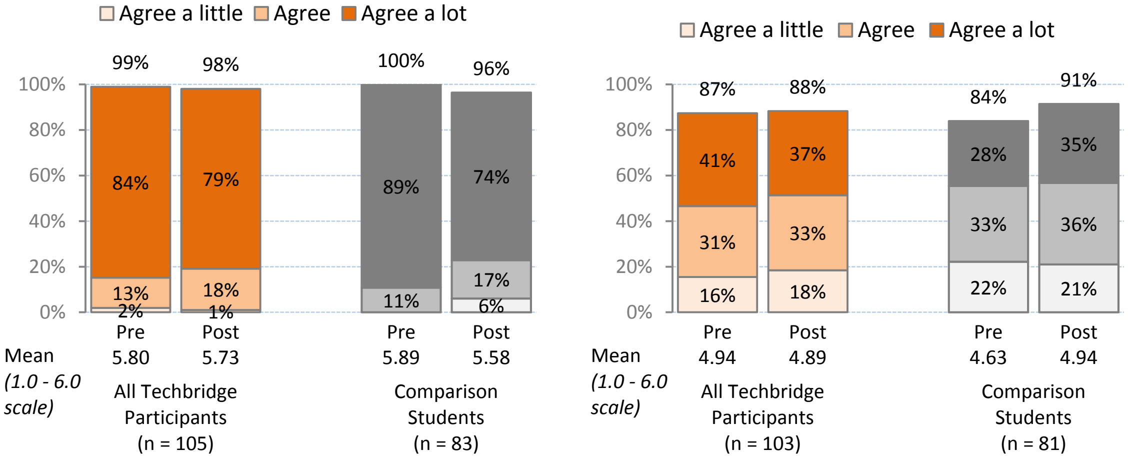
[10] The question "I can't change how smart I am" was reverse coded to match the direction of the other four questions on the scale.

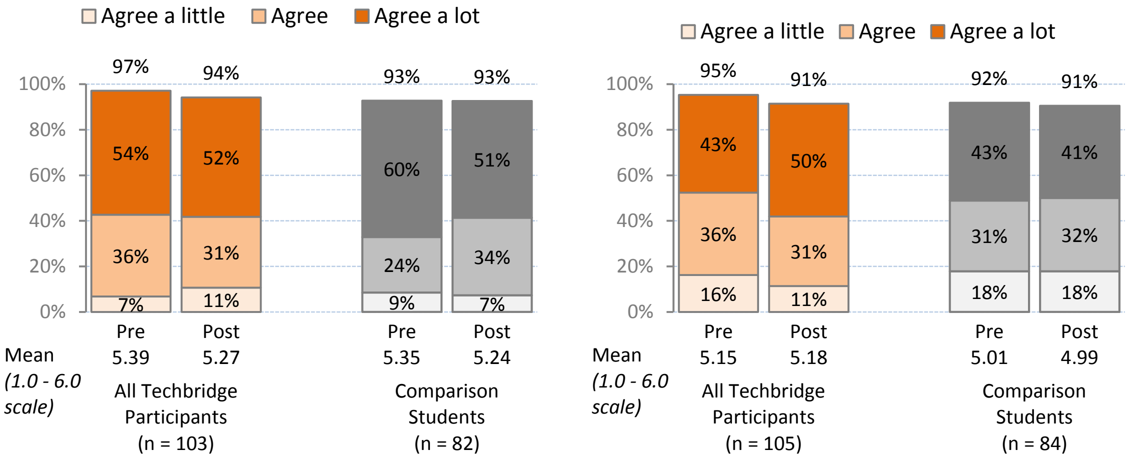
Figure 24. Girls' survey answers suggest most of them already had a growth mindset before Techbridge, but made some gains

Matched Student Pre/Post Surveys



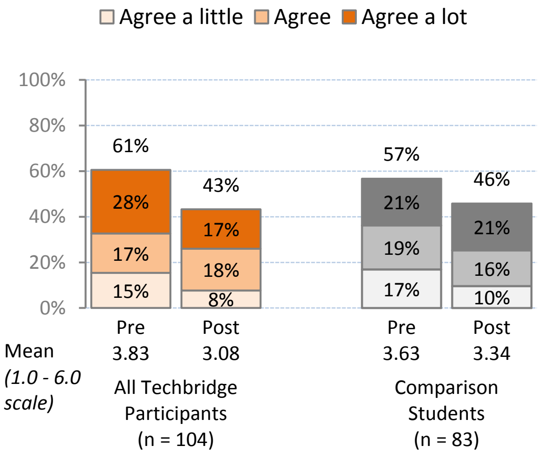
If I work hard, I will be more successful

I think I learn more when a tasks is challenging



I learn more when I make mistakes

I like doing work that I'll learn from even if I make a lot of mistakes



I can't change how smart I am

Girls in focus groups talked about problem solving and learning from failure. One girl mentioned how, if you keep on trying instead of giving up, you can make improvements: “Some of the projects, when we don’t understand and you just give up. But if you ask questions and look at demonstrations and you try again, you can get better at that one thing that you’re doing.” Another girl’s response shows how Techbridge has enforced the idea that it is more important to learn from doing something rather than to have achieved a certain, specific end product:

> “We get the directions, but still get to do things creatively, kind of in our own way. It should probably fit a basic criteria and stuff but it’s not like we’re getting graded. If we fail then that’s okay, because we learned from it. But we can also do things in our own way and express what we’re supposed to be doing in our own interpretation of how it should be done.”

Techbridge provides a safe space for girls to take risks, fail, and learn from failure. In another example of growth mindset, girls in a focus group all noted their agreement to the statement, “If I try hard, I will be more successful.” Girls responded that “you need to try your best.” In the following focus group exchange, girls describe how their Techbridge facilitators encouraged them to be persistent and not give up:

> Interviewer: “What have you learned about yourself in the program?”
> Girl 1: “We all play a role in the world.”
> Interviewer: “OK. How do you learn that in Techbridge?”
> Girl 1: “Because they encourage girls to do more.”
> Girl 2: “Because you’re like, ‘Oh, I give up,’ and then they’re just like, ‘No, don’t give up, you can do this, and this, and this.’”
> Girl 2: “Yeah.”
> Interviewer: “They encourage you.”
> Girl 2: “Yeah.”

In addition, the focus group discussions showed that girls understood that engaging in problem solving and being persistent are important in engineering. One girl said, “There’s a lot of problems in engineering that you have to actually think about and analyze to know or solve.”

Teachers were asked about the degree to which their program had a growth mindset orientation. All or almost all the teachers said they implemented practices that are consistent with growth mindset to a "large" or "very large" extent, including emphasizing the design process rather than product completion, and promoting the idea that girls can improve with time and experience.

Table 12. Teachers said their program promoted a growth mindset
Teacher Survey; n = 6

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Our program emphasized the design process rather than product completion.				👤 👤 👤 👤	👤 👤
Our program promoted a growth mindset (that girls can improve at science, engineering and/or technology through time and experience).			👤	👤 👤 👤	👤 👤

Many teachers and the Techbridge PCs observed that girls became more comfortable making mistakes and seeing them as a learning opportunity:

- "Initially, they're very resistant to the redesign…Teaching them it's okay to try something and if it doesn't work, that's okay. As the year went on, they were asking, 'Do we get to redesign?' Sometimes time didn't allow for that, so our reflection would be, 'If you had time to redesign, how would you?' Then, 'What do you think the result would be?'"
- "I think it happens pretty frequently during our program. Kids got challenged, but you see a lot of kids not. At first they want to get up and less and less we see that kids, when they're getting frustrated, giving up. They're getting more into, 'Let's figure this out,' which is good."
- "I think growth mindset does come up a lot in the programs and also having them share out their experience, like 'this was challenging, this was difficult, this is how I got through it' and then asking the girls who had that same experience so knowing that they are not the only one that had that challenging, frustrating experience."
- "I'm seeing, as time has gone on, less frustration and more just relaxing into it, being okay with making mistakes and being okay with not having it right the first time. I do see that happening. More perseverance, more sticking to it. We do talk about that a lot too. In the real world, scientists make mistakes, and that's how they learn."

Sometimes the facilitators worked alongside the students and modeled having a growth mindset:

> "These two girls who were working particularly quickly got stuck on one of the advanced challenges. I said, 'Well, let's sit the three of us and put our heads together.' We kept messing up and we kept trying and eventually got it. It was so powerful to say, 'How many times did we mess up, and then we got it right one time. It was only because of all those mistakes.' That was probably one of the most powerful moments for me [in Techbridge]."

Techbridge facilitators sometimes had to remind themselves to allow students to figure things out on their own rather than immediately providing assistance:

> "I feel like it is still hard for me not to help them as much as I want to help them...Trying to give them hints to get to their own understanding and their own 'aha' moment. Then I know personally if I hear, 'Oh, it's too hard,' I will say, 'We don't talk like that. Tell me why you feel like it is hard and let's work through things.' Because I don't want them to give up or get frustrated."

Only one teacher, in an interview, commented that growth mindset could be better incorporated into Techbridge programming:

> "They [Techbridge trainers] had talked a lot about growth mindset and Techbridge's belief in the growth mindset, and I think that's really, really powerful, but I don't necessarily see so much of that. I feel like that could be something that's taught to the girls very specifically, and I feel like that could be incredibly powerful in empowering them not only in Techbridge but also in their everyday lives, so I think more on that, because we had spent a fair amount of time talking about what that is and what that could look like in a classroom or in an after-school club, but then I didn't see so much of that in the classroom."

"There are always girls that will get frustrated with the activity. In the beginning they will say, 'This is hard. I can't do this. This is too hard.'

Then when they get through it, they get really happy and they feel successful. Then, if I see that 'aha' moment, I will definitely emphasize it. Like, 'See you didn't give up.' You give them specific growth mindset feedback like, 'You worked really hard and you didn't give up and look you did it. You came out [with] something."

Techbridge teacher

Teachers were asked about the degree to which they thought girls in their Techbridge program developed a growth mindset orientation. All six teacher survey respondents 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. A slightly smaller number of teachers (three) said that the majority of their students actually were more persistent in the face of challenges to a "large" extent.

Table 13. The majority of teachers said Techbridge helped girls develop their persistence
Teacher Survey; n = 5 except where marked

Because of Techbridge, the <u>majority</u> of girls participating …	**Not at all**	**To a small extent**	**To some extent**	**To a large extent**	**To a very large extent**
Are more likely to believe they can improve their abilities in SET with time, practice, and effort. (n = 6)				🧍🧍🧍🧍🧍	🧍
Understand better that it can take many tries to solve a problem.			🧍	🧍🧍🧍🧍	
Are more persistent in the face of challenges.			🧍🧍	🧍🧍🧍	

Teachers also reported that their girls became better problem-solvers through their participation in Techbridge (see Table 14). For example, all five 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" extent.

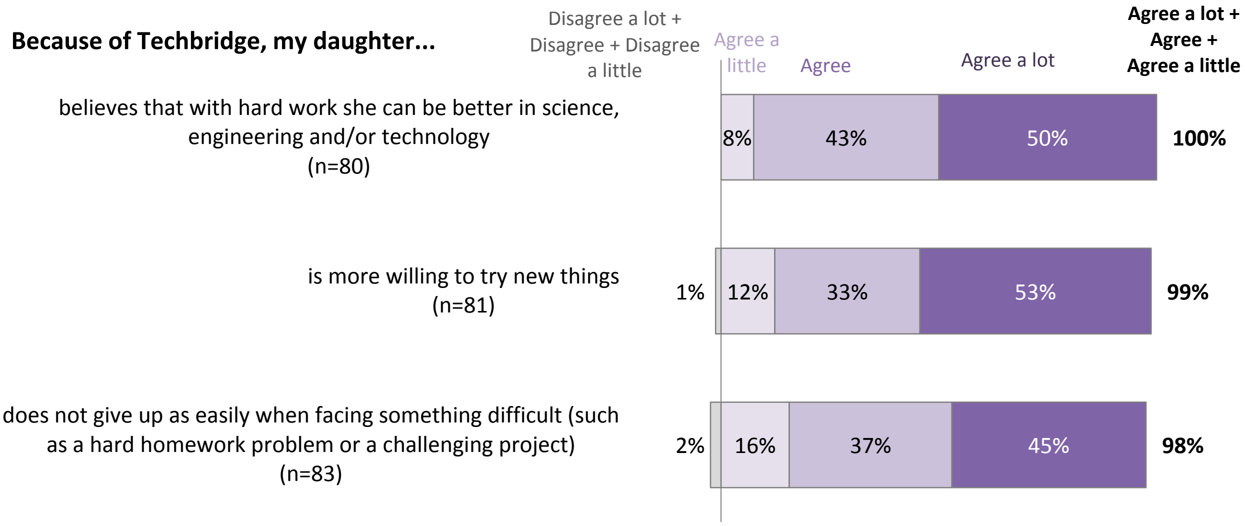
Table 14. The majority of teachers said Techbridge helped girls develop their problem-solving skills and communication skills
Teacher Survey; n = 5

Because of Techbridge, the <u>majority</u> of girls participating …	**Not at all**	**To a small extent**	**To some extent**	**To a large extent**	**To a very large extent**
Are better at problem-solving.				🧍🧍🧍🧍🧍	
Are better able to construct an argument or explanation based on evidence.				🧍🧍🧍🧍🧍	
Understand better the value of creativity in solving problems.			🧍	🧍🧍🧍🧍	
Communicate clearer/stronger arguments for their point of view.			🧍🧍	🧍🧍🧍	

Every parent who completed the parent survey reported that because of Techbridge, their daughters now believe that they can become better in SET with hard work (see Figure 25). Furthermore, the vast majority of parents reported that their girls are more willing to take try new things and to work through challenges.

Figure 25. Parents said Techbridge had a positive impact on their daughter's growth mindset

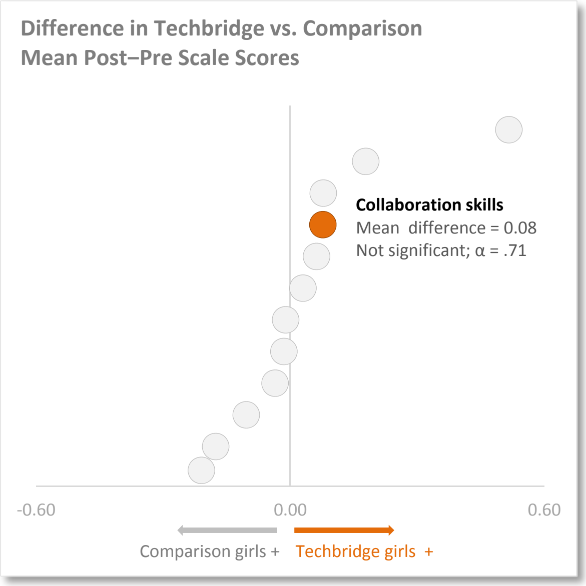
Parent Survey



Some parents commented that their daughter was more confident trying new things and was not scared of setbacks after participating in Techbridge:

- "Now she is more motivated to try new things without fear of making a mistake."
- "She's very motivated by pushing herself out of her comfort zone."

3.2.9 What is Techbridge's impact on girls' collaboration skills?



Techbridge girls' self-reported attitudes toward teamwork and teamwork skills were very high prior to their involvement in Techbridge and remained high at the end of the year. Five questions on the pre- and post-surveys assessed girls' ability to work with different types of people to solve problems (see Figure 26 on the next page for the results of each of these questions). Techbridge girls' responses suggest that most of them already valued teamwork at the beginning of the school year. For example, on the pre-survey, 86% of Techbridge girls agreed working with others is usually more fun than working alone (including 54% who agreed with this statement "a lot"). As shown on the figure to the left, the average Techbridge student's mean collaboration scale score (which includes all five questions shown on the next page[11]) was 0.08 higher than the average comparison student's. However, this difference was not statistically significant.

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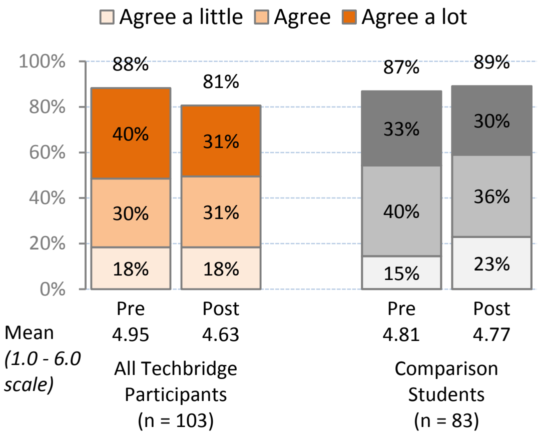
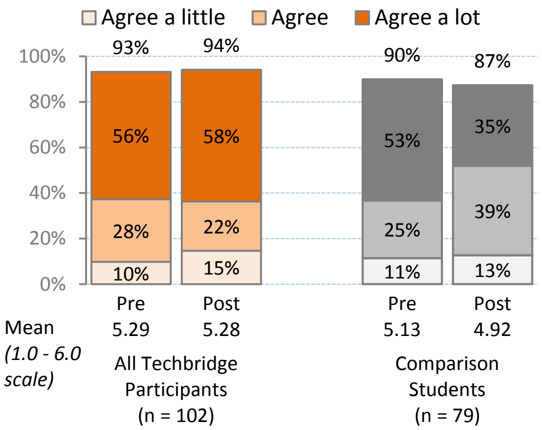
[11] The question "I learn better when I am by myself" was reverse coded to match the direction of the other four questions on the scale.

Figure 26. Girls' collaboration skills were already high and changed relatively little following Techbridge
Matched Student Pre/Post Surveys

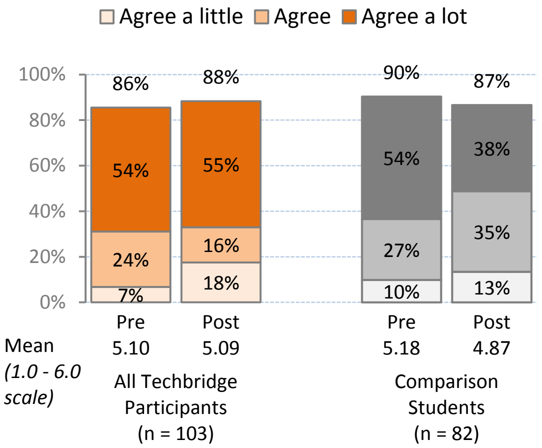
I work well with different types of students



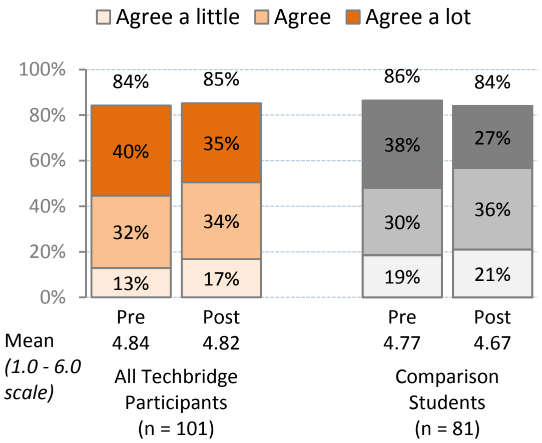
I like being part of a team
Matched Student Pre/Post Surveys



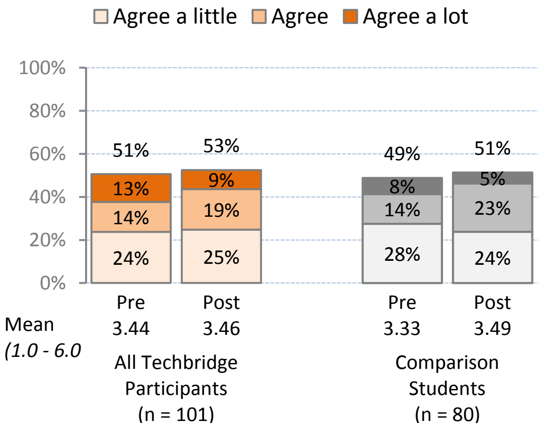
Working with others is usually more fun than working alone



I learn better when I am working with others



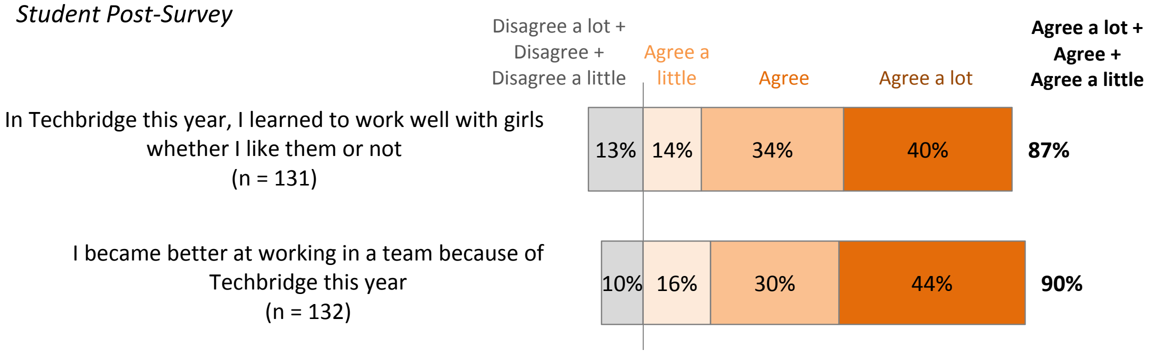
I learn better when I am by myself



The majority of girls said they improved their teamwork skills because of Techbridge (see Figure 27).

Figure 27. The majority of girls said Techbridge improved their teamwork skills

Student Post-Survey



Four of the five teacher survey respondents thought the majority of their girls had developed teamwork skills to a "large" extent because of Techbridge (see Table 15).

Table 15. The majority of teachers said Techbridge helped girls develop their teamwork skills

Teacher Survey; n = 5

Because of Techbridge, the <u>majority</u> of girls participating …	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Are better able to collaborate with their peers.			🧍	🧍 🧍 🧍 🧍	

Some programs assigned students to work with different groups (rather than allowing them to self-select). This prevented the group from forming too many "cliques" and forced students to learn how to find ways to work effectively with many different types of students:

- "It's been interesting watching them…being able to work with students they don't always work with. I've always mentioned, 'Hey, you've got to be able to work with different people that you're not used to working [with]…That's real life.'"
- "I think that's one thing we've changed. We used to let them pick their partners, but then we've seen this clique-ness happening or attitudes. Then, when we break them up, they're fine. It serves for a better atmosphere and I think they have a better time."
- "I try to break my girls up, because they're all in cliques, especially at the elementary school. I'm pairing fifth and sixth graders. One of my sixth graders was like, 'Why do we always have to work with the fifth graders?' I'm just like, 'You're always going to have a different partner. You have a different partner every week.' It's just interesting how cliquey they can be."
- "They were randomly sorted every single time they got together to work on a project and they relied on those partners, so sometimes if you had a stronger communicator than the other ones and if the other one wasn't participating, the girl that was a stronger communicator, you would watch her try to pull the other girl out of her shell and participate."

The facilitators sometimes played an active role in helping girls learn that being a good teammate means knowing how much of a leadership role to take in a group:

> "When I pair them up, sometimes there is a pair…[who] are just really headstrong and kind of knock heads with each other. I kind of help guide them to be better leaders so if I see one person falling back and the other leader is taking more of a role, I will talk to the leader and you know be like, 'even though you are taking more of a role, make sure you include your partner because you are a team. You are not working by yourself.' Or if I have two girls who just can't come to a decision because they are both laid back and neither of them want to step up, I try to help them cultivate an idea and then leave them alone for a minute and then they start it. Someone has started the conversation now that I have kind of helped them along. I feel like they take leadership roles in different ways."

Girls also learned how to compromise. One girl initially would sit out if she did not agree with how an activity was being done:

> "We have one girl that at the beginning of the program was really shy and she didn't want to sit with anybody and she didn't want to partner with anybody, and the very first meeting the girls had to get up and talk out to the group and they went up in a group of three…and the other two talked and she refused to say anything. She just kind of hid behind her hair and wouldn't say anything, and then the first activity that she did with the group, she wouldn't get involved. She wanted to do something they didn't want to do and she just pulled out her phone and got on her phone and wouldn't participate. But then, flash forward through to now and she's giving ideas of what she wants to do but then compromising when the other group member doesn't want to. So instead of just saying 'Okay, we'll do whatever you want,' I heard her say, 'Well, if we do this, then we can do what you want to do and then we both get what we want.' She was getting that sort of relationship part."

"In terms of collaboration and the willingness to be patient with your group as your group members work through maybe a challenge, or a stumbling block—that has happened a lot more.

What's really great about the group of girls we have, so many of them are in my homeroom. I think a lot of what Techbridge has taught them in terms of those soft skills, has translated into building a much better community, in my own homeroom, in the classroom. Especially when they're dealing with boys, that often frustrates them to no end. They've exhibited the ability to negotiate, to talk people through problems. The willingness to let somebody try, even though they know they can do it better.

I think a lot of that is gained from their time at Techbridge."

Techbridge teacher

Techbridge facilitators explicitly made the connection for their students of how teamwork skills and collaboration are relevant to the 'real-world.'

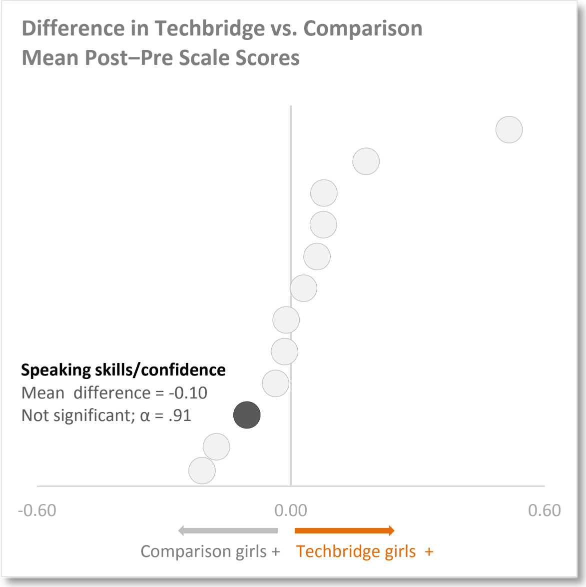
> "It's been interesting watching them grow as problem-solvers and being able to work with students they don't always work with. I've always mentioned, 'Hey, you've got to be able to work with different people that you're not used to work... That's real life. When you have a job someday, you'll have to be able to do that.' So those little bugs in their ears of the skills that you're doing right here right now are the skills that you need to develop to be successful as you go on up through education."

Girls who participated in the focus groups frequently talked about working together and feeling part of a peer support network. Girls pointed to the benefits of partnering with others. For example, one girl said, "We get to get other people's ideas to make like what people want to make. It's nice to get to work together on a project instead of struggling by yourself and not having that other factor of support." Girls recognized that working with others could be challenging, such as when there were conflicting ideas among partners and they needed to come to a resolution.

> "We were doing this coding. It was kind of hard because you were doing it this way, but it wasn't the right way. But then your partner had some ideas and when you put them together it worked. It's like she got some ideas and then you got some ideas and when you put them together, it can finish the project."

In summary, Techbridge helped girls learn to work in teams, compromise, and solve problem collaboratively.

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



Many Techbridge girls reported having more confidence in public speaking situations. Four questions on the pre- and post-surveys asked students to indicate whether they do well in activities involving public speaking (see Figure 29 on the following page). The percentage of Techbridge girls who said they like to speak up in class increased from 46% to 54%. Similarly, more Techbridge girls agreed that they felt comfortable speaking in front of a group at the end of year than at the beginning of year, increasing from 52% to 56%. Although Techbridge girls' confidence increased, comparison students' self-reported speaking skills and confidence also increased, and increased to a greater extent than Techbridge participants. As shown in the figure to the left, the average Techbridge student's mean speaking skills/confidence scale score (which includes all four questions on the next page) was 0.10 points *lower* than the average comparison student's. However, this difference was not statistically significant.

A retrospective question on the post-survey asked girls whether they were more comfortable speaking in public because of Techbridge. Compared to other program impacts, girls reported that Techbridge has relatively less influence. Although a total of 77% of girls agreed that Techbridge helped them become more comfortable speaking in front of a group of people, only 31% agreed "a lot"; see Figure 28).

Figure 28. 77% of girls said Techbridge helped them become more comfortable speaking in front of a group of people

Student Post-Survey

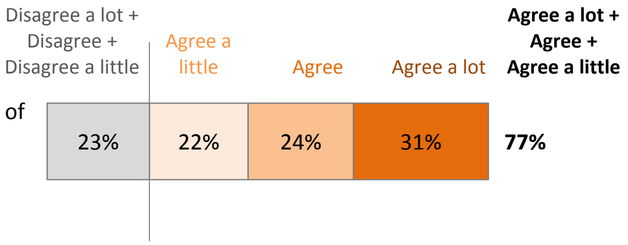
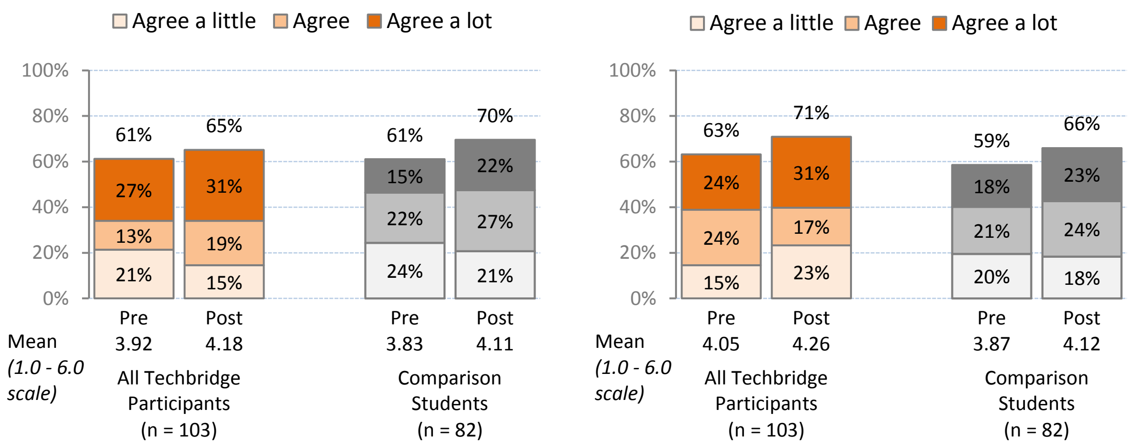


Figure 29. Some Techbridge girls improved their speaking skills and confidence

Matched Student Pre/Post Surveys

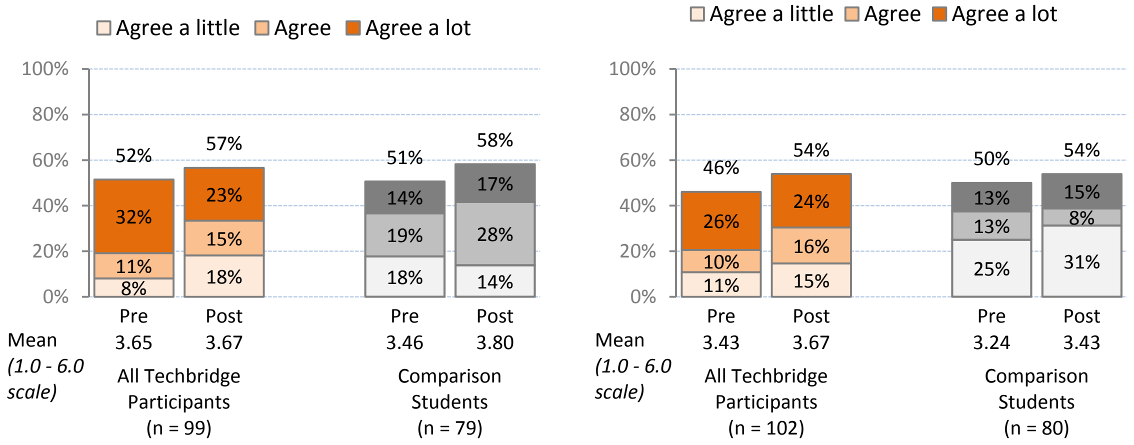
Presenting something in front of other people makes me feel proud

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



I am comfortable speaking in front of a group of people

I like to speak up in class



Techbridge teachers and PCs built in multiple opportunities for girls to practice speaking during the program, such as by helping to lead the reflections at the end of the program and presenting at Family Nights. One facilitator said:

> "We've done activities where the girls have to come up and talk about something what their favorite part of Techbridge is or their favorite part of school, just getting them comfortable with being in front of group of people and speaking about themselves."

In one focus group, participants said they were more comfortable speaking in Techbridge's all-girls environment:

Girl 1:	"Sometimes when I'm around boys I get really nervous."
Girl 2:	"Because they start laughing."
Girl 1:	"Yeah, yeah. Being around girls and learning to speak out loud is good practice. It's really comfortable."

Similar to students, teachers were also somewhat less likely to report that girls had improved their public speaking skills versus other student outcomes. Four of the six teachers said they provided girls in their program with opportunities to practice public speaking to a "large" or "very large" extent.

Table 16. 4 of 6 teachers said their program provided girls with public speaking opportunities to a large or very large extent

Teacher Survey; n = 5

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Our program provided opportunities for girls to practice public speaking.			🧍 🧍	🧍 🧍 🧍	🧍

All the teachers indicated that the majority of their girls were more likely to speak up in a group and to take a leadership role in activities to a "large" or "very large" extent. All but one teacher said their girls were more comfortable speaking in front of a group to a "large" or "very large" extent (see Table 17).

Table 17. Teachers said Techbridge helped girls develop their public speaking skills and confidence

Teacher Survey; n = 5

Because of Techbridge, the majority of girls participating …	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Speak up or share opinions with the larger group more readily.				🧍 🧍 🧍 🧍	🧍
Are more comfortable speaking in front of a group of people.			🧍	🧍 🧍 🧍	🧍
Are more comfortable taking a leadership role in any activity (in Techbridge or elsewhere).				🧍 🧍 🧍 🧍 🧍	

Several teachers and principals commented that they were impressed with the speaking skills of Techbridge girls at Family Nights:

- "The format where the girls were leading, they really led the session. I know with middle school they started out that way and they released more of the responsibility to the elementary girls, but they were teaching their parents, and the girls are really good at it, not telling, but asking questions and giving them the next piece of information that would help them."

- "One of [the girls] was the emcee, and she just had a lot of confidence in leading the group, and also talking to the parents."
- "Definitely seeing them come out and not being afraid to come up and speak because we've done some presentations in front of everybody, they've presented in front of their families at a Family Night in front of all that. Some kids, they learned that we prepared them, we practiced, and then they were very confident up there doing that."
- "She attended our parent night and she was fabulous at manning one of the booths and she had to explain what we did and answer questions to a variety of parents and seeing her being so confident and talking to people and also being confident with her ideas."

> "There was one girl who was very reticent to sharing her ideas in front of the group of people that is now opened up tremendously because she's participated and had to working groups with them the Techbridge program. She's now becoming a more open woman and just share her ideas without being asked and it's not as uncomfortable for her."
>
> Principal at school with Techbridge program

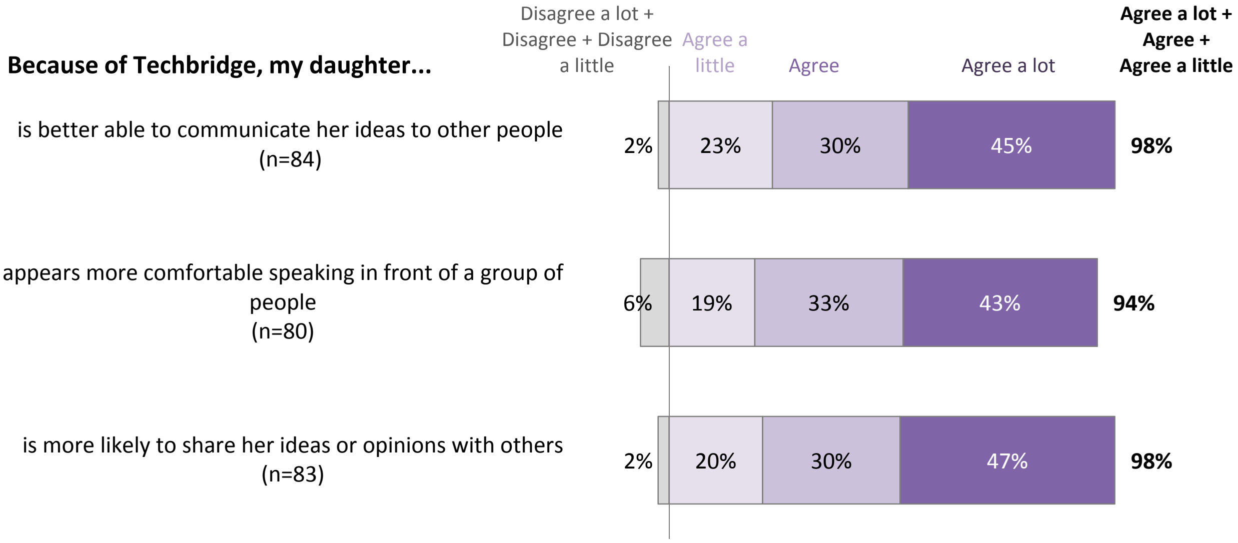
Techbridge faciliators shared stories of girls who became more comfortable speaking due to Techbridge:

- "I've seen a few of these girls grow tremendously in their being willing to share their ideas, which I think is a leadership quality right there, being able to stand up and say 'I think this, because this. What do you think of my idea?' And being able to have those conversations with people."
- "One of my girls in my elementary school is super shy. She will not talk. She will talk to her friends, but if we ask her to share out something, she won't talk. We are like, 'Well, you can speak in Spanish' ... But then, when I asked her to translate at Family Night, she was translating her butt off and I was just like, "What?" I was just so proud of her because I can't even get this girl to talk for nothing and now she is front of way more people than just her classmates translating. I was a proud teacher."

As shown in Figure 29 below, the vast majority of parents believed that Techbridge helped their daughters improve their communication skills.

Figure 29. Parents said Techbridge had a positive impact on their daughter's public speaking skills and confidence

Parent Survey



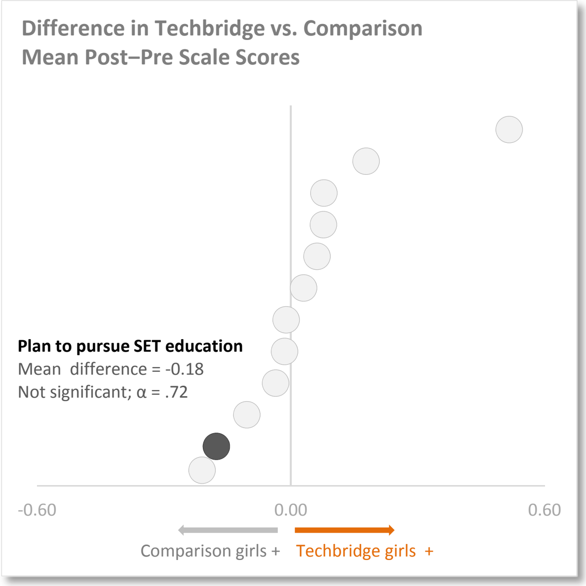
Parents' open-ended responses reported that their daughters are more confident in public speaking situations:

- "She is more confident in her public speaking."
- "She speaks for herself more and has made wonderful friends."
- "She's more willing to speak to a crowd. I like that she's trying new things."
- "She is more interest in science, talks more in front of groups."
- "She has much more confident leading and has fallen in love with science, technology and building."
- "Smarter talking about her projects with her smile on her face each time coming home."

Other social benefits to the girls came up during a handful of parent interviews. One parent said her daughter may have previously been on the Asperger's spectrum, but that it has been good for her to be in Techbridge with other girls. Parents made references to their daughter developing friendships and gaining confidence.

- "She has more friends, working more as a team. She is confident, especially talking with other students."
- "Every year she has gotten a little less shy, and Techbridge helps."
- "What I like about this class, they don't put her down. When she comes here, it's a second home for her. This is her second home. School is not her second home, maybe because school is with both boys and girls. Here [at Techbridge], it's just with females and your friends."

3.2.11 What is Techbridge's impact on girls' intention to pursue SET education in high school and college?



Four questions on the pre- and post-surveys assessed girls' interest in going to college and in studying SET (see Figure 31 on the next page for the results of each of these questions). Three quarters (or more) of Techbridge girls said 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 72% to 78%, and the percentage of girls who said they were interested in studying engineering increased very slightly from 79% to 80%. The percentage of girls who said they were interested in studying science declined slightly from 87% to 81%. Comparison students' interest in studying computer science, engineering and science increased from pre- to post, although they were still less likely than Techbridge participants to say they planned to study SET in college. As shown in the figure to the left, the average Techbridge student's plans to pursue SET education scale score (which includes all four questions shown on the next page) was 0.18 lower than the average comparison student's. However, this difference was not statistically significant.

Two retrospective questions on the post-survey asked whether Techbridge had affected their post-secondary school plans (see Figure 30 below). The majority of Techbridge girls (90%) agreed that Techbridge had made them think more about what they will do after graduating from high school, with 44% agreeing "a lot" that Techbridge had made them think about post-high school plans. The majority of Techbridge girls (87%) said that Techbridge had specifically increased their interest in studying engineering in college.

FIgure 30. 87% of girls said Techbridge increased their interest in studying engineering in college

Student Post-Survey

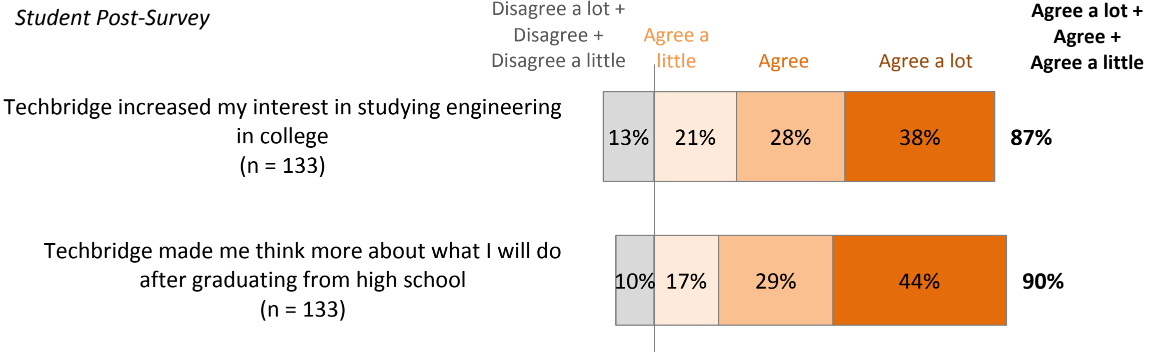
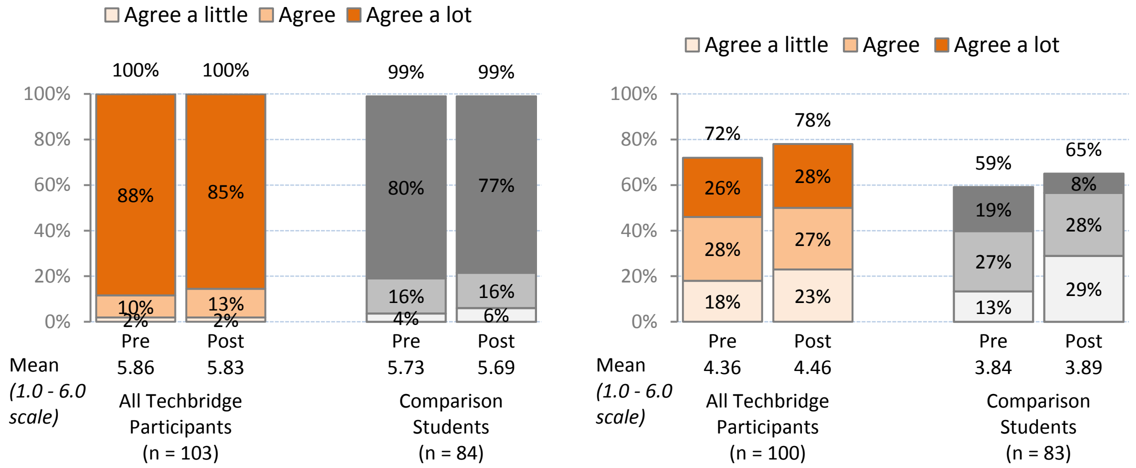
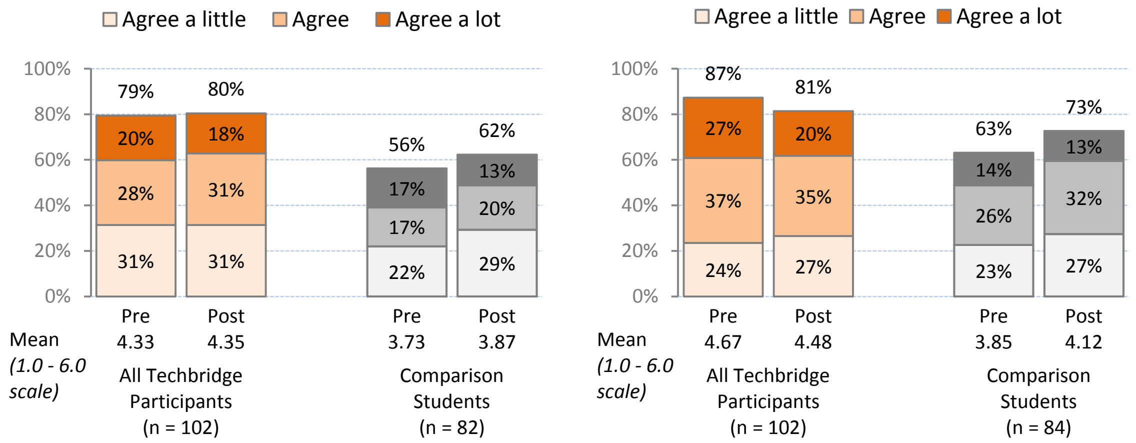


Figure 31. More students said they intend to study computer science after participating in Techbridge

Matched Student Pre/Post Surveys


I will go to college

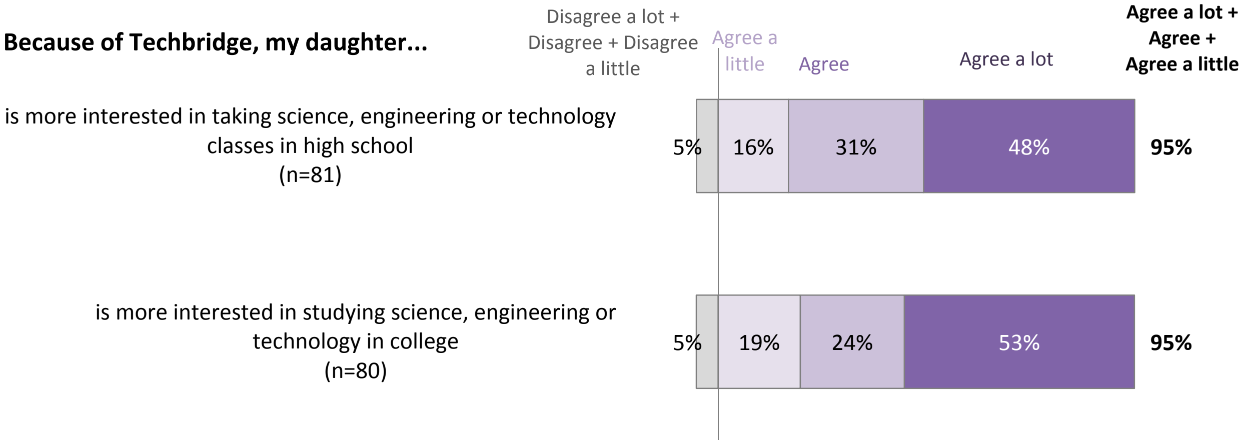
I plan to study computer science in college


I plan to study engineering in college

I plan to study science in college

The majority of parents said their daughters were more interested in taking SET classes in high school and college because of Techbridge (see Figure 32).

Figure 32. Parents said Techbridge increased their daughter's interest in taking SET classes in high school and college
Parent Survey



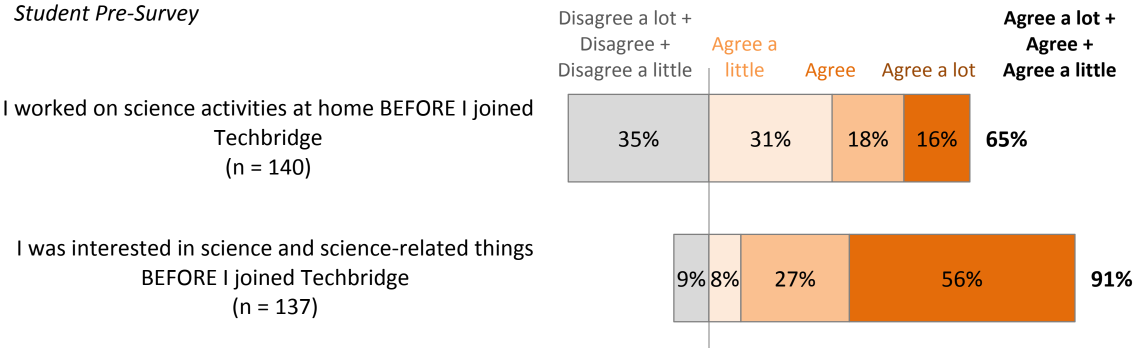
3.2.12 What is Techbridge's impact on girls' participation in curricular and extracurricular activities (related to SET or otherwise)?

Many Techbridge girls reported already being engaged in SET activities before they became involved in Techbridge, but they reported becoming engaged in even more activities by the end of the year.

Techbridge girls were asked two questions on the pre-surveys regarding whether they had already engaged in SET activities at home before Techbridge. The vast majority of girls (91%) said they were already interested in science and science-related things before Techbridge, and about two thirds (65%) said they had actually worked on science activities at home.

Figure 33. The majority of girls said on the pre-survey they were already interested and engaged in SET activities before they joined Techbridge

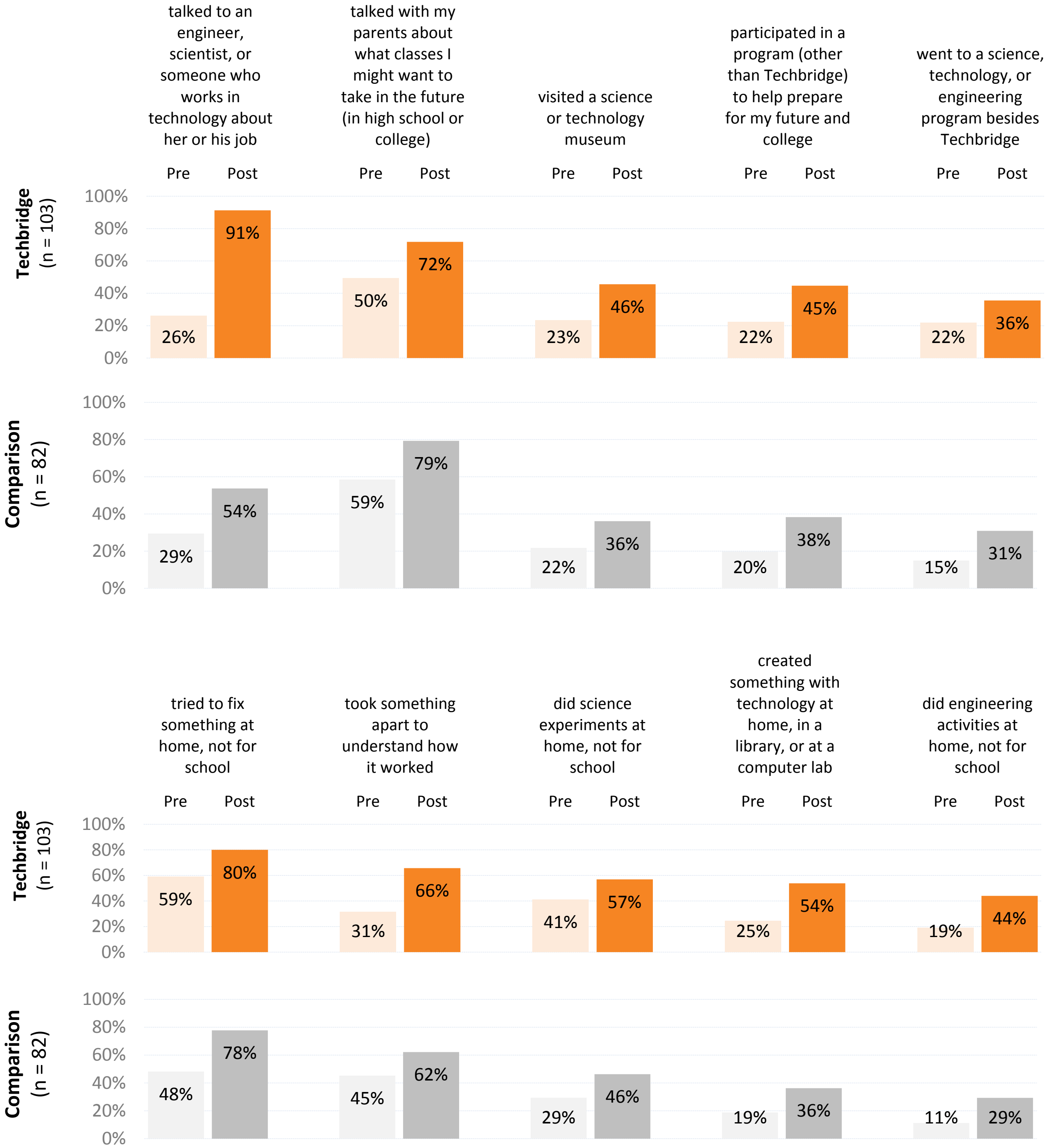
Student Pre-Survey



Girls were asked to indicate at both the beginning and end of the year whether they had participated in various specific SET activities outside of school during the previous school year (see Figure 34 on the following page). More Techbridge participants engaged in each SET activity during the 2014-2015 school year than had done so during the previous school year. For example, the percentage for girls who said they created something with technology outside of school more than doubled from 25% on the pre-survey to 54% on the post-survey. (In contrast, the percentage of comparison girls who reported they had created something with technology increased from 19% to 36%.)

Techbridge girls engaged in more SET activities by the end of the 2015 school year than they did in the fall, and engaged in more activities than comparison students. The average Techbridge girl engaged in three SET activities in the fall and six activities in the spring, whereas the average comparison girl engaged in three and a half activities in the fall and five activities in the spring.

Figure 34. More Techbridge girls reported engaging in various SET activities by the end of the year



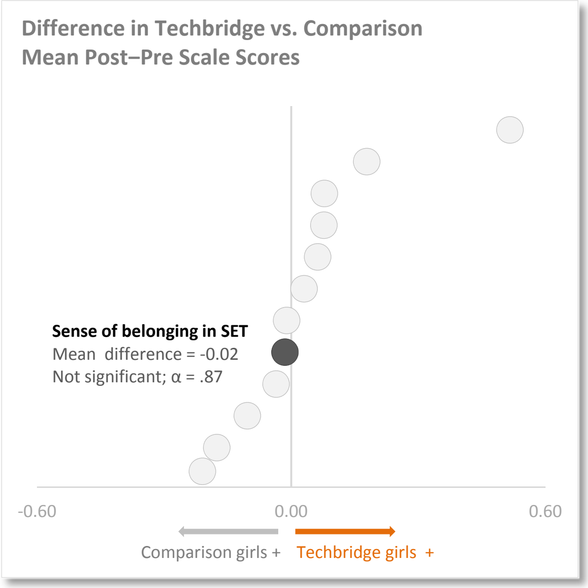
3.2.13 What is Techbridge's impact on girls' high school completion rates?

Since all of the 2014-2015 Highline participants were in elementary or middle school, they are several years away from graduating from high school. Techbridge girls' educational aspirations increased slightly after their involvement in Techbridge. More girls said they expect to earn at least a four-year degree (54% on the pre-survey vs. 61% post-survey, see the table below). A substantial percentage of Techbridge girls (about one third) said they were not sure how far they will go in school.

Table 18. Techbridge girls have high educational aspirations
Matched Student Pre/Post Surveys

How far do you think you will go in school? I will finish…	**Techbridge (n = 97)**		**Comparison (n = 77)**	
	Pre	**Post**	**Pre**	**Post**
High school/G.E.D	3%	0%	5%	1%
Some college	5%	4%	3%	4%
2-year college degree	3%	2%	9%	16%
4-year college degree	14%	19%	30%	18%
Master's degree	14%	23%	21%	23%
Ph.D., M.D. or other professional degree	25%	20%	10%	14%
I'm not sure	35%	33%	22%	23%

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

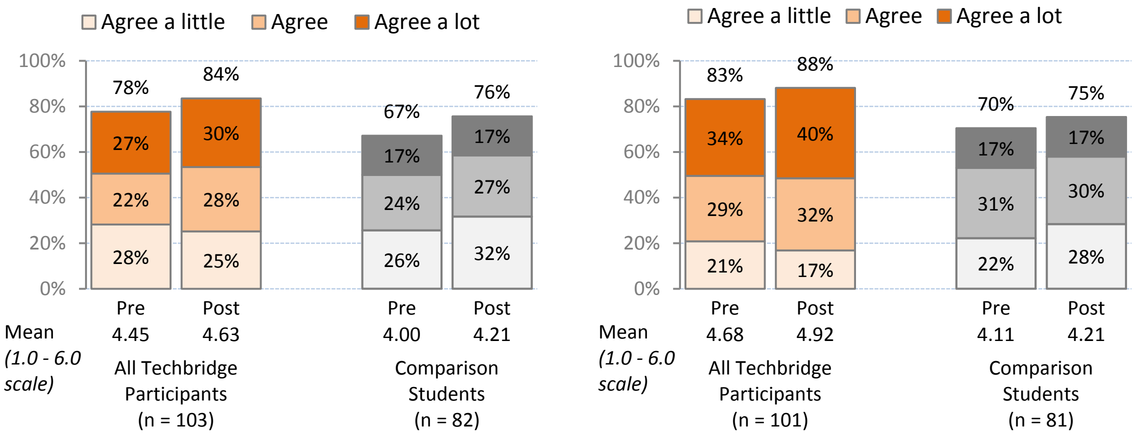


After participating in Techbridge, girls were more likely to say that someone like them could work in engineering or technology (see Figure 35 on the next page). The percentage of Techbridge girls who agreed that someone like them could work in technology increased from 83% to 88% ($p < .10$). The percentage of Techbridge students who agreed they could see themselves as an engineer increased from 78% to 84%, although the increase was not statistically significant. The percentage of Techbridge students who agreed they could see themselves as a scientist remained essentially unchanged at 82%.

While Techbridge students' sense of belonging in SET increased, so did comparison students'. For this reason, as shown in the figure to the left, the average Techbridge student's mean sense of SET belonging scale score (which includes all three questions shown on the next page) was 0.02 points lower than the average comparison student's.

Figure 35. More Techbridge girls were able to envision themselves in SET after participating in the program

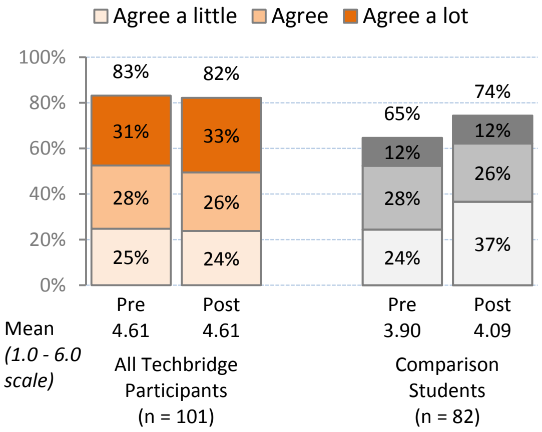
Matched Student Pre/Post Surveys



Someone like me could become an engineer

Someone like me could work in technology

Someone like me could become a scientist



Girls who participated in focus group felt a sense of belonging in Techbridge, and said Techbridge facilitators played a large role in developing these positive relationships. As one girl said, "They help us and they make us feel like there's actually someone there to help us when we need it." 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, "I've learned that science is really fun and I might want to do it when I grow up."

Teachers also believed that girls' confidence in SET grew as a result of Techbridge. All the teachers indicated that the majority of their girls became more confident about their SET abilities to a "large" extent (see Table 19).

Table 19. Techbridge teachers said that girls became more confident about their SET abilities
Teacher Survey; n = 6

Because of Techbridge, the <u>majority</u> of girls participating …	**Not at all**	**To a small extent**	**To some extent**	**To a large extent**	**To a very large extent**
Are more confident about their SET abilities.				🧍🧍🧍🧍🧍🧍	

Teachers said Techbridge helped students envision themselves in SET careers. One teacher said:

> "A lot of my girls, particularly at two schools, they're in the more low-income households. When they go to these field trips or when they're learning these activities, they're really getting into it. Their minds are changing, like, 'Oh, I can maybe see myself being an engineer or this and that.'"

4 Techbridge's Impact on Teachers & Schools

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

Techbridge worked closely with Highline Public Schools staff to identify schools that were a good fit for the program. The district took the lead in identifying schools, suggesting that Techbridge partner with its STEM Academy schools, and identified other schools that it thought would benefit from the program.

Principals said they appreciated having Techbridge at their school because it provides additional SET opportunities for their students:

- "Most middle schools in Washington don't get engineering. For the Highline District, there is not a lot of science that is taught in the classroom in the elementary grades because there's so much emphasis on reading and math and writing, so any extra science exposure that any student can get is a really big benefit."
- "Because our school is high ELL [English Language Learners] and also high poverty, there is very little exposure to science because we're so focused on what they're being tested on that particular year, and we have to spend a lot of time making sure they can pass those tests. Not that I endorse this, but, this is just how education has gone. There's a lot of kids that don't speak the language, so we have to spend a lot of time teaching them how to be more proficient in English. Again, it's usually at the expense of science and social studies, and that's a sad fact. Also, because the socioeconomic status in our school is so low, I just don't know that these girls have contact with people that work in these types of fields. Parents do a lot of service industry jobs or [are] stay-at-home moms. I don't know that they get out and talk to people that are in the tech industry or in the science industry. Knowing that science especially—but both math and science are not strong areas for our building, I thought it would be a great opportunity."

Other schools were already focused on SET-related learning opportunities for their students, and Techbridge was considered to be a good fit:

- "We have a really big Science Olympiad team. We have a great department in science, and a great math department. They are already promoting strong, strong instruction in math and science, instruction and outcomes."
- "I know that a lot of our kids that are in the Techbridge program also take a STEM class. It's one our most popular classes and its growing. A lot of robotics are going to be in the program for next year and I know they just spent another forty grand on BioCerts [which] are really cool, awesome things. Our instructors are going to be off at Seattle University for close to a month this summer building that whole curriculum. It's exciting and it's just one of those things that Techbridge takes a piece of that and it kind of builds on that capacity for kids to really love science and technology."

The exposure to different SET careers was an important component of Techbridge, according to principals. A number of principals were inspired by the equity focus of Techbridge in engaging girls and particularly girls from underrepresented ethnic groups in SET.

- "We have a lot of STEM industry right in our backyard, and I think the really interesting part is getting kids aware of the job opportunities, that they could go to college and come back to their community, and I think sometimes that's a big pull on families that want to stay close within their community. It's the awareness piece that I think is the bigger, more important piece. You could live here and not know what industries are right in your backyard, and so for them to have that opportunity to do field trips, have role models that come in, and other networking that they've been able to see and do has been a big deal."

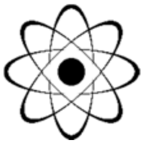
- "To have Techbridge or to have one more type of learning that could inspire some of our kids of color, I think is even more reason to be able to inspire them. If you look at the workforce it's still predominantly white. It's not what our nation [is] as far as the breakdown. If we can inspire these kids, so as an elementary student they go into middle school and then into high school with a deeper and a more almost inspiring lens to be able to want to do those fields."
- "Yes, [Techbridge] has a STEM focus but the applied piece is the real draw for me. It's a place for a group of kids to hang out with one another and have a like joy around science, and then have two female leads in there that are also are well-educated, smart women that have done something with this science idea, this passion that they have. I think it's really cool."

Within each school, the principal often helped identify a teacher to be part of Techbridge. The principal would ask teachers that he/she considered a good fit or sent notification of the opportunity to all teachers and asked who was interested. One principal described the important characteristics of the teacher who would be part of Techbridge:

> "What mattered to me was strong relationships with the students and strong classroom management, which [the teacher] has. [The Techbridge teacher] has a very calm demeanor, and kind of sets a good culture with the kids. I wanted the teacher to also have an interest in kind of the social justice angle of this to empower girls with STEM Education."

Other characteristics mentioned were a commitment to equity, a positive relationship with students, and classroom management skills.

Table 20. What are important characteristics of a Techbridge teacher?

Teachers Need…	Quotes from Highline Public Schools Staff
Commitment to equity 	“I thought back to my own experience with science, and I always really enjoyed it, but I was also really nervous and scared, and it felt like a boy thing. I remember it feeling like a boy thing, and all the boys got all the share and they got all the really cool experiments and ideas.” “I saw the program and, like, this is actually really empowering, not only for these girls, but for me, too, to take this on. I’ve come to love science myself, teaching science especially, and seeing the love that kids have for it. This is like the perfect opportunity for me to delve in myself and hopefully change the science opportunities for these girls, so it’s not the same as what I had.”
Personality/Relationship with students 	“Definitely having the personality to be able to relate to the girls, it makes a big difference.” “Having a laid-back personality, I think is really important. Not too strict, but know how to have fun and have a sense of humor and someone that the girls look up to.” “Learning how to be flexible and how to do things on the fly. There is a lot of changes during the course of the program, like, ‘Oh, let’s do this. Let’s do this instead.’” “I think that’s a really strong point in all my teachers. The girls really like them and really look up to them. I think that’s one of the main reasons they’re in the program in the first place, is because they have a good relationship with the teacher.”
Classroom management skills 	“Knowing how to make a classroom dynamic, just knowing the girls and knowing how to pair them up, knowing their working styles, things like that.” “As far as really making it effective, I think classroom management skills are really important.”
SET expertise is nice, but not necessary 	“Ideally, of course, it would be a teacher that has a lot of expertise in science, but that’s not really necessary, because… Techbridge has their curriculum and they come help do the teaching. You just really need the partner teacher to manage the logistics of the girls.”

Other teachers further described the draw for being part of Techbridge as helping girls feel comfortable to pursue higher education and SET careers.

- “Our demographics are often the ones cited as far as girls really being reluctant to pursue math and science. There also tends to be a stigma in a lot of our communities culturally, about girls in higher levels of education, being perceived as very academically bright, or advanced. Those are areas that I am very passionate about within education. That was something I want to be a part of, to push ahead as part of my own teaching agenda."

- "A lot of my girls, they're in the more low-income households. When they go to these field trips or when they're learning these activities, they're really getting into it. Their minds are changing, like, 'Oh, I can maybe see myself being an engineer.'"

4.1.2 How are teachers trained and supported in the expansion sites?

Teachers generally found Techbridge's training and support helpful. Teachers attended an initial two-day training during the summer before the programs started, and participated in a follow-up training in January 2015. Four out of six of the Techbridge teachers who completed the teacher survey found the initial training over the summer to be "extremely" helpful, with the remaining two reporting that it was "very" helpful (see Table 21). All but one teacher found the teacher meetings during the school year "extremely" helpful; one indicated it was "moderately" helpful.

Table 21. Teachers said the initial training and meetings during the school year were the extremely helpful
Teacher Survey

	Not at all helpful	Slightly helpful	Moderately helpful	Very helpful	Extremely helpful
Initial teacher training in the summer (n=6)				🧍 🧍	🧍 🧍 🧍 🧍
Teacher meetings during the school year (n=5)			🧍		🧍 🧍 🧍 🧍
Opportunities to interact with other Techbridge teachers, in a group or individually (online, informal conversations, etc.) (n=5)			🧍 🧍	🧍	🧍 🧍

When asked what they found to be the most valuable aspect of the training and the support they received, teachers said having the opportunity to try the activities that the girls would be doing was the most valuable. Having the opportunity to try the activities prepared them to implement the activities and helped them empathize with the student learning experience. Teachers said:

- "The hands-on experience of many of the more difficult activities that the girls would be doing throughout the year allowed me to be able to assist girls when their time came to do the activities."
- "I found that [hands-on activities] to be incredibly helpful. I felt like even though I maybe didn't always know exactly what the plan was for the day coming into a Techbridge day, that I had done the activities or seen the activities or heard of the activities so I knew what to expect."
- "The hands-on stuff, getting to experience what the girls would experience, and having it with the same mentality of hearing you need to make a design first. I remember sitting in the training and working with a partner, like, 'We don't know how to draw a design for this.'... And we hear [the girls] say it all the time, too, like, 'We don't know how to draw. We just want to grab our materials and get going.' Experiencing that role of students as well, I think, is good for me."

One teacher commented that offering additional support sessions throughout the year, rather than "cramming everything in at once in the beginning of the year" was appreciated so she could "think in chunks and plan in chunks, and make adjustments according to how things were going throughout the year."

At the trainings, teachers also learned more about Techbridge and its goals and purpose. Two teachers mentioned that this was helpful:

- "For them to also clarify those goals, what's their purpose, what are they really trying to accomplish here in their branch out to Seattle, I think it helped me understand what we're going to do, how to do it, the thinking that we'll be doing around it, and to build the general enthusiasm from the teachers who are going to do it, because that filters down to the kids."
- "I think they did a really nice job of immersing us in their mission and their program—how it works and the parts of it."

Teachers were somewhat less likely to report that opportunities to interact with other Techbridge teachers were helpful, with only two out of six teachers reporting these interactions were "extremely" helpful. One teacher wrote, "It was also good to hear what other schools' successes and challenges were." In an open-ended response, one teacher suggested more opportunities to collaborate with other teachers.

Most of the teachers said they were pleased with the training and did not have any suggestions for improving it. One teacher noted: "I don't have any suggestions [to improve teacher support] as it was all extremely helpful!" The two teachers who did offer suggestions wanted "more consistent communication" or to allow teachers to select the projects they would like to tinker with.

During interviews, teachers provided additional information on the trainings and support they received. One teacher talked about a one-on-one meeting with the PC where they discussed the program and the unique aspect of the school and population of students. Teachers received a flash drive with Techbridge materials and curriculum for their own reference. Two teachers referred to weekly meetings with the PC where they reviewed what would be covered during the following week. One teacher took that opportunity to "tinker" and do the activity, which allowed her to learn more about the SET concept and help her predict where girls might have issues.

> "We meet and we talk about what's coming up for the following week and if there's something that's foreign to me, we'll actually do the activity together so I can do it hands on, so I'm better prepared to help the girls, which has been really helpful because I'm not particularly scientifically inclined. I need to do those things ahead of time too, so I know what I'm talking about and know what problems to anticipate that the girls are going to run into."

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

Overall, teachers were satisfied with the amount of control they had over different aspects of the program (see Table 22). One teacher each wanted less leadership in recruiting girls to the program and one teacher wanted less responsibility for involving role models. No teachers indicated they wanted more control over any of the aspects that were asked about on the teacher survey.

Figure 22. Teachers were generally satisfied with the amount of control they had in the program
Teacher Survey; n = 6

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
Deciding on the program schedule		👤👤👤👤👤👤	
Choosing SET curriculum or activities		👤👤👤👤👤👤	
Facilitating activities		👤👤👤👤👤👤	
Organizing field trips		👤👤👤👤👤👤	
Communicating with girls' families about the program		👤👤👤👤👤👤	
Recruiting girls to participate in the program		👤👤👤👤👤	👤
Involving role models in the program		👤👤👤👤👤	👤
Other SET-related content of the program, such as SET career information		👤👤👤👤👤👤	

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 (unless otherwise planned). In one example, the teacher generally led the reflection piece at the end of the program. During the program, the teacher and the PC were going back and forth and "teaching at the same time." In another example, the PC and the teacher both did the introduction and added on to what the other was saying.

At another school, the PC felt it was somewhat equal, and took turns with the teacher in leading the introduction and reflection and always co-facilitating the activity. In a few schools, the PC felt that the teacher was more support and less of a leader: "I feel like there are a couple schools where it's more me-driven and the teacher's just there to support. They know what's going on, but they still are just there to support."

One teacher described how she and the PC "have a good balance." This teacher appreciated how the PC has taken on "the nuts and bolts... She has planned what we're doing." Despite not having time to do the planning, the teacher still appreciated that she and the PC would discuss their overall plan and current balance of the work:

> "What days would work for this? What do you think about this? How do you think we should do this?' We'll make those type of decisions together. If I would want more or fewer opportunities, I think the balance, at least in my opinion, the balance that we have works for me really well right now."

Another teacher described how she felt responsible for logistics and classroom management, while the PC led most of the activities.

> "I saw myself as the facilitator and the person that's in charge of a lot of logistical stuff and keeping order in the classroom because the girls are noisy, so keeping them under control, but I saw (the PC) as the main leader of Techbridge."

4.1.4 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?

Techbridge improved teachers' knowledge about how to engage girls in SET and their application of these practices to their regular classrooms (see Table 23). Of the various possible impacts that teachers were asked about on the survey, teachers reported that Techbridge had the greatest impact on their knowledge of strategies to engage girls in SET and their interest in engaging girls in SET. They experienced the least growth in their ability to provide academic guidance for girls to pursue SET, though all respondents experienced an increase of at least "some extent."

Table 23. Teachers said Techbridge increased their ability to support girls in SET
Teacher Survey; n = 5

This year, Techbridge increased my…	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Knowledge of strategies to engage girls in SET.				🧍🧍🧍	🧍🧍
Interest in engaging girls in SET.			🧍	🧍	🧍🧍🧍
Awareness of SET careers.			🧍	🧍🧍	🧍🧍
Knowledge about other SET resources and programs available for girls.			🧍	🧍🧍🧍	🧍
Ability to provide academic guidance for girls to pursue SET.			🧍🧍	🧍🧍	🧍

In response to an open-ended questions asking about how Techbridge had influenced the way they teach in their regular classroom, teachers mentioned a range of influences, and many reported multiple areas of influence. Two teachers referenced the engineering design process and finding opportunities for SET. Two mentioned helping girls through leadership positions or encouraging them to pursue SET. Two teachers mentioned that the growth mindset framework has influenced their classroom teaching. Responses were:

- "Growth mind set and engineering design process. These are both things that I use in my own teaching now."
- "Has made me want to bring more SET opportunities into the classroom. Has challenged me to put more girls in leadership positions in the classroom and help them develop that sense of leadership even with mixed gender groups."
- "I have incorporated the design process in other areas the kids work in throughout the school day."

- "It has given me conversation starters with girls, especially those who may not have previously considered SET careers. It has helped me emphasize problem-solving, growth mindset, and a diversity of skills as I teach my regular classes."

Teachers elaborated further on Techbridge's impact during interviews. In four different examples (three below and one included in the sidebar), teachers cited applying growth mindset principles, using a Techbridge activity and engineering design process, and adding in more time for students to reflect.

- "I've incorporated the design and engineering process as it aligns itself. With math, again, it's kind of different. It's more about problem solving. 'Okay, well that strategy didn't work, what could you design to try again?' That whole mindset thing comes in a lot, building confidence."
- "It's really pushed me to let go, and let my students and explore. Even if they fail, saying that it's okay, everything is a learning opportunity, but still be very encouraging."
- "I think that reflection piece, that opportunity to give shout outs, it really builds a lot more confidence than I expected…My personality is not, I need somebody to come by and say 'Oh, keep going, you're doing a good job.' I kind of rolled my eyes at that, honestly, at the very beginning. But, over the course of the year, seeing the kids really appreciate each other. It definitely led a lot to community-building that I would like to work into my regular classroom routine more often."

Two teachers did not see any impacts from Techbridge on their regular classroom, commenting that the age group or subject matter is different. One teacher said, "What I do in Techbridge is so different from what I'm doing in [my classroom]. Again, aside from gaining more knowledge, more content knowledge, not really. Maybe that speaks to how long I've been teaching and how kind of habituated you become."

"I actually used one of Techbridge's activities [designing a catapult] with my whole class the week after we did it, because I was like, 'This is great!' I wanted to teach the engineering design process to my students, and I wanted to do that with a simple, fun activity. It was the day before winter break or something, and I was like this is perfect because it's manageable, I can teach it, they can have fun with it, and I can teach this engineering design process."

Techbridge teacher

"I think Techbridge is part of the piece of the pie in regards to me falling more in love with science and teaching science…while giving me fun little ideas for my classroom as well."

Techbridge teacher

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

The Highline Public Schools wanted to have an active role in the program (more than previous school districts Techbridge has partnered with), and were highly involved in selecting the schools, brokering connections with principals, and even helping to select what it considered to be well-qualified teachers. District staff and school leaders showed continued interest in the program. District staff had regular meetings with Techbridge staff and periodically visited the after-school programs themselves. Based on interviews, all seven principals were extremely familiar with the program and principals from three of the seven programs reported attending at least one of the Techbridge Family Nights at their school.

5 Techbridge’s Impact on Role Models

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

One of the Greater Seattle PCs was 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 the Techbridge participants:

> "All the role models that visit, as well as all the role models that lead on the field trip, are female. As much as possible, they're women of diverse backgrounds. Even today [at a panel on a field trip], several of them mentioned, 'I was able to get this much of my schooling paid for. I was able to have this experience because I'm a woman, because I'm an African American woman, or a Hispanic woman.'"

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. One teacher said:

> "I would describe [the role models] as giving girls an opportunity to see what the possibilities are for them out there in the real world and showing them that not only boys and men are scientists, but women can be, too... I love that they have the role models come in that are female... Just showing them that, yeah, that could be me. We had a field trip last week and there were ten role models that worked with us. Several of them were of diverse cultural backgrounds. Obviously, our school is highly diverse, so it was great for [the girls] to see. Not only are girls doing this, but girls that look like me are doing this."

"After a field trip], they [the Techbridge girls] were just blown away. They came back really excited and jazzed and 'Wow, I'd like to work at a company like this,' and seeing how math, science and technology, and engineering is a path to that occupation. I think they're excited about job opportunities out there, excited about knowing that they can be thoughtful mathematicians, thoughtful writers, thoughtful scientists in their own right."

Techbridge teacher

Role models were asked to provide input on how to recruit a diverse pool of role models. They suggested reaching out to professional societies, recruiting from higher education institutions, using social media, and attending relevant events:

- "Get involved with technical affiliations to utilize their wide distribution – i.e., NSBE (National Society of Black Engineers), HENAAC (Hispanic Engineers), affinity groups at Boeing or Microsoft, etc."
- "The WTIA (http://washingtontechnology.org/wtia-speakers-bureau/) is collecting an index of tech leadership committed to helping. You can ask for specific backgrounds, etc."

The training and support featured background about Techbridge and information on how to talk to and mentor youth. Techbridge provided role models with the link to the Techbridge website that features different online tools and resources related to serving as a role model. PCs also 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 shared tips for the role models.

All but five of the 26 role models responding to the spring survey said they had received some type of preparation from Techbridge for their role. Thirteen role models (57%) attended the in-person training offered by Techbridge. Five role models (22%) were prepared over the phone with a Techbridge staff member and two others (9%) participated in an online training. One role model specified they attended a Techbridge presentation that included a description of role models.

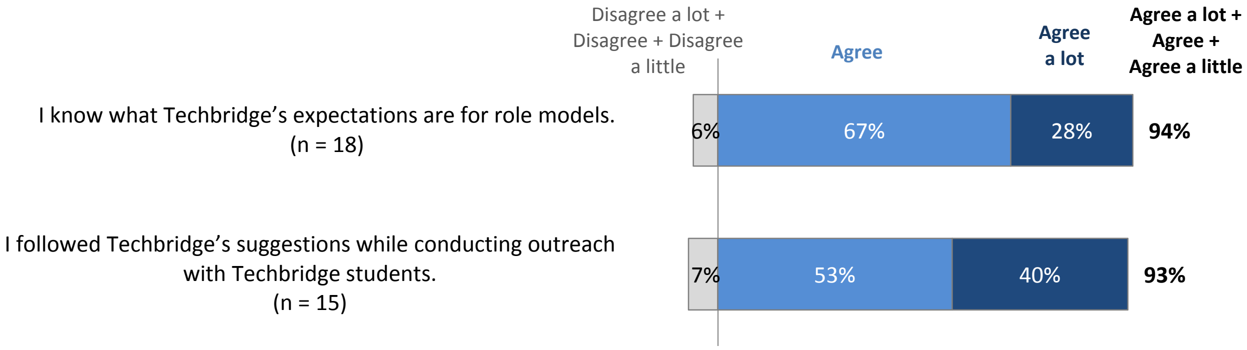
Of those attending a Techbridge training on being a role model, 89% felt that it was "somewhat helpful" or "very helpful." Those who felt that the trainings were "only a little helpful" cited reasons such as, "I've done plenty of events like this before, so not a new thing for me."

Table 24. The majority of role models (89%) said the Techbridge training was at least "somewhat helpful"
Role Model Survey (n = 18)

	Number	Percent
Very helpful	7	39%
Somewhat helpful	9	50%
Only a little helpful	2	11%
Not at all helpful	0	0%

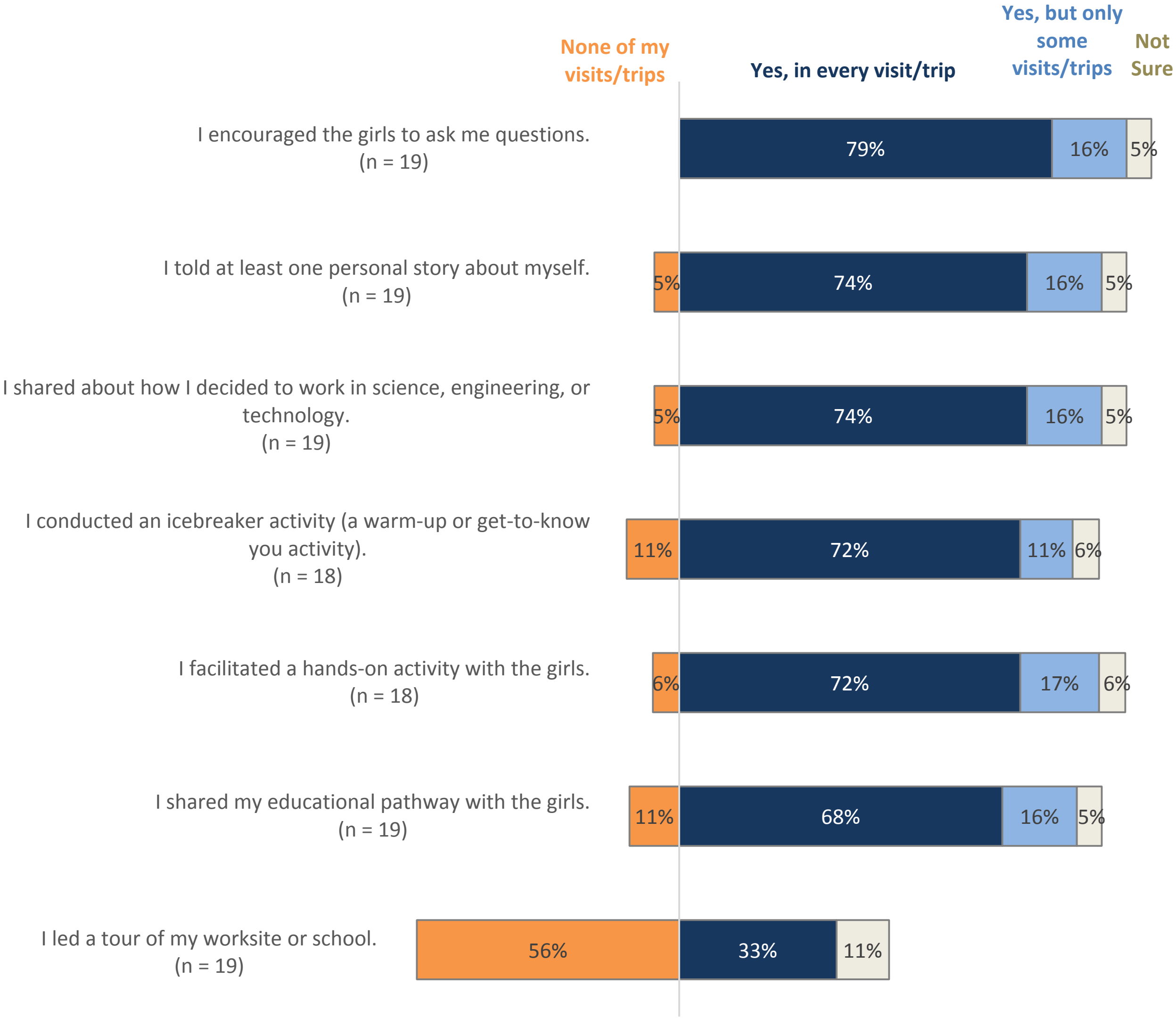
All of the role models but one indicated that they understood Techbridge expectations of role models, and all but one said they followed Techbridge's suggestions while conducting outreach with Techbridge girls (see Figure 36).

Figure 36. Almost all role models said they understood Techbridge expectations and followed them



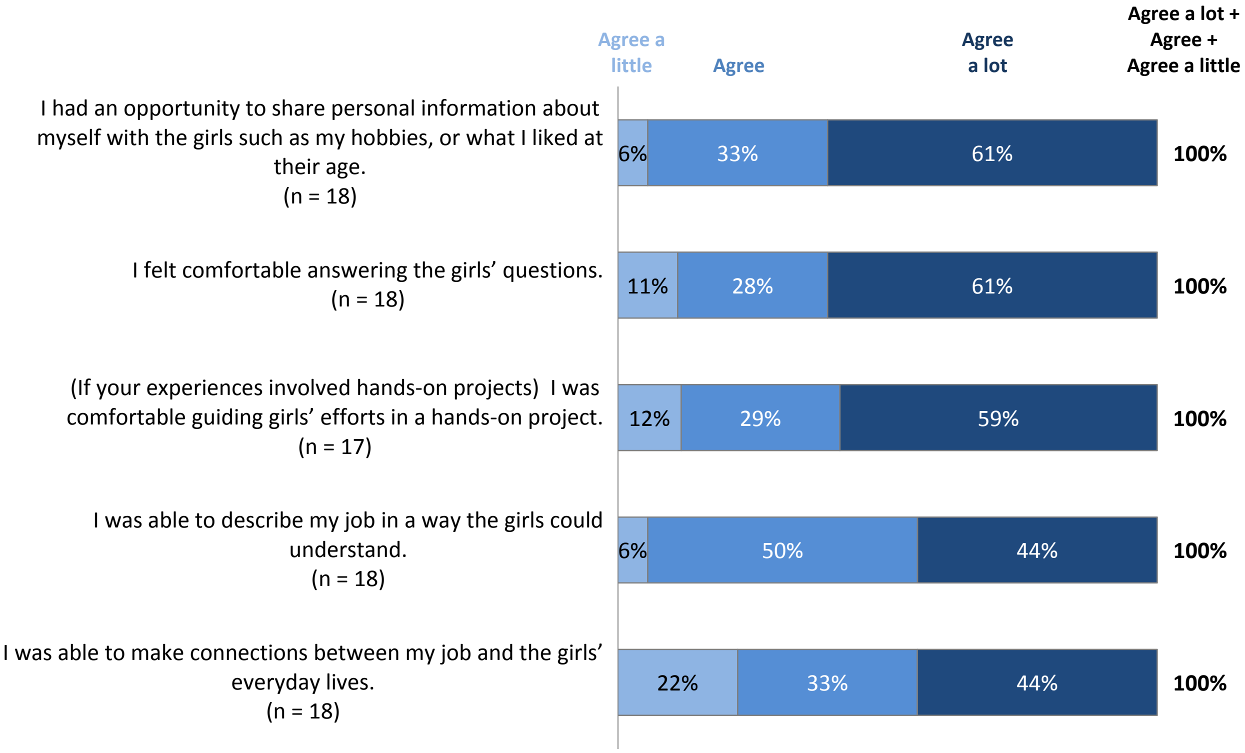
The majority of role models said they implemented Techbridge strategies for engaging with the girls. A total of 83% of role models said they included an ice-breaker activity as part of their presentation (including 72% who said they did so on every visit/trip) (see Figure 37). All of the role models felt like they had opportunity to share personal information about themselves, with 90% reporting that they told at least one personal story about themselves at some or all field trips or visits. Role models were least likely to report they shared their educational pathway with the girls, with 68% saying they had done so on every visit or field trip and another 16% saying they had do so on some visits/trips.

Figure 37. Between two thirds and three quarters of the role models said they implemented Techbridge strategies during every visit to a Techbridge program or field trip they hosted



With most visits or field trips, role models felt comfortable offering opportunities for the girls to participate in hands-on projects and encouraging the girls to ask questions. Role models also felt that they had opportunity to describe their careers in ways that girls could understand, though the percentage who agreed or strongly agreed that they could make connections between their jobs and the girls' everyday lives was slightly less than other strategies Techbridge encourages role models to employ.

Figure 38. Role models said used strategies that helped them connect with the Techbridge participants



Role models who were highly personable and able to make connections with the girls were thought to be most effective. Role models accomplished this by sharing personal details about themselves that were not work related and sharing challenges that girls could sympathize with, such as difficulties with working in a team and persisting through frustration.

- "The role model visits, I've only seen two, and they were both young women, and they were really smart about sharing enough about themselves that the girls could connect with them. 'Oh, you have a dog,' or 'oh, you like to travel,' and then talking about, showing pictures of where they worked and how they dressed at work, so kids could see themselves in that environment. And then they shared, of course, a little bit about what project they're working on, that kind of thing. That's what I've seen, and anecdotally touching base with teachers once we have attended, I haven't heard anything but praise for the role model."
- "I think growth mindset does come up a lot in the programs and also having them (role models) share out their experience, like 'This was challenging, this was difficult, this is how I got through it,' and then asking the girls who had that same experience so knowing that they are not the only one that had that challenging, frustrating experience."

When asked what additional support from Techbridge would be helpful, role models suggested that Techbridge provide role models with a list of common questions from girls and more information on what topics girls might be most interested in prior to their visits:

- "It would be helpful to have a list of sample questions that the girls might ask during the session. For example, the questions around salary were unexpected since I'd never done something like this before and [the salary questions] kind of threw me off."
- "Maybe a little bit more information on what should I have focused on during my intro talk so that I could address what the girls want to know most and not spend as much time on other topics."

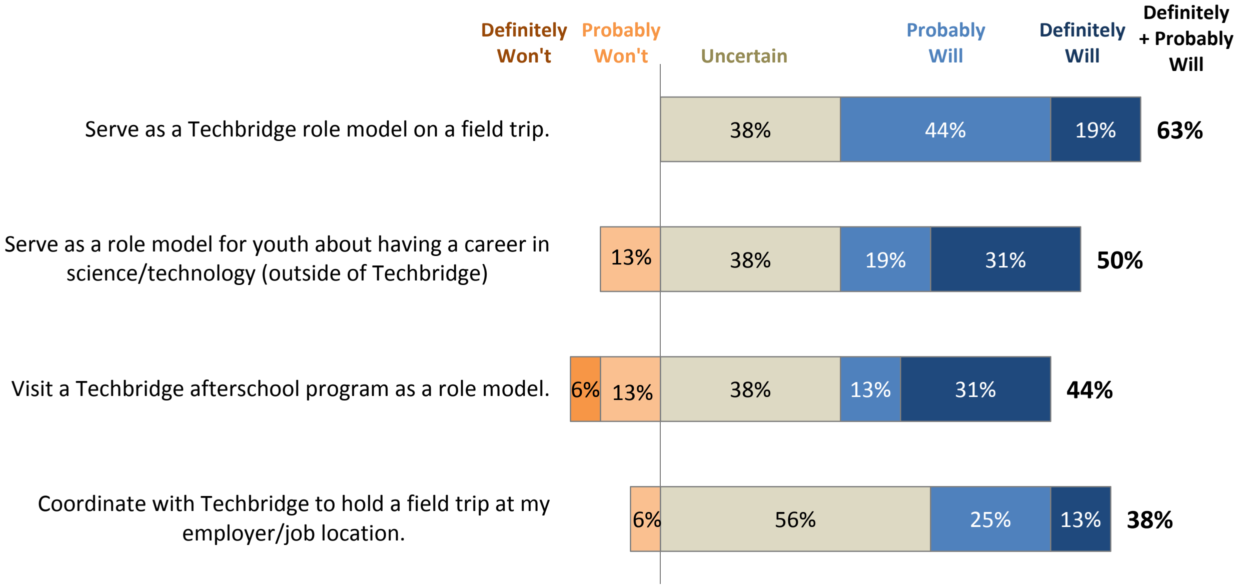
Another role model mentioned that additional lead time would be helpful to her, as she is still working her public speaking skills. Finally, one role model would have liked to see a written script of an introduction to review before the event.

Eighty-five percent of respondents interacted with a group of girls just once. However, many role models said they would be open to follow-up visit. One role model commented:

> "I really enjoyed my experience! I was a bit apprehensive at first, and leaving during the middle of the work day and going through traffic hour to get there was a bit stressful. However, after my visit I was sad that I would only be there that one day. I wanted to come back and see how the girls progressed in their learnings of Scratch and computer science and help with the process. I would be happy to volunteer again next year!"

Other role models were less certain of their continued involvement (see Figure 39). While 63% of respondents indicated they would "probably" or "definitely" serve as a role model on a field trip, 44% of role models indicated they would "probably" or "definitely" visit a Techbridge program and 38% would "probably" or "definitely" coordinate field trips at their place of employment. When asked what sort of circumstances would affect future decisions to continue participation, role model cited barriers such as the distance, moving, community college classes, and spending time with their own children. Half of the respondents indicated that they "probably will" or "definitely will" serve as SET career role models outside of Techbridge.

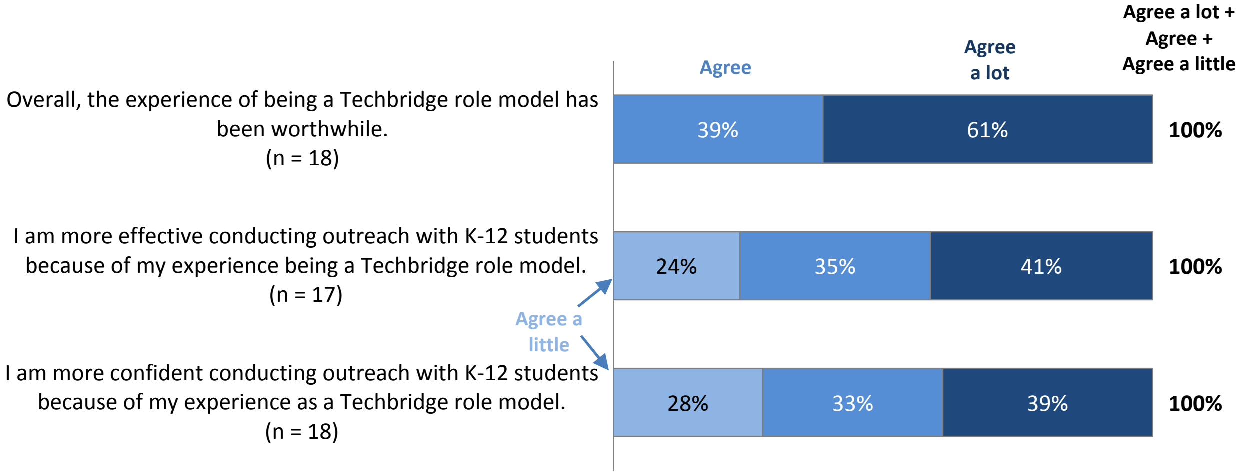
Figure 39. Role models were mostly interested in hosting Techbridge on a field trip
(n=16)



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

All role models agreed that serving as a Techbridge role model was worthwhile. In addition, all role models agreed that they are more confident and more effective in conducting outreach due to their experiences with Techbridge.

Figure 40. Every role model increased their effectiveness and confidence in conducting outreach due to their experiences with Techbridge



Role models experienced a variety of benefits from their experiences in Techbridge. Three role models wrote about gains related to feeling good about volunteering and encouraging more females to work in SET:

- "I always like getting public speaking experience, and hope to get more females in technology fields."
- "I am passionate about women in tech and this gives me a chance to show young girls what a career in tech might look like for them."
- "It was a lot of fun. I enjoyed working with the girls and sharing our space. And hopefully inspiring them to try tech careers."

Three role models mentioned more tangible gains, including increased leadership and presentation skills as well as greater confidence:

- "Learning how to interact with younger girls and what they want to know at that age about following a career in computer science."
- "I was able to share my story a lot better after a few times."
- "I'm recently out of school and don't feel extremely confident in my job yet. Seeing myself as a role model required a mentality shift. It was good to force myself to be confident."

Other responses were very positive, but more general, citing their enjoyment of being a role model:

- "It felt good to give something back, do something for others beyond myself or my family. The energy, honesty and the enthusiasm of the girls invigorated and uplifted me. It was a real treat."
- "I enjoyed it and liked interacting with the girls—especially those who were clearly engaged and committed to the learning event (not all were)."
- "Gratification, inspiration, fun."
- "Excitement for the next generation."

6 Techbridge's Impact on Families

6.1.1 How do expansion sites engage girls' families?

Teachers reported using a variety of tools to engage families of girls participating in Techbridge (see Table 25 below). All five teachers who answered the survey questions reported that they shared information on Techbridge activities, created opportunities for girls to show their families what they have learned, provided information on other SET programs and opportunities, shared information on why it is important to involve girls in SET, and provided strategies on engaging girls in SET.

Table 25. Teachers reported using a variety of strategies to engage Techbridge girls' families
Teacher Survey; n = 5

In what ways did you engage (or assist Techbridge to engage) the families of girls participating in Techbridge? Check all that apply.	**Number of Respondents (out of 5)**	
Shared information on Techbridge activities	5	● ● ● ● ●
Created opportunities for girls to showcase what they had done or learned in Techbridge with their families	5	● ● ● ● ●
Shared other SET programs or educational opportunities for girls	5	● ● ● ● ●
Shared information on why it is important to involve girls in SET	5	● ● ● ● ●
Shared strategies on how to engage girls in SET	5	● ● ● ● ●
Shared ideas for SET-related activities to do at home	4	● ● ● ● ○
Shared SET-related resources that could be accessed at home, electronically, or in the local community	4	● ● ● ● ○
Shared information on career opportunities in SET fields	4	● ● ● ● ○
Other, please specify	0	○ ○ ○ ○ ○

Parents were invited to attend Techbridge field trips with the girls. At one school, the same parent attended both field trips. Family Night piqued parents' interest in volunteering to chaperone the field trip, and interest increased at some programs throughout the year:

- "There's certain families that want to be engaged more or know a little bit more, be more involved. I know on this last field trip I had five or six parents who wanted to come as well. After Family Night they were like, 'Oh, I want to come.'"
- "That first field trip I had one parent who right away said, 'Yeah, I'll come, I'll come.' Then one dad who asked me, 'Do you need somebody else?' I was like, 'I'd love to have one more person' who came, but by the end of the year I had parents asking and I didn't have any more space to bring parents."

Table 26. The Techbridge Family Nights in Greater Seattle were generally well-attended and successful

Theme	Quotes from Teachers, Principals and Program Coordinators
Attendance at Family Nights varied by school. 	At some schools, attendance was high and drew families who often do not attend school functions: “For the first Family Night, I would say of the 30 girls, I'd say probably at least 20 of their families were here, which is amazing, considering attendance at most of other functions isn't usually that high.” “I was in shock both Family Nights that we had the attendance that we did, because even our janitor looked in the library and was like 'What event is this?' Because that's like the attendance of whole school events for just a small program of its equivalent. So that's huge.” “I was actually really kind of nervous about the family engagement component of this, because who knows what that's going to look like here, but that first Family Night, we had 27 of our 30 families show up.” “There were ethnic groups represented that we don't normally see at large events or family events.” Other schools dealt with the challenge of low attendance: “It wasn't overly successful with the number that attended, but I don't think that that's the program, I think it's just the schedule of the families not being able to attend. We have a lot of families that work swing shifts and a lot of families that have younger siblings or other things going on or sports practices… I think it's probably hard for a lot of families at the end of the day to come in and go to an activity after school. It's just tricky and especially if you have multiple kids and you're going to a multiple activities.” “I would say a little less than half of our families are very consistent at coming to our events and being a part of the things that we host.”
Successful strategies for increasing attendance at Family Nights included phone calls to parents, giving parents more advanced warning, holding it as a potluck, encouraging them to bring the entire family, and reaching out during the year to engage parents and siblings in Techbridge. 	“We made phone calls. We invited them personally. 'Here's what this is. We want to welcome you to Techbridge. There's going to be a Family Night.' I think that phone call probably is what did it and what kept people coming for those things and knowing what's going on.” “Our first Family Night was pretty informal. I think we gave them two weeks' notice, maybe three weeks' notice. It was mixed success. We had families come that didn't RSVP and families not come that did RSVP. The second one, we gave them quite a bit of notice. We made reminder phone calls. It was a potluck, so we sent them, 'This is what you agreed to bring.' We had a lot more families come.” “I think it's ongoing work for us in the school to figure out how do we better engage those families, some of whom maybe will be working multiple jobs. It's not even an option for them to be here for the kinds of things that we do.” “We have a lot of families that are just by nature, very involved with their kids and the whole family comes out, and supports all of them. Those are families that are easy to get. A lot of times when it comes to pick up, waving hi, inviting younger siblings who come by, or older siblings who come by. I know that's not really protocol, but inviting them in to kind of see what their siblings are doing, seeing what the girls are doing. Having them watch a little bit piques their interest, and also generates a lot more support.”

Theme	Quotes from Teachers, Principals and Program Coordinators
At a Family Night, girls talked about what they had done during Techbridge, led families in hands-on activities, and answered parents' questions. Principals were also able to attend to learn more about Techbridge. 	“It was all smoothly run by my students and the organization. They were able to get a right of parents in, an excellent turnout. The set up was interactive. They share food. It's like a potluck and ordered some pizza. She did a brief presentation. It seemed really like just to hit all the points, just enough information, enough incentive to draw families in, and then I believe (the PC) had worked. She took basically a session or two to prep the girls. They all had note cards so they could share what they were working on and explain it to parents because it's one thing to do the experiment or the activity. It's a whole different thing to be able to explain it, to not only their parents but to multiple adults. Then what was nice too is that it was a station rotation set up. If for some reason there was a girl there whose parents couldn't come but the girl wanted to show off and join her friends that were in the program and show what they had worked on, that adults went through all the stations not just the one that their own child had contributed. I felt like it was really well run and well attended and nicely set up for interaction.” “I knew that they (the girls) had been doing claymation, animation. Each group of girls that was there got to kind of highlight a particular project from the year that was their most favorite thing.” “That was exciting to see them (Techbridge girls) be able to answer questions about... One of the parent was pushing them to talk about like frames per second, and just other technical aspects of shooting a video like that. That they understood the question and were able to respond to.” “What's cool is that they actually engage the parents in a project. So the parents get to do some hands on learning. Their daughters can have some expertise for them. Their daughters get to highlight their work.”

All five teachers mentioned that language was a barrier to engaging families effectively. Programs used various strategies to connect with families. At one school, a para-educator helped make calls to the Spanish-speaking households at the beginning of the school year to welcome them to Techbridge and invite them to an upcoming Family Night. A teacher explained why this was more effective than sending translated materials home:

> “Even for a family who speaks Spanish, they may not always have literacy in the language. We have two full time bilingual para-educators who speak Spanish. One of whom, it's half of his job to be in the office every day and to be communicating with families. He knows all those families, because he's been here for years.”

At another school, they asked the girls to translate for their families at the first Family Night, and a parent who had attended both field trips translated for other parents at the second Family Night.

Eighty-two percent of parents indicated that they have received written materials from Techbridge. These resources are being used to learn about and encourage their daughters to participate in additional SET activities. Parents used Techbridge resources to learn about SET different activities and opportunities (as noted in open-ended responses) and to keep them informed of what their daughters were doing in the Techbridge program. Parents articulated that it was useful to have both “at-home” and outside activities, especially for school breaks such as holidays and summer:

- "We have some potential summer camps for our daughter and have done 'daughter-led' science projects at home. We love it."
- "The Techbridge newsletters help us stay aware of what was going on with the program. We plan to do some activities from the summer list."
- "Getting informed about how to best use vacation time."
- "Knowing what activities were/are available for my child."

Some parents requested that Techbridge offer more information on the program and the girls' current activities to parents. In an interview, one parent suggested that Techbridge invite parents to come in to experience what the kids do:

> "I would like the kids to get the parents involved at least twice a month so I can know more about the ideas… so I can do it with her…They're coming home and telling us what they're working on, but we don't have the equipment. If we had a list of materials and activities, when we go to Staples or Walmart, we could pick it up materials to work on the Techbridge projects and we do the experiments with the kids."

Several principals and teachers commented how parents were usually very supportive of the Techbridge program and the opportunities it offered for their daughters, even if they were not highly engaged:

- "I feel like we have a very strong culture of support, but maybe not of engagement. Parents want their girls to be a part of this. They know that STEM is important. They know that it's important for girls."
- "We have wonderful parents, all of whom definitely want to be involved. Some have more access to do that than others, but most are impacted pretty severely by poverty."
- "I think, for the most part, even if we don't see the parent, I feel like they're still supportive of their daughter being in Techbridge or they [the daughters] wouldn't be there."

However, some of the Techbridge facilitators wished that parents could be better connected to Techbridge:

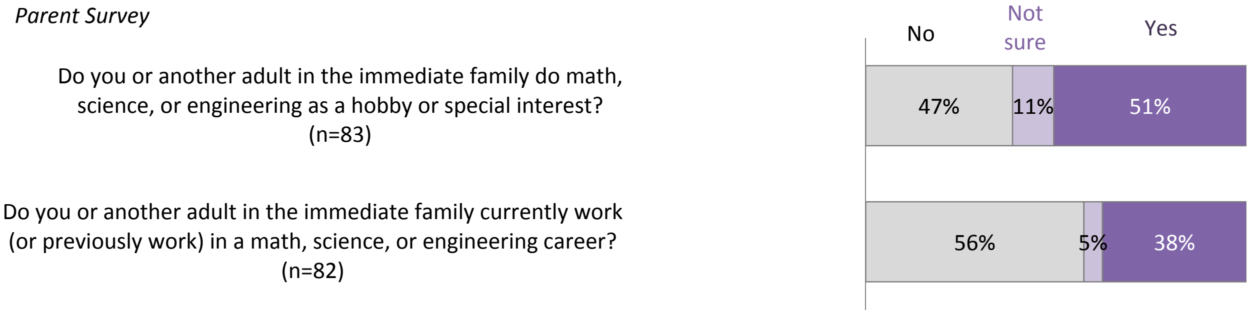
- "I still think parents maybe don't feel as connected as I would like them to be."
- "I feel like other than that (phone calls home when their daughter is absent) and letting them know when Family Night is, we don't really have too much connection with them."

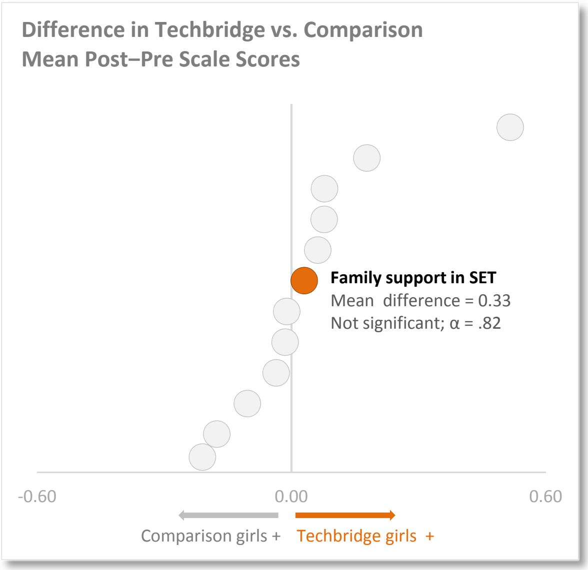
6.1.2 What is the effect of the program on participating girls' families, including their awareness of SET resources; their understanding of SET careers and career pathways; and their view of SET careers? To what degree do families encourage their daughters to participate in SET activities, and to pursue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

Thirty-eight percent of Techbridge parents indicated that an immediate family member works in a SET career and just over half of the parent respondents indicated an adult or immediate family had a special interest in SET.

Figure 41. About half of the Techbridge girls have family members who have a SET-related job

Parent Survey

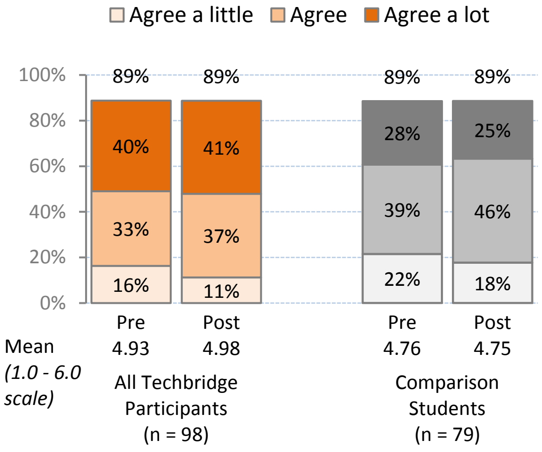




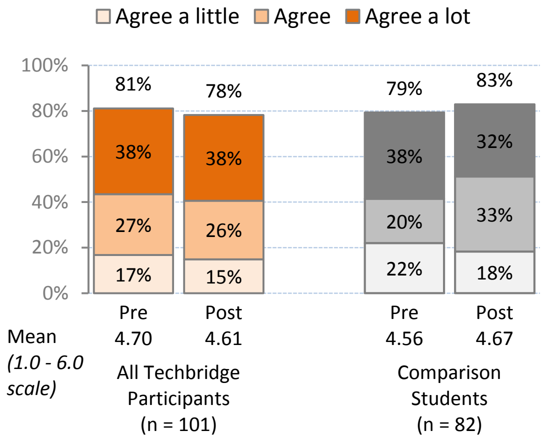
The majority of parents support their daughter's interests in SET. Some Techbridge girls reported that their families became (even) more supportive of their interests in SET. Five questions on the pre- and post-surveys asked students to indicate whether they discuss their education and career with their families and how supportive their families are of their interest in SET (see Figure 42 on the next page). As shown in the figure to the left, the average Techbridge student's mean family support scale score (which includes all five questions on the next page) was 0.33 points higher than the average comparison student's. However, this difference was not statistically significant. The highest increases in agreement for Techbridge girls was that their families encourage them to consider a SET career (increasing from 68% to 83%). At the end of the year, Techbridge girls were slightly more likely to report that their families would like it if they had a SET career (increasing from 81% to 87%). The comparison group had lower levels of agreement on the pre- and post-surveys, though their agreement also increased from 79% to 83% overall). Techbridge girls were slightly less likely to say they talk about their career interests with their family (decreasing from 81% to 78%, while comparison agreement increased from 79% to 83%).

Figure 42. Some Techbridge girls reported that their families became more supportive of their interests in SET
Matched Student Pre/Post Surveys

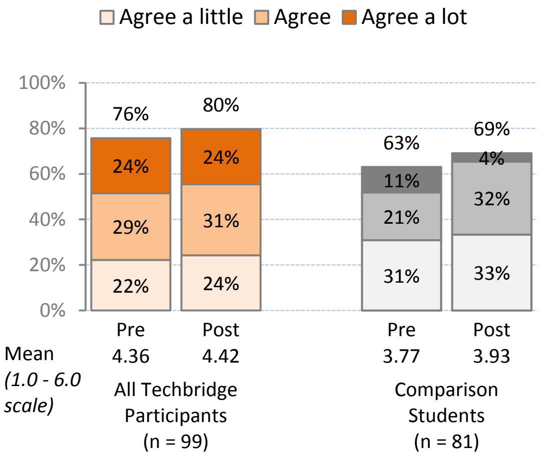
My family is interested in the courses I take



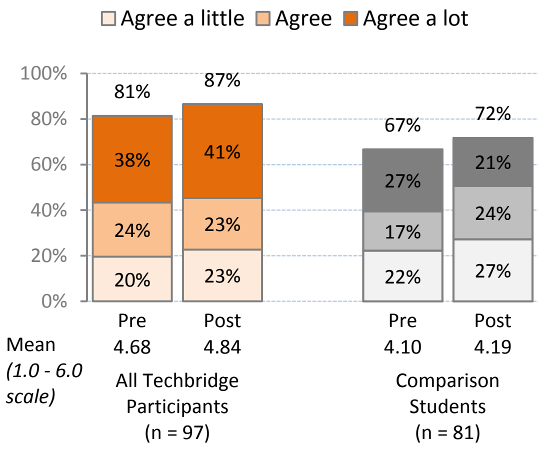
I talk about my career interests with my family



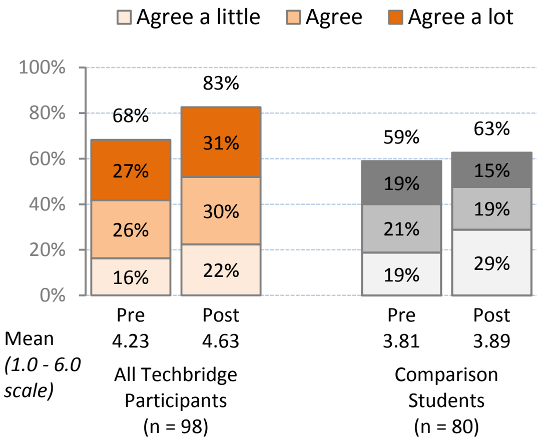
My family thinks science is interesting



My family would like it if I became a scientist, engineer, or had a tech career

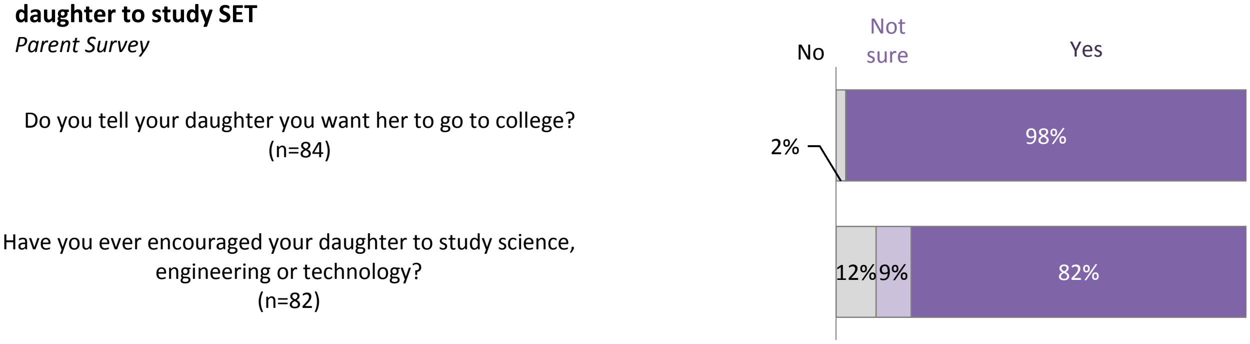


My family encourages me to think about a career in SET



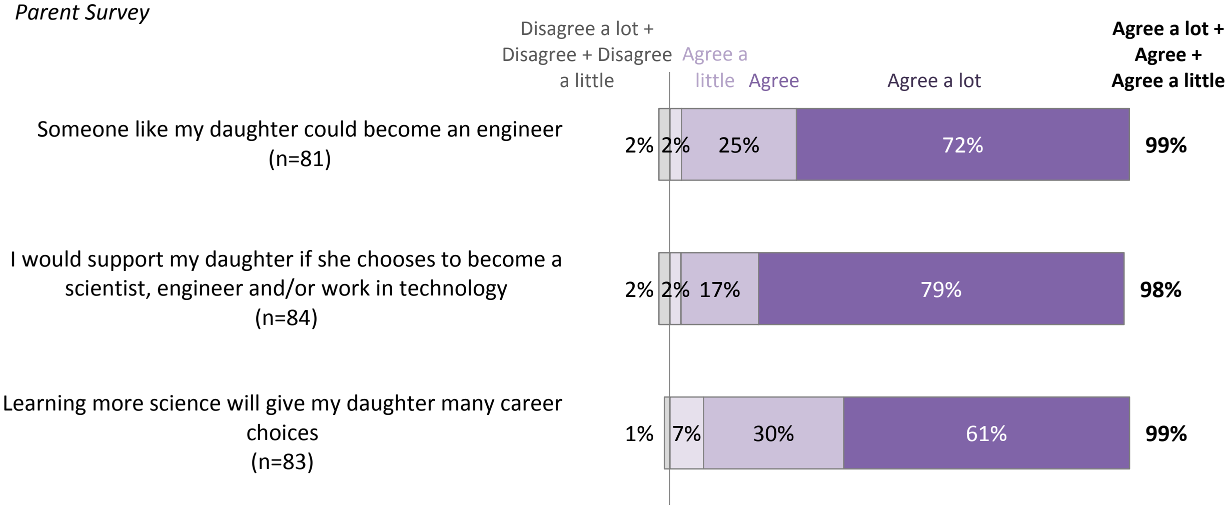
While nearly every parent (98%) said they have told their daughter they want her to go to college, a somewhat smaller percentage (82%) said they have encouraged their daughter to study SET (see Figure 43).

Figure 43. 82% of parents say they have encouraged their daughters encouraged their daughter to study SET
Parent Survey



Almost all parents reported positive attitudes about their daughters' potential interest in SET. Seventy-two percent of parents strongly agreed that someone like their daughter could become an engineer, and 79% strongly agreed they would support their daughter if she chose to pursue a SET career (see Figure 44).

Figure 44. Parents had positive attitudes about their daughters' interest in SET
Parent Survey



Many parents commented that they supported and encouraged their daughters' engagement in SET and that they were grateful for the opportunities that Techbridge provided to create additional exposure to SET:

- "We all have been very interested, and encourage her at any point."
- "We always like those programs. And we encourage our daughter to learn science and engineering."
- "We are eager to help our daughter get more exposure to science programs."
- "We support our daughter in all of her endeavors, but are excited that she has a new one in Techbridge."
- "I always like science and math and I would encourage my daughter to take engineering or be a doctor."

A few girls who participated in focus groups mentioned receiving support from their families about pursuing SET:

- "My dad thinks that it's really cool…My mom, because she does come to the Family Night and stuff like that. When we show her stuff that we did, she thinks it's like pretty cool because she didn't get a chance to do it when she was a little kid. It's nice to have this opportunity where I get to do different stuff."
- "My mom's always talking to me, she's always saying, 'I want so much for you, I want you to take advantage of every opportunity that you have, because I didn't have those opportunities.'"

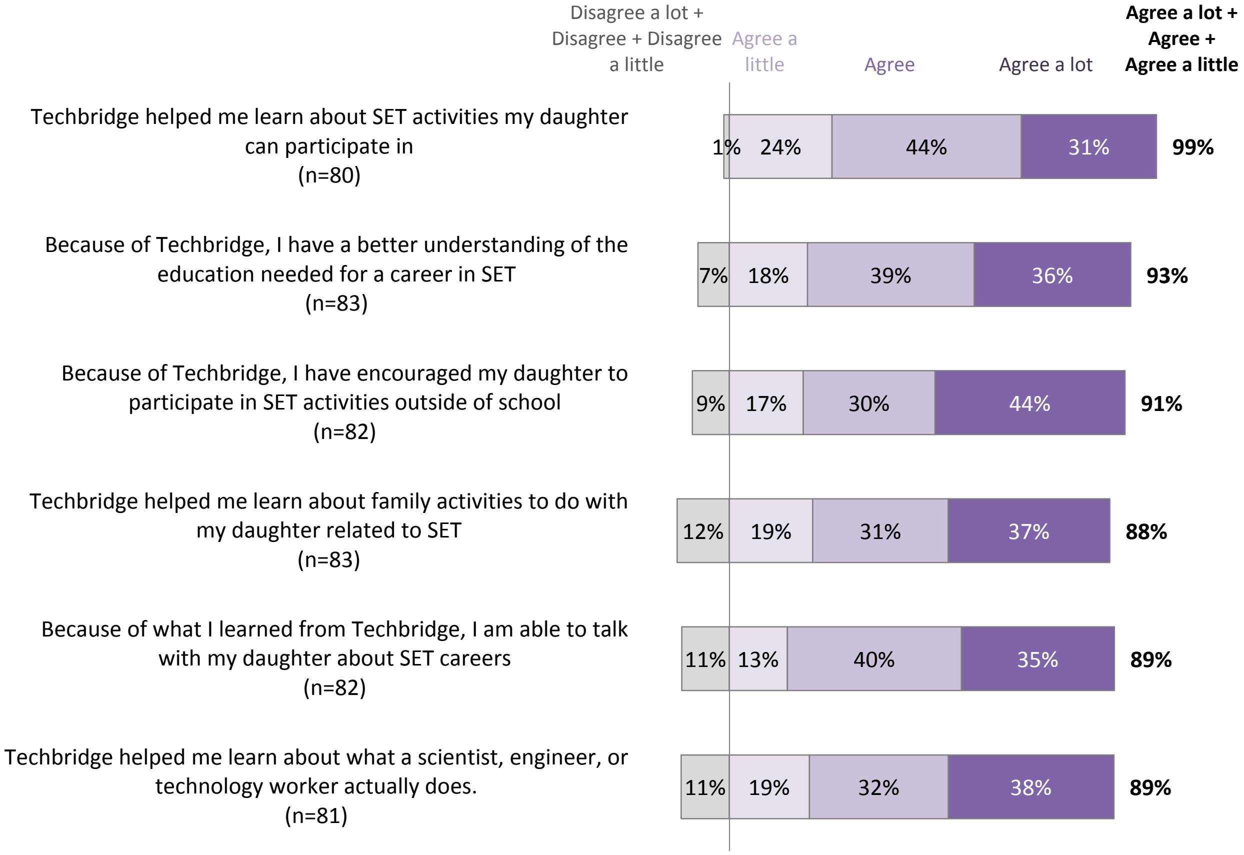
Parents' strong support was also noted by PCs and teachers, who believed that parents were attracted to the SET opportunities for their daughters:

- "I feel like a lot of [parents] are more grateful for our program just because they didn't have those opportunities growing up. They're grateful to have their kids be in the program. They really support their girls being in the program.
- "We have a very diverse population, so a lot of underrepresented populations. We have a lot of families that want opportunities for their girls and want ways to break generational poverty, but don't necessarily have the means or don't know how to provide those opportunities."
- "[Parents] are learning things. Their daughters are teaching them things that they don't know. Every kid that we gave a permission slip to, the parents returned it. They wanted them to have this opportunity to see STEM in action. Same thing with the college visit. They want their kids to go to college. They know there's opportunity in STEM."

Parents reported that Techbridge helped them become more aware of science, engineering, and technology resources, to encourage their daughters to use those resources, and to encourage their daughters to pursue careers in SET (see Figure 45). The majority of parents indicated that because of Techbridge, they are more aware of SET activities their daughter can participate in (99% agreed, including 31% who agreed "a lot"), and encourage their daughter to participated in more SET activities (91% agreed, including 44% who agreed "a lot"). Many parents also said Techbridge helped them better understand what SET professionals do (89%) as well as the education needed for a career in SET (93%), and are able to talk with daughter about SET careers (89%). Parents said they became more interested in science and technology through their daughters' involvement in Techbridge. One parent said, "We thought science was a boring subject before, but now we think science is very interesting. We also want to know how to build things."

Figure 45. Parents said Techbridge helped them learn about how to support their daughter in SET

Parent Survey



Parent survey responses and interviews showed they understood the value of a SET education and would support their daughter in a SET career choice. Parents also noted that Techbridge allowed them to understand that anyone can work in the SET field:

- "Now we believe everyone can study and work in the [SET] field."
- "Now I know that there exist many opportunities to create interest in science and technology for our daughter."

- "Now I think that now not only men can be in the technology field, but also women. There are programs that can help them starting when they're young. It's very important. If she decides when she's going to attend college, but there isn't much gender diversity, they'll feel in some way intimidated. Having a group of 35 students with just one girl, imagine it. But if someone helps them starting from when they're young, then it makes me feel confident that she can study whatever she wants."

In an interview, one parent stated a desire for more detailed career information and the steps to lead her daughter toward a SET career:

> "It would be nice to get a little bit of guidance about how it works or what ideas [there are for careers]. Right now everything about technology and computers sounds good. I think that's the best way to go. I think it would be nice to have some guidance—information about where to go or what age to start something. I see people who work at Boeing, but I don't know how [she could] get into it."

Figure 46. 91% of girls said they had talked with their family about the things they've done in Techbridge
Student Post-Survey

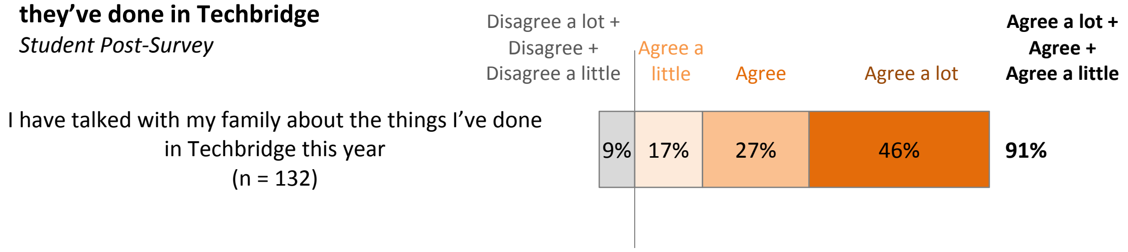
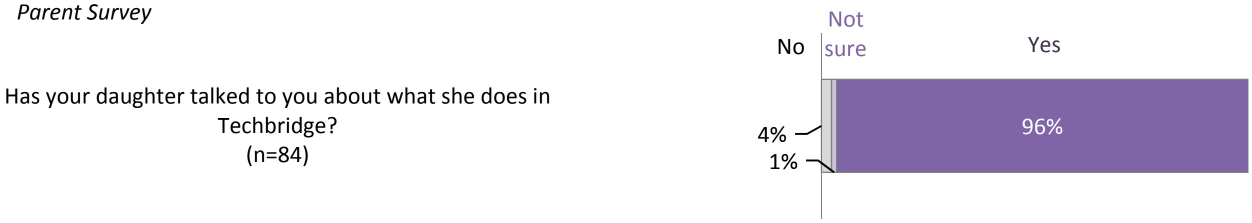


Figure 47. 96% of parents say their daughters have talked with them about Techbridge
Parent Survey



Parents referred to family discussions about Techbridge in open-ended responses and interviews. In interviews, parents talked about what their daughter brought home from Techbridge. Some girls seemed to share a lot with their parents, such as one who had brought home a light and talked a lot about circuitry, knew about the Claymation video, and heard her daughter talk about coding.

- "She has had fun coming home and telling about her projects and how much she has enjoyed it and what she learned."
- "When she comes home on Thursday, she comes home with a smile on her face. She asks, 'Mom can I please have your attention?' Then she tells me about her experiences. A lot of things about batteries, science."

Teachers had positive views of how families were affected by Techbridge and described how parents were able to see their daughters enjoy the program, hear about what their daughters were learning and valued the program. According to teachers:

- “[Parents feel] encouraged to see their daughters grow and be more mature or involved with their learning.
- “Overall, positively. The families had more to speak about with their child regarding their education, and share their excitement in the weekly work.”
- “We got a lot of positive feedback - they really like the program and what it was teaching girls and exposing them to.”

Parents were asked if they had any other suggestions for the program or other comments. The majority of parents offered praise for the program:

- “It’s a really good class for kids to learn more and to have fun after school.”
- “Really grateful for the program and opportunity my girls have had.”
- “Great workshops to teach girls that science is fun!”
- “You guys are doing a great job thank you for everything.”

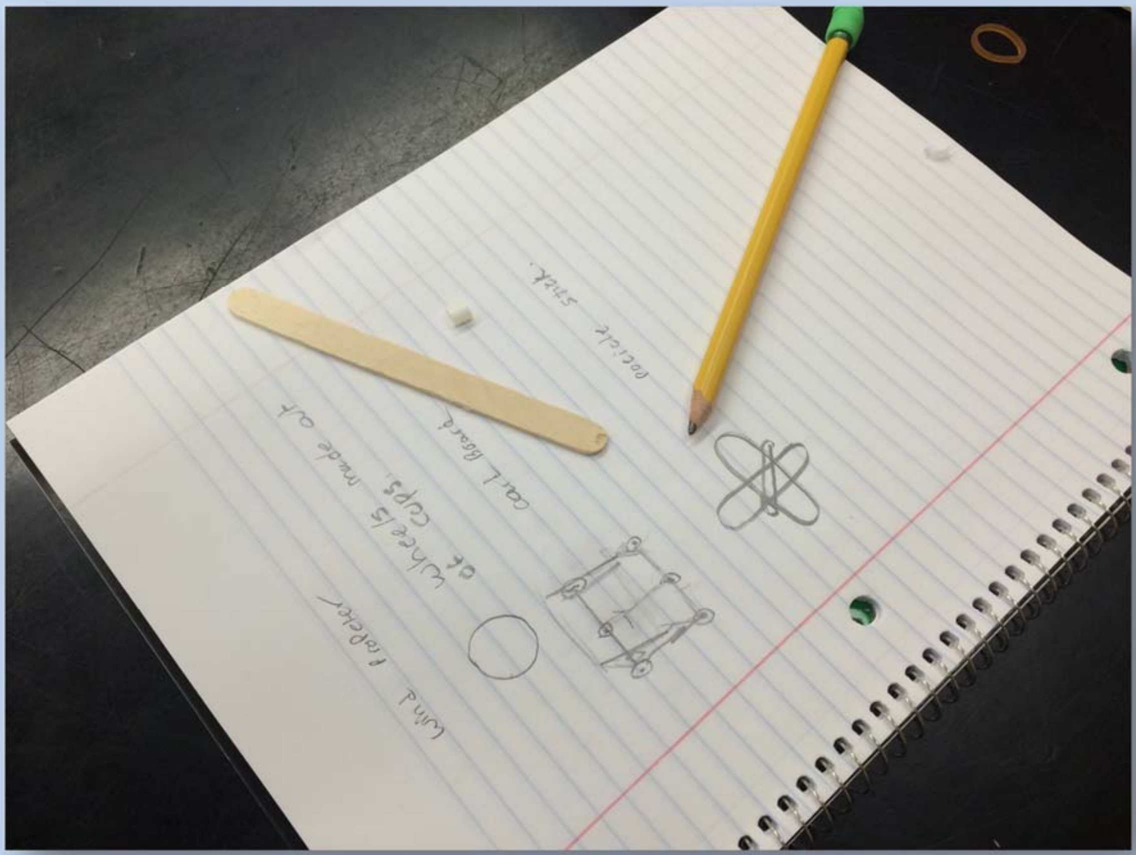
Parents who did offer a recommendation suggested more career education, such as teaching about the different types of engineers and bringing students to Microsoft. Two parents mentioned spending more time on improving students’ communication skills. One said, “Teach the student how to communicate, like speech in front of people; it’s not clear what they talk about.”

Three parents who were interviewed suggested more time in Techbridge:

- “She needs more time in Techbridge. Have it be earlier. More time—longer program.”
- “I just think it’s a great, great opportunity. She wishes it was more than once a week.”
- “More opportunities and more things for them to do. More programs.”

One parent said it was difficult not having an activity bus to take her daughter home after the program, and that she had to adjust her work schedule in order to pick her up.

7 Implementation and Fidelity



In the following section, findings are presented regarding the degree to which the first expansion site implemented the Techbridge program model, differences between the Greater Seattle and Bay Area programs, and how the scale-up process has influenced processes in the Bay Area thus far.

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

Based on external observations and self-reports by Techbridge teachers and staff, the first Techbridge expansion site generally implemented the Techbridge program model with fidelity.

An observer from the evaluation team used the Dimensions of Success (DoS) observation tool to observe five of the seven Techbridge after-school programs located in the Highline Public School District in the fall of 2014 and the same programs again in the spring of 2015. Figure 48 on the next page shows the fall and spring average ratings on the eight DoS dimensions that the evaluation/research team and Techbridge leadership identified as being key programmatic 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 average spring ratings were higher than fall ratings on all eight Techbridge-related dimensions. In the spring, the five observed programs showed **compelling evidence** (an average rating of ~4 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)
- 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).

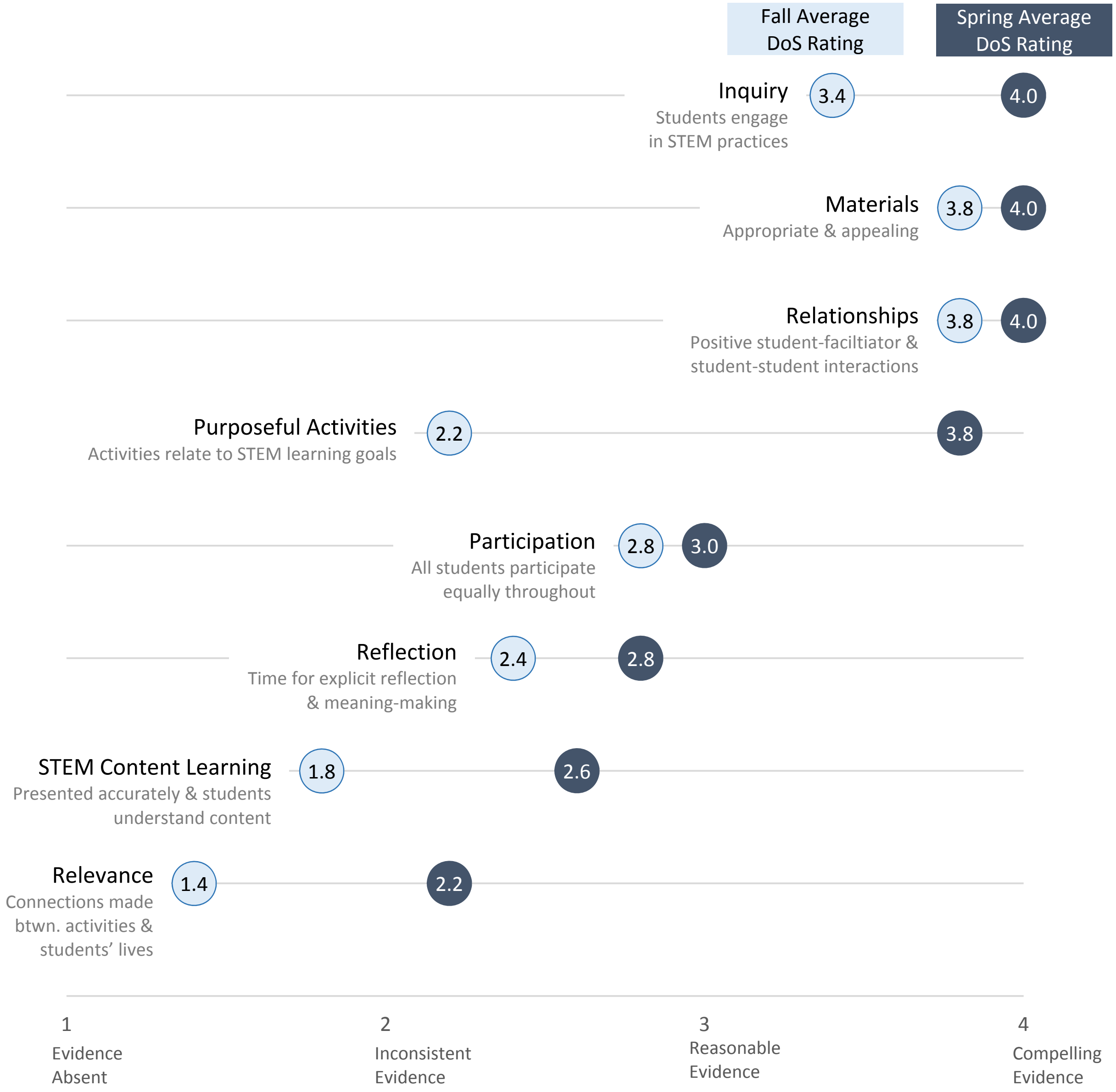
The observed programs showed **reasonable evidence** (an average rating of ~3 on the DoS) of the following two dimensions:

- having consistent and equal **participation** of all the students throughout the activities
- fostering explicit time for **reflection** and meaning-making during the activities.

The observed programs showed **inconsistent evidence** (an average rating of ~2 on the DoS) of the following two dimensions:

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

Figure 48. The average Dimensions of Success spring observation ratings were higher than fall ratings on all eight dimensions that were identified as important elements of the Techbridge model



Source: Observations of 5 Techbridge programs in November 2014 and April/May 2015 (Highline Public School District)

Teachers were asked to describe the extent to which various Techbridge-specific elements were implemented in their program (see Figure 49 below)—elements that were not specifically addressed in the DoS, 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.

The following sections show the survey results for each element, together with related findings from the teacher interviews.

Figure 49. Of the various Techbridge program elements, teachers were most likely to say they talked about SET careers and least likely to say they talked about gender inequities in SET

Source: Teacher Survey; n = 6

SET Educational and Career Pathways

In all Techbridge programs, teachers reported talking about SET careers and educational pathways at least "to some extent." Teachers were more likely to say they talked about SET careers than to talk about educational pathways that can lead to those careers. All six of the teachers who responded to the survey said they talked about SET careers to a "large" or "very large" extent. In contrast, only one of the teachers said they talked about SET educational pathways to a "large extent;" three teachers said they had to a "large extent" and two said they had only talked about educational pathways to "some" extent.

Table 27. All the teachers said their Techbridge program had talked about SET careers to at least a large extent, although they were less likely to talk about educational pathways leading to SET careers
Teacher Survey; n = 6

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Our program talked about science, engineering and/or technology careers.				👤 👤 👤	👤 👤 👤
Our program talked about educational pathways that can lead to science, engineering and/or technology careers.			👤 👤	👤 👤 👤	👤

Teachers said the primary methods their programs used to introduce students to SET careers were to (1) show short videos of SET professionals explaining their jobs, typically when introducing a new unit related to that career topic, and (2) ask role models to explain their jobs during program visits or on field trips to SET companies. The typical Techbridge program arranged two field trips and at least two role model visits during the year. As one teacher explained:

> "A lot of the units, we watch…a video of people from those careers getting interviewed and talking about what they do on a daily basis, how they got started. It's just those little bio videos of, 'What were they doing in elementary? What path did they take to get to where they are today?' and then showing them in their workplace. We watch a variety of those to start each unit, and sometimes multiple times within a unit.
>
> "We did have guest speakers come in from careers throughout this year to talk. The mentors came in and talked about what they did and worked with the kids. Then we had the field trips, too, so they got to meet and speak with girls who are currently majoring in science fields at the community college. And we went to Facebook so they got to see actual software developers doing their job—not doing it, we kind of got to see them doing it on a tour—but they got a chance to speak with them and ask questions."

Another teacher described how Techbridge girls heard a number of STEM professionals talk about their jobs:

> "The last role model that we had last week, she was an Amazon coder. She talked a lot about what she did. She talked a lot about other jobs that you could do in Amazon. Then the field trip that we just took last week, as well. Each of the 10 role models plus the CEO of the company, they each spoke to them and said, this is exactly what I do here, this is my job title, this is what I had to do to get this position, here's the schooling I had to go through. It was really amazing."

Teachers thought most of their students were unfamiliar with SET careers like software design or engineering before participating in Techbridge. One teacher said, "They know somebody probably makes the games, but they don't know who does it, how do they do it, and the other type of careers, [like] structural engineer. What we've learned was that a lot of them didn't even know these things and, if they did, they didn't know very much about these careers." Another teacher said the students also have little idea about various higher education options and an unrealistic concept of how much a college education costs (saying for "our kids, $100 is like, 'Whoa, that's too much!'"), and that going on a field trip to a local community college campus may have been helpful "to see a path which is a path many of them will probably end up taking."

One teacher mentioned the program made a point of framing the projects around a particular kind of SET career and about giving the students the opportunity to actually be a SET professional.

> "We try, at least in every unit if not every project, to tie in. When we present the challenge or like, 'Today, you're going to be mechanical engineers. What is a mechanical engineer? What do they do? What kind of jobs do they have?' Whether that was through just describing it to them, showing them pictures and examples, or watching a video interview or something."

Although Techbridge emphasized SET careers, relatively few teachers said they explicitly talked in detail about the educational pathways associated with attaining those careers, such as what courses to take in middle school or high school, what activities to considering pursuing, or what post-high school education is required. For example, one teacher said conversations about educational pathways were casual and general, rather than structured and specific:

> "It's not necessarily structured. It's one of those conversations as they're working, just letting them know this is a great skill for what this would look like in middle school. This type of class in high school. Someone who's really enjoying this, you would really maybe be interested in pursuing this type of program, or thinking about this as a major. Making it part of the regular conversation, so it's part of their just general frame of thinking. To me personally, I think that's more impactful than saying 'you should do this, this, and this. Let's sit down and plan out your career.'"

Another teacher said:

> "I don't think we talked about offerings at the high school. I don't remember doing that. In terms of college, I think there was a general understanding of college being in the picture based on what people said in the videos, but I don't think there was a whole lot of discussion about electives or classes."

A few teachers said their programs had explicitly talked about educational pathways associated with SET careers. One teacher who had done so said his/her program made sure every adult they met talked about their educational journey:

> "Then we start, at the very first Techbridge meeting, we started with our own mini-biographies, telling them our own educational pathway…Then every role model, whether it's on a field trip or a role model that visits the program, they all share their educational pathway. We talk about, 'Okay, so this is a mechanical engineer. This is the kind of things they do. How do you do that?' Just trying to be transparent about, 'These are steps you can take to get there.'"

Another teacher said the program discussed educational pathways at the end of most units:

> "We've done stuff after each unit, and I think we did it yesterday, like, 'What are some of the characteristics or some of the things you would need? What are some things you might need to study or really want to learn to do this type of career?' We've always had those discussions after the last activity of the unit or the last day of that unit activity. There's been some conversations to wrap things up."

Engineering Design Process

All six teachers who completed the survey said they had emphasized the design process rather than product completion to a "large" or "very large" extent.

Table 28. All the teachers said their Techbridge program had emphasized the engineering design process to at least a large extent

Teacher Survey; n = 6

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Our program emphasized the design process rather than product completion.				👤 👤 👤 👤	👤 👤

In interviews, several teachers said they had posted the engineering design process on the wall during each program, and frequently referred to it. As one teacher explained:

> "We spend time talking about what this looks like, and then it's always referenced every time. Most every program, the girls get an opportunity to design something and then either reflect on what they would do to redesign or redesign themselves. I think just having it up there and reinforcing it and talking about why [there are] different steps [and] why planning is important."

One teacher said they began requiring the girls to show the teacher or the PC their written plan before getting their supplies, which forced the girls to think through the planning stage of the process.

Another teacher said that there is little time during the school day for students to evaluate their work and think about how they could improve it, so Techbridge was a powerful way for students to learn the value of iteration:

> "The girls really liked being able to show off to the other girls what their ideas were and how it worked out and then having the chance to correct it and change it and the re-show it again...which is so great because in our general science classes we just don't have time for it. They get to do it once. Whatever you get, you get and then we fix your data with a set of class data, but they never have the time to actually go back and go, 'Oh I did that wrong, let me do it again,' and then learn from it. It just doesn't allow for us to do it so that was really nice for them to be able to do that [in Techbridge]."

Although the Techbridge engineering design cycle emphasizes re-design, about half of the teachers said that they thought there was not always enough time in the program for the girls to go through the entire engineering design process, and iteratively modify their designs. One teacher said:

> "The girls have become more and more familiar with it [the engineering design process], so it's always up there as a reference like, 'Hey, we're going through this process as you're designing something. You're having to design this, and this is the process that you're going through.' Even this last Monday, we finished, and we did the test, and then one girl goes, 'But don't we get to redesign now?' It was just kind of funny, because me and [the PC] looked at each other like, we don't have time, but they wanted to go through like, okay, ours worked but we want to make it better."

Another teacher thought that the girls could benefit from more scaffolding about what the steps of the engineering design process are:

> "They were introduced in the very beginning to the design process, but we had to keep revisiting it over and over again because it's not something that's intuitive or that they would necessarily remember. I also feel, maybe this is my many years of working with younger kids, but I felt like some of the activities were a little too abstract. They needed to be broken down and explained a little bit

> better piece by piece instead of giving them a set of instructions then, okay go. But instead, reading it with them together and addressing any questions they have. I'm better equipped to predict misconceptions or issues that they would run into because I'm a classroom teacher, and [the Techbridge PCs are] not. We have had to take a couple lessons and say, 'Let's slow this down a little bit here,' so they will understand exactly what they're doing and they understand the vocabulary, so they have a better handle on what they're doing."

This teacher also thought that the girls would benefit from additional instruction about some of the science concepts that relate to the activities, such as more information about electrical circuits when doing the LED butterfly activity.

> "[The students] hadn't had experience with the electrical circuit. They had no idea how to connect them. [The PC] drew a diagram on the board but that wasn't quite enough. There was a lot of times where I had to go over to almost all the girls and show them, this is how you do it, this is why. Again, they didn't have that background knowledge. They really struggled with that a lot. It involved not only knowing about the circuitry but then the soldering as well. They had to learn the soldering, first, that was an added complication. They actually did well with the soldering. Again, it was just understanding this whole concept of energy and how it travels through."

Growth Mindset

Five of the six teachers who completed the survey said their program promoted a growth mindset to a "large" or "very large" extent, with the remaining teacher saying their program had promoted growth mindset only to "some" extent.

Table 29. Almost all the teachers said their Techbridge program had talked about growth mindset to at least a large extent

Teacher Survey; n = 6

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Our program promoted a growth mindset (that girls can improve at science, engineering and/or technology through time and experience).			🧍	🧍 🧍 🧍	🧍 🧍

Several teachers described how they had assured girls that it's okay to fail and to believe they can improve at SET through time and experience. One teacher described how they talked about this explicitly during the program:

> "I think growth mindset does come up a lot in the programs and also having them share out their experience, like 'this was challenging, this was difficult, this is how I got through it' and then asking the girls who had that same experience so knowing that they are not the only one that had that challenging, frustrating experience."

Another teacher said:

> "Some kids have this stigma about kids who like science or math. We've definitely addressed that because you see that kind of thing pop up with kids, 'I'm not very good at this. I can't do this.' For whatever reason, they go to that in their brain at some point. We've had to put those fires out, like, 'No, you can. It takes work.'"

The teachers and PCs also helped to model and reinforce a growth mindset for the girls (and for each other). One teacher described how her PC had helped her have a growth mindset orientation:

> "I think a lot of times as teachers, right or wrong, we're seen as experts. A lot of times, we're not seen as humans. We preach a lot about growth mindset. There's a lot of things I didn't know how to do at the start of this year that I learned in Techbridge. One in particular is computer science. I was extremely frustrated by the programming. On Teacher Tinker Day, [the PC] told me, she said, 'I know this is hard for you. I know you're frustrated by it.' She goes, 'Take it slow. Work with your partner.' …When I got it, I was so excited. I was so proud of myself. Then I was able to tell the girls that 'I kept messing up and I kept going and eventually [I got it].'"

Peer Relationships

All the teachers reported that the Techbridge programs promoted positive peer relationships.

Table 30. All the teachers said their Techbridge program promoted positive peer relationships to at least a large extent

Teacher Survey; n = 6

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Our program promoted positive peer relationships among girls.				👤 👤 👤 👤 👤	👤

One teacher said that requiring girls to work with different partners helped foster their teamwork and conflict resolution skills.

> "Forcing them to be with different personalities and accept everybody I think was a big deal and then the other one was the fact that [the PC] and I didn't really help them much when they got stuck. They had to ask their partners and think and work together and they would ask us and we're like, 'Well, what do you think you're going to do?' Instead of just giving them answers. So they I think they realized that we were just there to kind of guide them but we weren't going to help them solve their problems, and they had to find a way to make it work. I think those helped a part of it."

Another teacher said a visiting role model helped reinforce the message that conflict is a natural part of working in a group:

> "Yesterday, we had a role model come in and they had some working partners. One was a project manager and one was a software engineer….The girls would ask the role model, 'Do you ever fight with your co-workers? Do you ever get angry and frustrated with them?' She goes, 'Yes. All the time, but we work through it. We communicate with each other and we get through it and we don't give up.'"

Public Speaking

The teachers ranged in the extent to which they said their program had provided opportunities for girls to practice public speaking. Four of the six said they had done so to a "large" or "very large" extent, while two said they had only done so to "some" extent.

Table 31. Four of six teachers said their Techbridge program provided opportunities for girls to practice public speaking to a large or very large extent

Teacher Survey; n = 6

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Our program provided opportunities for girls to practice public speaking.			👤 👤	👤 👤 👤	👤

The primary public speaking opportunities Techbridge provided were encouraging the girls to lead the 'Shout Outs' (where participants acknowledge their peers) and 'Glorious Goofs' (where participants celebrate their failures) at the end of each program session.

A few teachers said they had girls present during the second Family Night as Master of Ceremonies or demonstrating things they had made in the program. One teacher said, "We've done activities where the girls have to come up and talk about something what their favorite part of Techbridge is or their favorite part of school, just getting them comfortable with being in front of group of people and speaking about themselves."

Another teacher said that the girls-only environment provides a safe space for girls to become more vocal. "I also think it being a safer environment, being just girls, makes a few of those girls more willing to participate…I see that transfer over in the classroom as well in a normal day, because those girls in Techbridge are in their class, so it feels like that safe environment still, I think, for them."

Gender Inequities

Of the various Techbridge program elements that teachers were asked about on the survey, teachers were least likely to say that they had discussed gender inequities in SET or how to address them to a large extent. Most teachers said they had only done so to "some" extent.

Table 32. The teachers were least likely to say their Techbridge program had discussed gender inequities in SET or how to overcome them to a large extent

Teacher Survey; n = 6

	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
Our program talked about gender inequities in science, engineering and/or technology.			👤👤👤👤👤	👤	
Our program talked about how to address gender inequities in science, engineering and/or technology.		👤👤	👤👤👤	👤	

A few teachers said the role models and/or the PCs specifically talked about their experiences of being of the few women studying SET in college or graduate school. One teacher said:

> "I think it's been talked about quite a bit. I remember especially at our college visit, one of the professors, was a math professor, came in and talked to the girls specifically about how she was one of the only girls in her program and how everyone was telling her, 'You should go do something else,' but she stuck to it. I thought that was pretty eye-opening and cool for the girls to hear, like, 'Oh hey, even if you are the only girl in this field, stick to it.' I know a lot of the girls are starting to get pretty vocal about, 'Yeah, there are a lot of boys in science, but there should be more girls in science.' I can't think of other times that we've directly talked about women in the field. There has been the role models and, like I said, the college visit as well, sticks out to me….[The PC] has talked to them about how even in her programs in science going through college that she was one of the few minority females in the program, so it's been talked about."

Another teacher said:

> "I think you have to lay it all out there. I don't believe in sheltering the kids, as far as anything goes. Actually, we're spending this whole week talking about Baltimore riots, and race relations, classism. That's just a general thread for the whole year, because I think if our kids don't know what the reality they're facing, we're doing them a disservice. All of a sudden they're going to encounter a lot more barriers than expected. If we lay down the reality in front of them, and say this is what may happen. If you prepare for the worst, but hope for the best, you will always come out doing better than what somebody else might do, if they approach it a different way."

In interviews, two teachers said they talked about gender issues in SET only at the beginning of the year. Some of the teachers said they thought that they thought their girls were already well-aware of inequities in SET (and other areas) and highly motivated to overcome them. One teacher said:

> "It was discussed in the beginning of the year when we first started with the girls…but it's not an ongoing conversation…I think they do care. I feel like these girls, in this day and age, are more empowered than maybe they have been in the past. I think they do pay attention more now to the inequities that they see in the world. I think they do care. The reason why I think I know that about them is just because I know them, again, as people from last year but not necessarily because of anything that happens in the class. We're usually just so focused on the activity or the task at hand. Before you know it, the time is almost over."

Similarly, another teacher said:

> "We did in the beginning—part of the beginning of the program, when we're explaining what the purpose is to the girls and why we're here. I think one of those first weeks explaining that to them, that these career fields are underrepresented. It's not because they can't do it. It's because they haven't really been exposed or really been pushed towards those careers as a possibility."

However, when asked if they had had any discussions about strategies for coping with being the only girl in a SET classroom, the teacher said, "That's a good question. I don't think we really addressed that. I don't think that question ever came up. I don't know if that would be a question a kid would ask. Or if they would ask in front of all the other kids."

One teacher said they did not explicitly discuss gender inequities in SET:

> "I'm not too sure if we really made the distinction between being male or female in those careers. I think that we did some general discussions of the girls' opinion about women or men in the career options and we discovered that for most of the girls they did not see that there was an underrepresented amount of females. Their viewpoint was that they're both and there's enough jobs for both and the opportunities are equal for both. I don't think that was something that we necessarily had a big discussion about."

Data from multiple sources (including the DoS results, as well as attendance records, student surveys, and interviews) were entered into a fidelity rubric the research and evaluation teams developed which identifies the Techbridge essentials—those critical components Techbridge identifies as essential for success. Appendix I includes a draft of the rubric completed for 2014-2015.

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

The Greater Seattle programs and Bay Area programs differed in a number of ways related to staff structure and responsibilities, program implementation, and school district involvement. The table below outlines the differences in the first year of implementation in the Highline schools.

Table 33. Greater Seattle and Bay Area Techbridge programs had somewhat different staffing structures, implementation, and school district involvement

	Difference	Greater Seattle Area Expansion Site	Bay Area	Quotes from Techbridge Stakeholders
Staff Structure and Responsibilities	**Fewer staff**	• Greater Seattle-area office has 3 staff (two program coordinators and one executive director (ED)) • Small office size means fewer people to interact with and receive support informally • Small number of positions means potentially fewer opportunities for advancement	• Oakland, CA office has ~18 staff, including executive team, development and communications staff, finance and operations, a curriculum developer, program coordinators, and professional development staff • Larger office culture means more people to interact with and receive support from informally	“ There’s a lot for them to do. It also in some ways precludes them from doing things that might be outside their job description, and I know for our staff, being able to do things beyond just the PC job description is kind of inspiring and exciting to do. I know I’ve gotten questions from the program coordinators from Seattle asking about when could it grow or when could we do other things besides just doing the work of the after-school program.”
	Different PC hiring practices	• Difficult to have PC candidates facilitate a mock program as part of remote hiring process	• PC candidates facilitate a mock program	“ We normally do math lessons, but [our interviews with the Seattle Area PC candidates were] with staff over Skype, which is a little awkward to role play teaching students and providing a lesson.”
	PC coordinated role model and field trips	• PC responsible for coordinating field trips and role model visits • Greater Seattle office initially developed own systems for coordinating field trips and role model visits, not realizing Bay Area had already developed some of these tools • PC had responsibility for initiating contact with new partners, rather than local ED doing so	• Techbridge Corporate Partnerships and Community Manager conducts outreach to partners and coordinates	“ In terms of staffing, with Seattle being small with only seven programs, we only have two program coordinators. So I think that involves them being really busy because they have a lot to do and they don’t have other staff to help support some of the admin work or doing the role models and field trips.”

	Difference	Greater Seattle Area Expansion Site	Bay Area	Quotes from Techbridge Stakeholders
	Less involvement in curriculum development	• Little to no involvement in developing curriculum	• Traditionally more involved in piloting new curriculum and providing input to curriculum director	“There's something really stimulating for our staff being able to be part of that process. [The Bay Area PCs] work with [the director of curriculum] and give ideas and are on the ground and really involved in a really deep way in terms of driving curriculum revisions and curriculum development, and there's less of that experience for the program coordinators in Seattle. I think it just makes their experience a little bit less rich and deep.”
Program Structure	**Shorter program**	• Program is 90 minutes due to district's school bus schedule • Curriculum was designed for two-hour program, so PCs and teachers had to adapt and shorten	• Programs are 120 minutes	“Every element is important, but something has to give.”
	Smaller teacher trainings	• Had 7 teachers in 2014-2015 • All teachers elementary or middle school level • Fewer teachers (and all teachers from same school district) may create a different dynamic in teacher professional development sessions	• Had 14 teachers in 2014-2015 • Mix of elementary, middle and high school teachers	“[Bay Area] trainings are completely different than our trainings—not a huge difference, but it's like, 'You might be running yours a little bit differently than we're running ours, because you have more teachers,' or 'You have different levels of schools.' I feel like they do a lot more content than we do. We do [include] content, but we try to give them more tinker time because this is the first time you're actually seeing these activities.”
	Different field trip destinations	• Visited local community college on field trip	• Visited four-year higher educational institutions on field trips	“I think in some ways that opened up new opportunities that may be [educational] pathways that are more typical that the girls are going to. I see this as an opportunity for us to revisit what we see as ideal field trip destinations.”

	Difference	Greater Seattle Area Expansion Site	Bay Area	Quotes from Techbridge Stakeholders
	Different summer programming opportunities  	• Chinook Middle School requested (and paid for) Techbridge to implement a modified summer program as part of the school's summer programming • Limited to students at one school • Opportunistic; not originally part of expansion plans	• Techbridge offers multiple one-week Summer Academy program as summer opportunity for school-year participants and other girls in the Bay Area • Offered to students from multiple schools	“ That's going to be another great way to keep it going…[The] summer school is going to be all enrichment-based and college career, high school graduation, college career exploration, so it just fits beautifully.”
District Role	**Tighter district connections** 	• All programs are located within one public school district • Highline Public Schools district staff wanted to have a hands-on role and 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	• Programs are located within 3 traditional public districts as well as multiple public charter schools • Techbridge selected which schools to partner with	“ I think something that's really different about Highline is we really take a system approach, and the model for Techbridge has always been going to the individual school and working just with the principal or just with the teacher. We wanted to set up a model of—because it included seven of our schools—that it was something that was consistent with the system and what we're already doing. I think that was a little different for the Techbridge crew. They're like, 'Why are you asking all these questions? Why are you showing up?'”

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

The scale-up process has influenced processes in the Bay Area in several ways thus far:

- Staff in both the Greater Seattle and Oakland offices have created new materials documenting Techbridge processes and practices, including manuals for various staff, more detailed descriptions outlining expectations of teachers, and overviews describing the program for prospective partners. These documents have helped to clarify and codify Techbridge best practices that are used throughout Techbridge, including in the Bay Area. The documents have helped communicate Techbridge's vision to current and prospective staff, teachers, principals, role models, and district partners. One staff member explained:

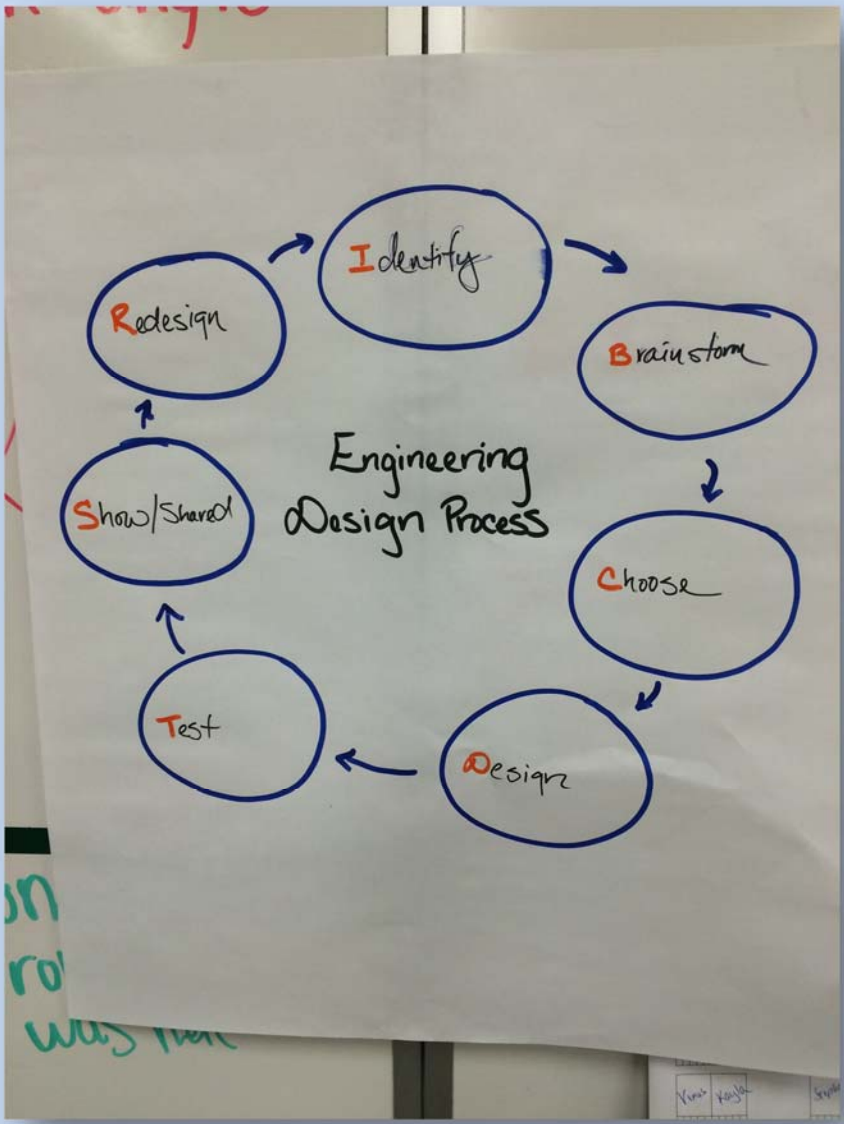
  > "There's been increased rigor in terms of document codification and also creating new documents. [We've] spent a lot of time creating documents for prospective district partners and prospective school partners laying out an overview of Techbridge and also what would be expected of a school partner... We leveraged that a little bit in the Bay Area this year... Historically in the Bay Area, we haven't really needed to do that because the programs have been around for so long and a lot of them are legacy."

- The Techbridge Bay Area programs are planning to adopt the DoS as a tool to help monitor program quality and provide feedback to PCs and teachers.

- The Techbridge Bay Area programs are revisiting the structure, timing, and content of teacher training—in part because of what it's learning through the process of scaling up to new locations.

- A Bay Area staff member who visited and observed the Greater Seattle programs reportedly commented on a few aspects to the curriculum that the Greater Seattle programs had adopted, including having girls write in journals at the beginning of an activity during the planning process as well as at the end of an activity for reflection. It is possible that practices that these will be adopted in the Bay Area.

8 Organizational Capacity



8.1.1 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)?

While it is still relatively early in the scale-up process (the first year of expansion has just concluded), a few factors are emerging that may be important for Techbridge to pay attention to as it continues to expand:

- **The role of the expansion site Executive Directors (EDs).** The expansion area EDs have dual responsibilities for overseeing the program (an inward-looking, managerial role) and marketing the program and developing its funding base (an outward-looking, promotional role). The skills, experience, and connections required for these two functions are quite different. If needed, Techbridge may need to find additional ways to support EDs with one or the other function.

- **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. The Techbridge main office will need to continue to be vigilant about facilitating cross-site communication and collaboration—especially as people and their positions are shifting.

8.1.2 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?

Highline Public Schools district leaders, principals, and teachers said Techbridge's mission aligns with district and school priorities to ensure more of their students have access to high-quality experiences in science, technology, engineering and math (STEM). Five of the seven schools in which Techbridge had programs in 2014-2015 have Race to the Top funds to restructure their schools into STEM Academies and provide additional professional development support for teachers around STEM. Even one of the schools that is not a STEM Academy offers a year-long "Design and Engineering" course which includes computer programming and project-based engineering activities. One principal said:

> "I think that [Techbridge] is absolutely aligned with the big ideas that are working on in STEM... I'm very committed to a 95% graduation rate in our district. I know that school has a piece of that puzzle, and that in order for our kids to see themselves graduating, they have to have also a picture of what is possible…When asked 'What job do you want?,' they are still saying fashion design or some of these other typical responses. We're trying to change that for our kids, so it's the exposure that really is I think key. We have to get more and more kids seeing it from different angles. Techbridge is one of them."

Principals also said the program aligns with their schools' goals and complements what students get during the school day. One said:

> "I like just the opportunity that girls have to be really project-based. To be having the opportunity to be creative and imaginative, and embark on some learning that they don't normally get to do on a

> day-to-day basis. As much as it would be great we had a lot of these kind of opportunities, and built in our program, it’s just not where it needs to be. The fact that girls have a different kind of opportunity that’s not presented on a day-to-day basis. Then just the unity and the cooperation and just that opportunity for them to be together in a very unique situation, I think also builds trust, support.”

Table 34. There is strong alignment between Techbridge’s goals and the goals of the first expansion site partner (Highline Public Schools)

Alignment Characteristic	Quotes from Highline Public Schools Staff
Strong initial interest from district leadership (including the superintendent) and sustained follow-through by district staff	“Our superintendent is a big innovative, tech savvy person. It’s part of our strategic goal, so he’s always interested in that, and as you know the statistics for girls being in STEM fields, the numbers are low, so it just seemed like the right fit for us…In our earlier STEM efforts, we really looked at equity and access to STEM opportunities, and we had a system that was a little bit like random access STEM-ness, meaning if a kid happened to be at a particular elementary school or middle school, that they’d get these opportunities. So we made a commitment to provide those opportunities more equitably across our schools. We’re simply not there yet, but we’ve made progress, and [Techbridge] fit in with that view quite well. We chose our Race to the Top schools because they’re going deep into the science and math academic work, but we know that’s not the whole answer to getting kids STEM-ready. Part of it is these after school and additional opportunities, so they best opportunities for us are ones that fit into a direction that we are already going in. [Techbridge] didn’t conflict and didn’t compete. It complemented what we were doing.”
Good fit with the district’s current focus (pre-existing STEM initiatives, including STEM Academy schools supported through Race to the Top grant from U.S. Department of Education)	“[When] I came in two years ago, our science scores were low. Our math scores were middle to low. As an instructional leader, I wanted additional support to my school around science and math. Science especially. Often in elementary, it has been something that we’ve kind of forgotten to do, because we’ve emphasized math and reading so much. Then when the opportunity to partner with Techbridge through the STEM Academy, was brought to me, it was really attractive because I know that my girls have not had a lot of science…One of the goals of the program is to show them that there are girls like them in the technology and science fields. I feel like that’s really important for their college- and career-going sort of mindset.”
Large percentage of students from groups that are underrepresented in STEM	“I think we’re heavily invested in our kids having all of the opportunities and advantages that some other communities might have that ours doesn’t. We have a very diverse community, a lot of immigrants, we have a lot of languages here. We have kids that live in poverty, a lot of kids that have experienced trauma, and that we are committed to making sure they work through those kind of barriers, but not let them stop them in the progress of getting a really decent education. Any kind of opportunities that we can provide that are quality and really do spark their curiosity, and also develop confidence in their learning, we’re all about. I like the extended day so a lot of our kids don’t have to go home to empty homes or hang out on the streets, but actually stay active and involved.”

Alignment Characteristic	Quotes from Highline Public Schools Staff
Proximity to sponsors and potential partners to provide funding, role models, and host field trips	“We just received a huge grant from Boeing and Alaska Airlines to fund Chromebooks, so every student in our building by November next year will be walking out of the building with their Chromebook.”
Schools and district have capacity to support Techbridge model (skilled teachers able/willing to lead after-school program, activity buses)	“One of our struggles with after-school opportunities is it ends up being additional planning for a teacher who works so hard during the day…So I think teachers have considered it a gift that these tried and true materials have come, and they can work alongside somebody who’s been trained with them.”

Stakeholders reported relatively few structural barriers to participating in Techbridge, none of which were “deal-breakers.” Barriers that were reported include:

- Highline teachers typically participate in Professional Learning Communities (PLC) on Wednesdays after school. Because of Techbridge’s staffing model, one of the programs met on Wednesdays and the teacher could not attend the PLC meeting.

- District staff originally assumed Techbridge would provide transportation support for participating elementary school girls to get home after the program. (Middle schools already had funding for after-school activity buses.) Some of the principals had funding to support their own activity buses, and the district kicked in extra funds to provide activity buses for another two schools.

- A few principals and teachers said that while they support Techbridge being a girls-only program, they wish that they could offer something similar to boys. One teacher said they would allow male siblings or cousins to come in to the last five minutes of the program. “A lot of our boys have asked this year, ‘Can I join Techbridge girls?’ They hear about it, or they see it, and they think it’s really cool.” Another district stakeholder said:

> “It’s only girls, which is totally purpose of the program. I’ve had some parents and students beg for a like program for boys which again I think because we’re in a community that is maybe traditionally underserved but actually it would be an equity piece to have one for our boys as well as our girls. In other communities, it makes more sense for it to be just girls. I wouldn’t want to put the boys in with the girls. Our charge is to maybe come up with something maybe as a district or maybe as a school that makes that for boys. I’m just not quite sure what that looks like, but we have had some requests for that. That is not a disincentive in any way, but it’s just kind of a complaint. If we’ve had any complaints at all, [it] is that we want more options like it.”

8.1.3 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)?

Techbridge was potentially affected by district priorities and funding, including:

- As previously noted, five of the seven Greater Seattle schools receive Race to the Top funds to support STEM learning. In addition, a few schools have a partnership with the University of Washington's College of Education, which is revising the schools' science kits to align with the Next Generation Science Standards and providing individual coaching. As one stakeholder noted, "I would imagine that Techbridge would complement that work."

- The district has a contract with an external partner to manage the after-school programs at three of the Techbridge schools, and that external partner recently changed. One district stakeholder said, "To me, it went relatively seamless for one organization to go under, and another organization to acquire their program, and keep it running, so that was huge, but we're definitely at a crossroads with what we're doing, because it's not what it was when we started that partnership five years ago."

- Two of the schools have Race to the Top Deep Dive funding which supports on-site, certified staff to coordinate their after-school programs. These programs use the ESTEAM model (exercise, science, technology, engineering, arts, and math).

Each of these factors may have been agonists rather than antagonists (to use a chemical reaction analogy) for Techbridge's partnership with schools in Greater Seattle.

8.1.4 What formal and informal communication structures evolve between the Techbridge Bay Area office and the Greater Seattle office?

A number of formal and informal communication structures have evolved (and likely will continue to evolve) between the Bay Area office and the expansion sites.

Formal structures include:

- One-week staff onboarding held in the summer in Oakland. All PCs (new and veteran from all Techbridge sites) participated in the July 2014 and July 2015 trainings. 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.
- Monthly teleconferences for all after-school staff.
- Biweekly virtual Curriculum Roundtables with the Director of Curriculum (who is based in Oakland) and all PCs.
- Central online repository for sharing Techbridge documents.
- Salesforce database software to manage participant and partner information.

Informal structures include:

- At least one PC from the Bay Area regularly contacted the new PCs in Greater Seattle. "She checked on us often to see how we were doing and how things were going."

- PCs reported occasionally contacting the Director of Curriculum to ask questions.
- The Chief Growth and Strategy Officer instituted a tradition where each Techbridge staff member is recognized on their special day once a year. Techbridge staff members send remotely located staff ecards and gift cards.
- Staff occasionally have virtual lunches (via Skype) with members of the Oakland-based executive team, including the Chief Operating Officer.

8.1.5 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?

Quality monitoring systems are still under development, but include:

- Techbridge developed and maintains a series of manuals, including one for the expansion site Executive Directors, one for Program Coordinators, and one on the role models and field trips. Techbridge also developed an online training module to help prepare volunteers to conduct STEM outreach with girls.
- The Bay Area Senior Program Manager came to Seattle to train the PCs in how better integrate science content into lessons. She also observed a role model training and programs.
- A Techbridge Program Manager served as the interim program lead during the gap between when the first Greater Seattle ED left and the second one started. She spent a week in the area supporting the PCs.
- PCs meet with their partner teachers after each program meeting to debrief and to plan the next session.

Techbridge plans to train its staff in how to use the DoS observation rubric, and anticipates using it as a tool for program monitoring and improvement throughout its programs in the future.

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

Several unanticipated issues and opportunities emerged that affected Techbridge's implementation in Greater Seattle. First, the Greater Seattle Area programs are 90 minutes long instead of 120 minutes, as in the Bay Area. (The Washington, DC programs are also 90 minutes.) 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.

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.

- The original Greater Seattle Executive Director resigned in February 2015. Teachers, principals, and district staff said her departure did not negatively impact the program, thanks in large part to the efforts of the two Greater Seattle PCs. A Techbridge Program Manager, who works on various special projects on an as-needed basis, came to Seattle for a week and provided additional in-person and remote support. A district stakeholder said, "When [the ED] left, I think [the PCs] did a really good job of taking up the reins. I'm sure they felt it from their end, but on my end, I didn't feel anything and I think that's commendable to the type of women they are. That's just a kudos to them." Another stakeholder said, "Checking in with the teachers, that transition was seamless. It didn't affect the kids and the teachers working in the program." Although the turnover in the ED position did not affect program implementation, the Greater Seattle Area is behind its original external fundraising goals. The new Greater Seattle ED is making developing partnerships and exploring funding sources a priority.

- Other staffing changes included the temporary absence of two Oakland-based staff who play a key role in supporting the project (the Director of Curriculum and the Chief Growth & Strategy Officer, both on maternity leave), the temporary lack of a Director of Development and Communications (who helps support the expansion EDs in fundraising), and the departure of the Bay Area Senior Program Manager in fall 2014.
- Three of the school principals at the Techbridge schools left in the summer of 2014, shortly before the Techbridge programs started. However, all of the incoming principals were supportive of Techbridge.
- 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.
- In the summer of 2015, Techbridge's Executive Director announced her planned departure in December of 2015.

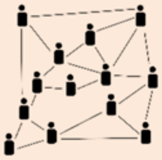
Finally, in the spring/summer of 2015, Techbridge leadership decided to scale back on two of its original expansion plans. First, the leadership team decided not to add high school programs in the Greater Seattle Area in 2015-2016 as originally planned. The team felt that it would not be worthwhile to train one of the PCs in how to implement the high school curriculum since it would only be implemented in one school (the curriculum is also in the process of being revised for the Bay Area programs). Instead of including a high school, Techbridge revised its agreement with Highline Public Schools to add a third middle school.

A second, more significant change is that Techbridge decided not to expand to a third city as originally proposed. With the addition of the Greater Seattle programs in 2014 and 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 is straining the operations side of the organization (e.g., accounting), which is currently working on ways to streamline and add capacity to support the growth.

8.1.7 What resources do project leadership and program partners each provide and are they sufficient (including funding, equipment, space, human capital, leadership, and time)?

The Highline Public School District, partnering schools, and external partners all provided resources that helped support the program. Stakeholders seemed to agree that the resources were sufficient, although some mentioned concern about sustaining the program once the NSF grant ends (addressed in next section).

Table 35. Multiple partners provided resources to the Greater Seattle Techbridge expansion site in 2014-2015

Partner	Resources Provided
Highline Public Schools 	• Selected partner schools, brokered connections between Techbridge and school principals, and helped select partner teachers • Helped publicize the program through the district's website and social media (Facebook and Twitter) • Snacks/light dinner for all participants • Paid for after-school activity buses at two programs whose principals lacked funds • Met with Techbridge staff on regular basis
Principals 	• Supported teachers' involvement in Techbridge • Paid for after-school activity buses (some schools) • Paid for substitute teachers so Techbridge teacher could go on field trips during the school day • Contribute annual funding toward Techbridge
External Partners 	• Hosted field trips • Provided role models to visit Techbridge programs

8.1.8 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?

Techbridge originally planned for the expansion sites to become self-sustaining within three years. One Techbridge staff member described what amounts to a funding catch-22—prospective local partners want to see the program in action before committing their support, but the programs need to build significant local support quickly in order to be sustainable. 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. Techbridge is exploring various options for reducing expenses and/or raising additional revenue, including hiring AmeriCorps members to serve as Program Coordinators, applying for national-level grants (now that Techbridge has a national reach), and adding more development capacity.

Principals were asked for their suggestions about ways to sustain the program. Several suggested that Techbridge reach out to various local corporations and foundations. One principal said:

> "I would tap Boeing. I would tap Amazon. I would tap [the] Gates [Foundation]. I would tap Alaska Airlines. All four of them partner with us as a system and in the region, and fund a lot of education and have a lot of interest, obviously, around STEM educated kids. I would say that if we were looking for that, that's where I would start. But there's other smaller funders. We have our own fundraising organization within the district called the Highline Schools Foundation. I'm sure they would be interested to participate if we needed them to. That's mostly money that we raise ourselves

> within the community. But they raise good chunks of money every year to support many grants to classrooms and things like that."

The Highline Public Schools are already thinking about ways to sustain the program. The district does not have a dedicated grantwriter; district leaders said it would be helpful to have Techbridge take the lead in identifying grant opportunities and developing proposals. The Greater Seattle Area ED recently collaborated with the Highline Public Schools on their Race to the Top renewal application. District staff wondered if there were other ways that they could continue their association with Techbridge beyond the end of the NSF grant:

> "Another avenue could be, since we're brand new to this, is there another grant opportunity that we could work together to do that [sustain Techbridge]? I just don't know what the interplay is of people who've done this for more than one year, so I don't know what the option is. Do we have access to materials? Do we have to buy them? Do we have to be a partner to use the name of Techbridge?"

8.1.9 What's considered to be "working" and "not working" as the expansion unfolds?

Participating girls, parents, teachers, principals, and district staff were almost universally very positive about Techbridge and eager to see the program continue. Teachers said they thought Techbridge was a valuable program. One teacher said:

> "I am impressed with the program and with the people that work for Techbridge and how easy it has been to work with [my PC], in particular. I just think it's such an amazing opportunity for the girls—again, something that I don't think they'd have access to [otherwise]. I'm really appreciative of the program, and I hope it sticks around for a long time."

One stakeholder said, "I think for a pilot program it's exceeded our expectations. I think there have been relatively few bumps, and probably where it counts, at the kid level, minor."

Principals were universally appreciative of Techbridge. One principal said, "I support the program. The kids like the program. It seems like it's a very good fit for a school." Another said:

> "It's been great. It's gone beyond my original expectations…When I've gone up there and seen what girls are doing, they were excited. They're working together. They're learning those skills that are going to … The ability to work in groups and solve. Do some problem solving to support one another in their learning. I think these are skills that I'd like all my kids to be able to have and successfully do on a daily basis."

Another principal expressed a long-term commitment to the program:

> "I know that we're moving forward next year. I can't imagine a year from now not wanting to move forward. It's the kind of thing that, especially over time, could really help several cohorts of girls really move in the right direction in terms of STEM related fields. If the opportunity was there and we have the right fit, I don't know why we wouldn't keep doing it for as long as we can."

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 2014-2015 findings from Techbridge's first year of implementation in the Greater Seattle Area.

Girls

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 students' understanding of how SET is relevant to their own lives and students' plans to pursue SET education. While many participants appear to have developed the confidence and habits of mind that may help them pursue a career in SET, they may also still have a superficial understanding of what SET workers really do and only a vague idea about how to get there. Multiple Techbridge stakeholders suggested that it would be helpful to make (even) more concrete and explicit connections between what the students see and do in Techbridge, and SET educational and career pathways.

Teachers/Schools

Consider additional creative ways to keep principals and school district leaders informed about the program. One Greater Seattle principal suggested Techbridge invite principals to visit their school's Techbridge program together with the Executive Director:

> "I'm sure they've reached out and tried to educate principals, but just maybe there could be [a] 'It's principal visiting day! Did you go out and visit your Techbridge classroom?' Or how about we go together, like have the person who [supervises the PC] say, 'Let's go visit the classroom and we can narrate what they're doing and why they're doing it.' Maybe just some concerted support for building administrators to have a closer eye on what's going on."

Consider providing additional professional development to teachers (and PCs) about specific ways they can foster students' growth mindset. One teacher said it would be helpful to have specific examples of what to say to students that would help them in this area. She noted that another Techbridge teacher had mentioned at one of the trainings that a colleague might have resources to share:

> "One of the [other Techbridge] teachers said, 'Oh, yeah, one of our teachers in our school actually teaches growth mindset to their kids,' and they have their big list of here's things you would say if you have a fixed mindset versus a growth mindset. They actually take the time to teach it. I went home and was trying to research ideas for lesson plans, and couldn't find that much out there unless I invented something myself. And the reality of schools is that got pushed aside. I just remember being really inspired and feeling empowered by that myself and wanting to

> bring that back to my own classroom and also experience that in Techbridge, and I guess didn't see that so much. But it's still something that I hold onto and want to learn more about myself."

Role Models

Consider adding more field trips and role model visits, which were particularly powerful ways of introducing girls to SET careers and career pathways.

Recruit participants' family members who have SET-related jobs or hobbies and ask them to serve as role models. In focus groups, several girls mentioned that they have parents, older siblings, other relatives or family friends who are currently working in or studying SET. Techbridge could encourage these individuals to join the role model community, which would not only help build the support network for all Techbridge participants but also reinforce the idea that their own community has expertise in SET.

Role models requested that Techbridge provide greater lead time before visits (so they have more time to prepare), a list of common questions from girls, and more information on what topics girls might be most interested in prior to their visits.

When asked for suggestions about how to recruit a diverse pool of role models, the Greater Seattle role models suggested having a greater social media presence; recruiting students and faculty from local colleges and universities; and connecting with various groups like the Washington Technology Industry Association, special-interest SET organizations (like NSBE, HENAAC, and SWE), and tech company's affinity groups (like Amazon and Boeing).

Families

Ensure Techbridge's written and oral communications are accessible to all girls' families. Teachers and principals said it was valuable to have Techbridge's written materials (including enrollment paperwork, family guides, and surveys) translated into other languages, and thought materials should be translated into additional languages. For Greater Seattle, the most frequently mentioned language needs were Spanish and Vietnamese (which Techbridge has also historically made available in the Bay Area), as well as Somali and Cambodian (which are new language needs for Techbridge). One teacher said, "I think having it in Spanish was really helpful. I would recommend Somali especially for our school, because we have a pretty big Somali population. Even with our Family Nights, they ask for it. 'Do you have a Somali copy of this, that, and the other?'"

Some stakeholders also requested that Techbridge find ways to facilitate parents' understanding of oral communications. Some Techbridge facilitators asked girls to translate for their parents during Family Nights, and one had a bilingual parent attend their field trips and translate into Spanish as needed. One stakeholder wondered if professional translators was an option:

> "Could we get actual translators from Techbridge? The district can offer them but that's an expense on the school and that's a logistical arrangement. We don't have a lot of translators to share. [It] could be something [to do] if they're really dedicated to reaching out those communities, maybe they provide adult translators for that event. Maybe some multiple translations of materials into some different languages other than just Spanish."

Consider whether to streamline the parent packet forms and/or provide more visual clues to help parents know which parts they must complete, sign, and return to enroll their daughter in Techbridge. Techbridge has already taken steps to revise the forms for 2015-2016 since data were collected from Greater Seattle's first year of implementation. The majority of teachers reported that they did not think the parent packets were a barrier to girls enrolling in the program in 2014-2015. As one teacher said, "No problems were reported to me, and it was provided in multiple languages, which was really helpful…I mean it was a lot of paperwork and some of them I had to send back and say you forgot these spots, but I think that's normal with any paperwork you send home." However, a few teachers said they thought the packets were too long or confusing. Multiple interviewees mentioned that some parents are not necessarily literate in their primary language (e.g., Somali is primarily an oral language), so even translating the forms might not be sufficient. Suggestions included adding pictures/icons to the forms to clearly indicate to parents (and teachers/PCs) which sections should be signed; having someone fluent in other languages at recruiting events (like school open houses) to assist parents in filling out the forms; and calling individual families to encourage parents to enroll their child in Techbridge and offer assistance in filling out the forms.

Continue to inform and engage families in Techbridge. Families were appreciative of all the information that Techbridge provides about what their daughters do in Techbridge. A few parents were eager to know even more or to become involved in Techbridge activities. Some parents were especially eager to join field trips. As previously mentioned, involving family members as role models is another possible way to engage some families. PCs communicating regularly with parents (such as when a girl is absent) was thought to be very powerful.

Consider finding additional ways to engage siblings, which stakeholders said was a good way to engage families. One teacher commented that attendance at their Family Night was high because they invited the whole family. Another teacher said:

> "Family engagement is just something we as a community struggle with. A lot of our parents, they work double shifts, and both parents are working. Time, just the sheer availability, is the biggest barrier. Language-wise is the other part that makes people hesitant, and the fact that there are a lot of younger kids. If there was a way that we could maybe facilitate activities with younger siblings. I don't know if we'd be able to do this once a week, but have an opportunity where girls can become an instructional group leader or activity leader in the language that they speak. I think that would engage parents a lot more, and families who are a part of that community."

Capture and share effective practices and lessons learned for increasing attendance at Family Nights. Each school tried different strategies to try to get a large number of Family Nights. Sharing this information across programs (including the new Techbridge expansion sites) could result in higher Family Night attendance at all sites.

Considering offering Family Nights at additional times during the week. One teacher said his/her school schedules student conferences in both the mornings and the evenings so parents are more likely to be able to attend, and wondered if Techbridge could offer a family event in the morning before school or on a Saturday morning.

Provide families with more information about specific educational opportunities and resources in SET. A few interviewees suggested sharing more information with parents about SET classes, scholarships, and internships for their children. Families were also interested in more SET activities they could do at home.

Program Design, Curriculum, and Professional Development

Revise the curriculum to explicitly accommodate the 90-minute length of the programs. The Greater Seattle 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. The Washington, DC programs are also 90-minutes long. While the facilitators were flexible and found creative ways to adjust the curriculum—designed for two-hour-long programs—Techbridge may want to make more deliberate and consistent choices about what can be eliminated from the curriculum and what is essential to keep.

Incorporate additional scaffolding in the curriculum regarding science-related content. Feedback from teachers and Dimensions of Success observations suggest that SET content is an area of growth for Techbridge. One teacher noted:

> "I think one of the things that stood out to me is when they were teaching the curriculum, it wasn't very thorough on the STEM side. It was just a very quick run-through of the science concepts. I was feeling a little bit confused. I just thought to myself, 'If I'm confused, then these girls are going to be definitely confused.' I feel like we both had to use our own background knowledge to add into what we were teaching the girls."

Similarly, find additional ways to scaffold girls' learning about the engineering design process. One teacher said, "We had to keep revisiting it [the engineering design process] over and over again because it's not something that's intuitive or that they would necessarily remember." Suggestions included asking role models to explicitly talk about using the engineering design process, and asking girls to talk during reflections about what parts of the engineering design process they used.

Consider providing a more structured professional development program for teacher meetings across Techbridge. Providing regional teams with a more detailed teacher training curriculum and activities—while still allowing room for local customization—could create organizational efficiencies (so each team would not need to spend time developing their own trainings) and ensure that Techbridge's messaging is consistent.

Develop processes to facilitate sharing about innovations across Techbridge, so that other teams learn about innovations like Greater Seattle's having girls use their journals to record their ideas throughout the engineering design process and having girls lead the "Shout Outs" and "Glorious Goofs" discussions at the end of programs. Perhaps Techbridge program team meetings could include a standard agenda item for each site to share their own "Imaginative Innovations" as well as "Glorious Goofs" related to particular topics, like recruitment, retention, curriculum, and family involvement.

Find additional ways to show PCs and teachers what Techbridge programs should and can look like, and foster cross-program learning within each region. Suggestions included sharing video clips of programs during trainings (especially during staff onboarding and the first teacher training), and building in time for PCs to observe one another's programs during the year.

> "Even though we were going through curriculum and talking about what Techbridge does and wants to accomplish, I still did not know what a program was supposed to look like [before we started]. I'm not saying that every program looks the same, but I had no true idea of how it was going to go. I just knew the components of what was supposed to be happening during the program."

Provide more information about SET careers and educational pathways. Survey and interview results suggest that programs could use more guidance in this area. Suggestions included: listing SET career and educational resources within each curriculum module; creating a list of math and science classes that girls could take before they graduate from high school and that are offered in college; and encouraging every adult to talk about their educational journey (including teachers, PCs, role models, and any other Techbridge visitors). The information provided to middle school students may need to be different than what is provided to elementary students. One teacher suggested:

> "I think it would be helpful to have a list of careers...like say, electrical engineering. And then a list of cool things that the girls can do with it, like design roller coasters, or design shoes, or something that relates to fashion and music because that is a big thing that they are really into. Different ways that the engineering subjects that we are learning about can fit into things that they are interested in. If we could have a list and different resources related to that, it would be helpful."

Another teacher suggested:

> "In the back of the curriculum, we have some resources, but I don't feel like it is enough, especially if they want us to connect to the girl and get that girl that real-world connection. I don't feel like we are given enough resources to do that. I feel like it is a lot of looking and searching. That takes a lot of time away from your prepping."

Some stakeholders suggested Techbridge change aspects of its program structure so more girls could benefit, by offering Techbridge more frequently, allowing girls to attend Techbridge for only part of the school year so they could participate in other after-school activities, and allowing teachers to co-facilitate Techbridge for only part of the year.

A few principals and several parents requested that Techbridge offer the program more than once a week. One principal said:

> "I don't know if it would be possible to have it twice a week. I think once a week is great, but for our kids, they need more dosage. More of that regular connection, and a lot of it is just solely based on relationship building, and re-enforcing that what we're doing warrants regular attention. Not just once a week, but a lot more, because that continuity, that consistency, the building up the skill by practicing it. That's what our kids really need."

Allow girls (and/or partner teachers) the option to participate in the program on a quarterly or semester-by-semester basis. One school leader said:

> "I think it matches our school more to not have it be a full-year program... We're pretty heavy into sports here and we have a cycle of sports... If there was the option where [girls] could just join up for six, seven weeks and they could plan for that. If they knew they were going to do fall sports and spring sports, they could join for just the winter quarter...That in my mind would probably be the biggest thing to increase the numbers because some of the girls felt tied in. They wanted to do other stuff, they didn't like coming very single week, and the parents wanted them to come every week."

A school leader wondered if teachers could rotate the responsibility of co-facilitating Techbridge:

> "I know one of the struggles in finding a new teacher partner is the same issue is that there's nobody that wants to do a full year commitment and the option has been, 'Can't there be teachers who share the commitment?' So it's on a quarterly basis."

Techbridge has previously considered at least some of these changes and decided that it does not have the capacity to do so, or such changes would not be in the best interests of the girls.

9.2 Conclusion

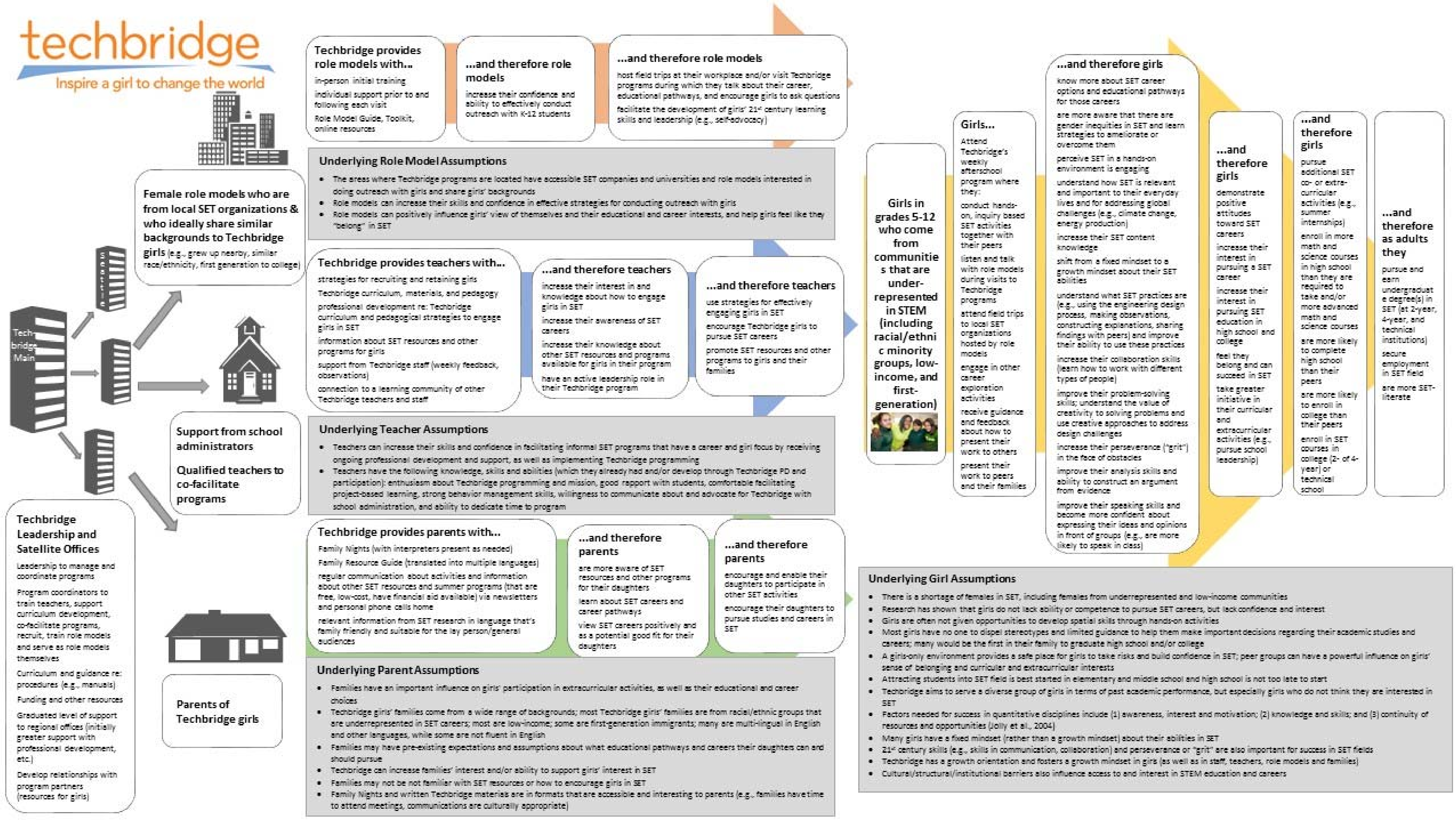
In summary, in 2014-2015 Techbridge successfully expanded to its first city outside of the San Francisco Bay Area, launching seven after-school programs for elementary and middle school girls near Seattle, WA. Highline Public Schools district leaders, principals, and teachers demonstrated a strong commitment to partner with Techbridge as well as the capacity to support implementation of the program. The Greater Seattle Program Coordinators were able to recruit a diverse group of 5th-8th grade girls to participate in the program, as well as a diverse group of women in SET to serve as role models. Girls, families, teachers, role models, school and district leaders from Greater Seattle all rated Techbridge highly.

Techbridge's hands-on 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. Several students said that the program was specifically empowering to them as girls. 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 report they understand and are interested in various SET career options; have improved collaboration skills and a growth mindset; and report greater family support in SET.

Techbridge has recently added an eighth school partner in Greater Seattle, and has begun implementing programs in its second expansion city, Washington, DC. Techbridge is at an important junction as it continues to scale up its programming while simultaneously undergoing changes in leadership and staff responsibilities (e.g., Techbridge's founding Executive Director will be leaving the organization in December 2015). May Techbridge continue to "shout out" its achievements and celebrate and learn from its "glorious goofs," just as it encourages girls to do.

Appendix A: Program Logic Model

Program Logic Model



Female role models who are from local SET organizations & who ideally share similar backgrounds to Techbridge girls (e.g., grew up nearby, similar race/ethnicity, first generation to college)

Support from school administrators

Qualified teachers to co-facilitate programs

Parents of Techbridge girls

Techbridge Leadership and Satellite Offices

Leadership to manage and coordinate programs

Program coordinators to train teachers, support curriculum development, co-facilitate programs, recruit, train role models and serve as role models themselves

Curriculum and guidance re: procedures (e.g., manuals)

Funding and other resources

Graduated level of support to regional offices (initially greater support with professional development, etc.)

Develop relationships with program partners (resources for girls)

Techbridge provides role models with…

in-person initial training

individual support prior to and following each visit

Role Model Guide, Toolkit, online resources

…and therefore role models

increase their confidence and ability to effectively conduct outreach with K-12 students

…and therefore role models

host field trips at their workplace and/or visit Techbridge programs during which they talk about their career, educational pathways, and encourage girls to ask questions

facilitate the development of girls' 21st century learning skills and leadership (e.g., self-advocacy)

Underlying Role Model Assumptions

- The areas where Techbridge programs are located have accessible SET companies and universities and role models interested in doing outreach with girls and share girls' backgrounds
- Role models can increase their skills and confidence in effective strategies for conducting outreach with girls
- Role models can positively influence girls' view of themselves and their educational and career interests, and help girls feel like they "belong" in SET

Techbridge provides teachers with…

strategies for recruiting and retaining girls

Techbridge curriculum, materials, and pedagogy

professional development re: Techbridge curriculum and pedagogical strategies to engage girls in SET

information about SET resources and other programs for girls

support from Techbridge staff (weekly feedback, observations)

connection to a learning community of other Techbridge teachers and staff

…and therefore teachers

increase their interest in and knowledge about how to engage girls in SET

increase their awareness of SET careers

increase their knowledge about other SET resources and programs available for girls in their program

have an active leadership role in their Techbridge program

…and therefore teachers

use strategies for effectively engaging girls in SET

encourage Techbridge girls to pursue SET careers

promote SET resources and other programs to girls and their families

Underlying Teacher Assumptions

- Teachers can increase their skills and confidence in facilitating informal SET programs that have a career and girl focus by receiving ongoing professional development and support, as well as implementing Techbridge programming
- Teachers have the following knowledge, skills and abilities (which they already had and/or develop through Techbridge PD and participation): enthusiasm about Techbridge programming and mission, good rapport with students, comfortable facilitating project-based learning, strong behavior management skills, willingness to communicate about and advocate for Techbridge with school administration, and ability to dedicate time to program

Techbridge provides parents with…

Family Nights (with interpreters present as needed)

Family Resource Guide (translated into multiple languages)

regular communication about activities and information about other SET resources and summer programs (that are free, low-cost, have financial aid available) via newsletters and personal phone calls home

relevant information from SET research in language that's family friendly and suitable for the lay person/general audiences

…and therefore parents

are more aware of SET resources and other programs for their daughters

learn about SET careers and career pathways

view SET careers positively and as a potential good fit for their daughters

…and therefore parents

encourage and enable their daughters to participate in other SET activities

encourage their daughters to pursue studies and careers in SET

Underlying Parent Assumptions

- Families have an important influence on girls' participation in extracurricular activities, as well as their educational and career choices
- Techbridge girls' families come from a wide range of backgrounds; most Techbridge girls' families are from racial/ethnic groups that are underrepresented in SET careers; most are low-income; some are first-generation immigrants; many are multi-lingual in English and other languages, while some are not fluent in English
- Families may have pre-existing expectations and assumptions about what educational pathways and careers their daughters can and should pursue
- Techbridge can increase families' interest and/or ability to support girls' interest in SET
- Families may not be not familiar with SET resources or how to encourage girls in SET
- Family Nights and written Techbridge materials are in formats that are accessible and interesting to parents (e.g., families have time to attend meetings, communications are culturally appropriate)

Girls in grades 5-12 who come from communities that are under-represented in STEM (including racial/ethnic minority groups, low-income, and first-generation)

Girls…

Attend Techbridge's weekly afterschool program where they:

conduct hands-on, inquiry based SET activities together with their peers

listen and talk with role models during visits to Techbridge programs

attend field trips to local SET organizations hosted by role models

engage in other career exploration activities

receive guidance and feedback about how to present their work to others

present their work to peers and their families

…and therefore girls

know more about SET career options and educational pathways for those careers

are more aware that there are gender inequities in SET and learn strategies to ameliorate or overcome them

perceive SET in a hands-on environment is engaging

understand how SET is relevant and important to their everyday lives and for addressing global challenges (e.g., climate change, energy production)

increase their SET content knowledge

shift from a fixed mindset to a growth mindset about their SET abilities

understand what SET practices are (e.g., using the engineering design process, making observations, constructing explanations, sharing findings with peers) and improve their ability to use these practices

increase their collaboration skills (learn how to work with different types of people)

improve their problem-solving skills; understand the value of creativity to solving problems and use creative approaches to address design challenges

increase their perseverance ("grit") in the face of obstacles

improve their analysis skills and ability to construct an argument from evidence

improve their speaking skills and become more confident about expressing their ideas and opinions in front of groups (e.g., are more likely to speak in class)

…and therefore girls

demonstrate positive attitudes toward SET careers

increase their interest in pursuing a SET career

increase their interest in pursuing SET education in high school and college

feel they belong and can succeed in SET

take greater initiative in their curricular and extracurricular activities (e.g., pursue school leadership)

…and therefore girls

pursue additional SET co- or extra-curricular activities (e.g., summer internships)

enroll in more math and science courses in high school than they are required to take and/or more advanced math and science courses

are more likely to complete high school than their peers

are more likely to enroll in college than their peers

enroll in SET courses in college (2- of 4-year) or technical school

…and therefore as adults they

pursue and earn undergraduate degree(s) in SET (at 2-year, 4-year, and technical institutions)

secure employment in SET field

are more SET-literate

Underlying Girl Assumptions

- There is a shortage of females in SET, including females from underrepresented and low-income communities
- Research has shown that girls do not lack ability or competence to pursue SET careers, but lack confidence and interest
- Girls are often not given opportunities to develop spatial skills through hands-on activities
- Most girls have no one to dispel stereotypes and limited guidance to help them make important decisions regarding their academic studies and careers; many would be the first in their family to graduate high school and/or college
- A girls-only environment provides a safe place for girls to take risks and build confidence in SET; peer groups can have a powerful influence on girls' sense of belonging and curricular and extracurricular interests
- Attracting students into SET field is best started in elementary and middle school and high school is not too late to start
- Techbridge aims to serve a diverse group of girls in terms of past academic performance, but especially girls who do not think they are interested in SET
- Factors needed for success in quantitative disciplines include (1) awareness, interest and motivation; (2) knowledge and skills; and (3) continuity of resources and opportunities (Jolly et al., 2004)
- Many girls have a fixed mindset (rather than a growth mindset) about their abilities in SET
- 21st century skills (e.g., skills in communication, collaboration) and perseverance or "grit" are also important for success in SET fields
- Techbridge has a growth orientation and fosters a growth mindset in girls (as well as in staff, teachers, role models and families)
- Cultural/structural/institutional barriers also influence access to and interest in STEM education and careers

Appendix B: Methodology

The evaluation utilized 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 develop each of the instruments to meet the needs of both the evaluation and research (when possible) and minimize the data collection burden on participants. Institutional Review Board (IRB) approval was received before data collection began.

Data about Techbridge's implementation and impact were collected from girls, parents, teachers, school principals, district representatives, role models, and Techbridge staff. In May 2015, EDC and CERC conducted joint site visits to four of the seven Greater Seattle programs to conduct focus groups with girls and interview teachers, principals, district leaders, and Techbridge staff. The evaluation team also conducted observations of selected programs, analyzed attendance records, attended Techbridge planning meetings and trainings for teachers and staff, and reviewed relevant Techbridge documents. The evaluation instruments and data collection methods are shown in Table A and described in more detail after the table.

Table A. Evaluation Instruments and Administration Notes

Source	Evaluation Instrument	Administration Date	Participation/Response Rate
Girls	*Participant Pre/Post Annual Surveys*	October 2014 (pre) and May 2015 (post)	• 141 Techbridge participants in Greater Seattle completed the pre-survey • 136 completed the post-survey • 104 completed both surveys (73%)
	Comparison Student Pre/Post Annual Surveys	October/November 2014 (pre) and May 2015 (post)	• 135 comparison students in Greater Seattle completed the pre-survey • 92 completed the post-survey • 85 completed both surveys (68%)
	Participant Focus Groups	May 2015	• 6 focus groups were conducted at 4 Techbridge sites in Greater Seattle with a total of 25 participants
	Embedded Assessments	Fall 2014 and Spring 2015	• 22 girls across 5 programs (in fall) • 20 girls across 5 programs (in spring)
Teachers, Schools, District	*TB Teacher Survey*	May/June 2015	• 6 of 7 teachers in Greater Seattle completed the survey (86%)
	TB Teacher Interview	May 2015	• All 7 teachers in Greater Seattle (100%)
	Principal Interview	May 2015	• All 7 principals in Greater Seattle (100%)
	District Leader Interview	May 2015	• 3 district representatives who were involved in the effort
	Participant and Comparison School Records	Data requested from Highline Public Schools	• Currently awaiting baseline records (for 2013-2014) and records for 2014-2015
Parents	*Parent Survey*	May 2015	• 84 parent surveys were completed (62% of the Techbridge girls in Greater Seattle who completed a student post-survey had parents who completed a parent survey)
	Parent Interview	May 2015	• 28 parents/grandparents from 5 Techbridge programs in Greater Seattle were interviewed
Role Models	*Role Model Survey*	June 2015	• 25 of 54 role models responded to the survey (46%)
Techbridge Staff	*TB Staff Interview (Main Office)*	August 2015	• 3 staff from the Techbridge leadership team were interviewed (the Executive Director, Chief Operating Officer, and Chief Growth and Strategy Officer)
	TB Staff Interview (Expansion Sites)	May 2015	• 2 program coordinators from the Greater Seattle office (interview conducted after first Seattle Executive Director left and before second ED hired)

Source	Evaluation Instrument	Administration Date	Participation/Response Rate
Other	*Dimensions of Success Ratings*	November 2014 and May/June 2015	• Observed 5 of the 7 Techbridge after-school programs located in Greater Seattle two times each
	Observe Expansion Site Training	July 2014 July 2015	• Observed staff onboarding for Techbridge program coordinators
	Observe Teacher Training	August 2014	• Observed part of first training session for Techbridge teachers in Greater Seattle
	Attend AISL TB Committee Meetings	March – June 2014	• Participated in bi-monthly planning meetings held by the Techbridge leadership team
	TB-Specific Fidelity Rubric	November 2015	• Draft included in this report; to discuss and complete together with Techbridge leadership
	TB Attendance Records	Ongoing	• Techbridge staff recorded the total number of students in attendance at each program each week and shared these data with the evaluation team
	Document Review	Ongoing	• Reviewed training manuals, curriculum materials, etc.

Student Pre- and Post-Surveys – Techbridge participants and comparison students were given a pre-survey during the first few weeks of programming in the fall of 2014 and a post-survey during the last few weeks of programming in May 2015 (see Appendix J for the pre- and post-surveys given to Techbridge participants and Appendix K for the pre- and post-surveys given to comparison students). The surveys asked students about their attitudes and interests in science, engineering, and technology (SET); career interests; involvement with science and technology activities outside of school; and demographic information. Most of the questions appeared on both pre- and post-surveys in order to assess changes over time in girls' SET attitudes, interests, and involvement. The Techbridge participant post-survey included additional questions that were asked only at the end of the year regarding girls' view of the degree to which Techbridge had impacted them. The majority of the survey questions were asked on a six-point agreement scale where 1 = "Disagree a lot" to 6 = "Agree a lot." Girls were also asked to give Techbridge a grade, explain their rating, and describe what they liked most about the program. The survey was administered on paper in the fall and online in the spring.

Two groups of students (all of whom had permission from their parents to participate in the evaluation) completed the pre- and post-surveys:

1. Girls participating in the seven Greater Seattle programs.
2. A comparison group of girls not participating in Techbridge who were from the same schools. Data from the comparison group were used as a proximate measure of changes unrelated to Techbridge that affected participants and non-participants (such as changes related to school curriculum, maturation, and other environmental and cultural factors) in order to measure changes in students' attitudes and knowledge that are attributable to Techbridge program activities.

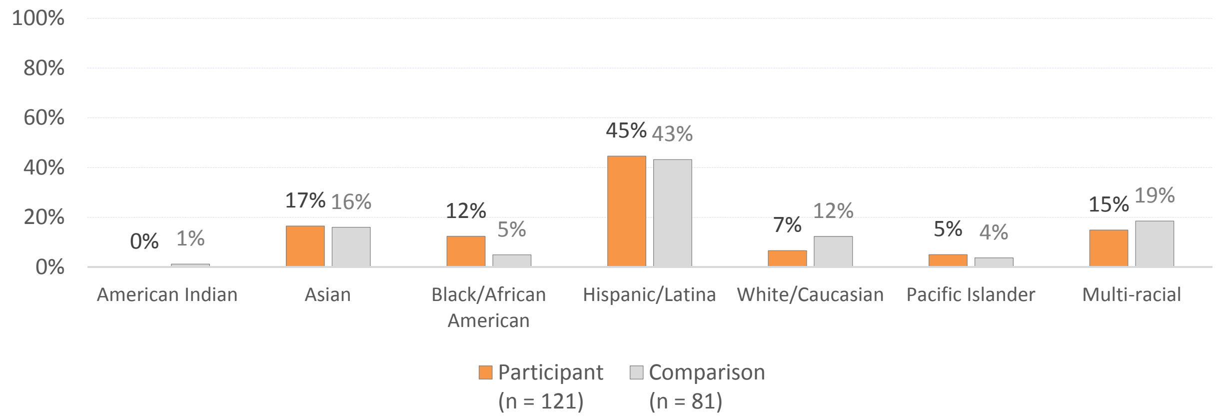
Table B (on the following page) shows the number of Techbridge participants and comparison students from each Seattle area school who completed the student pre-survey, post-survey, and both surveys (i.e., "matched").

Table B. Number and Percent of Matched Student Surveys by Group (2014-2015 Surveys)

		Techbridge Participants				Comparison Students			
	School District	Number of Pre-Surveys	Number of Post-Surveys	Number of Matched Pre- & Post-Surveys	Percent of Pre-Surveys Matched to Post-Surveys	Number of Pre-Surveys	Number of Post-Surveys	Number of Matched Pre- & Post-Surveys[1]	Percent of Pre-Surveys Matched to Post-Surveys
Elementary Schools									
Beverly Park Elementary	Highline	26	21	18	69%	5	5	5	100%
Hazel Valley Elementary	Highline	18	22	12	67%	20	13	12	60%
Madrona Elementary	Highline	27	24	19	70%	30	16	13	43%
McMicken Heights Elementary	Highline	26	26	24	92%	26	18	16	62%
Mt. View Elementary	Highline	13	17	9	69%	22	17	17	77%
Middle Schools									
Chinook Middle School	Highline	14	14	11	79%	14	9	8	57%
Sylvester Middle School	Highline	17	12	11	65%	18	14	14	78%
TOTAL (MEAN MATCHING)		141	136	104	(73%)	135	92	85	(68%)

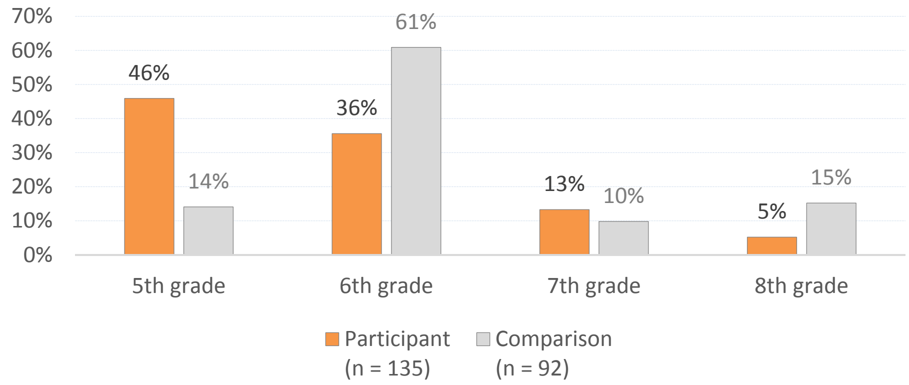
Tables B-D in Appendix C show the demographics of students who completed the post-surveys, including their grade level and race/ethnicity. As can be seen in Figure A below, Techbridge students and comparison students had a similar overall distribution of race/ethnicities.

Figure A. Race/Ethnicity of Techbridge and Comparison Students
Student Post-Surveys



However, Techbridge students were slightly younger than the comparison students (a higher percentage of Techbridge students were in 5th grade than comparison students).

Figure B. Grade level of Techbridge and Comparison Students
Student Post-Surveys



Participant Focus Groups – Members of the evaluation and research teams conducted focus groups in May 2015 with girls from four of the seven Greater Seattle Techbridge programs. The goals of these focus groups were to ask girls about their experiences in Techbridge and how the program had affected them (see Appendix L for the focus group protocol and Appendix D for a summary prepared by CERC of themes that emerged from the student focus groups).

Embedded Assessments – The research team led the development and analysis of embedded assessments to measure girls' learning of key scientific and engineering concepts and practices. The embedded assessment consists of one-on-one, girl-to-girl interviews; one Techbridge participant videos another as she answers questions about a recent Techbridge project they have worked on together, including the engineering design and redesign processes, reflection, and teamwork (see Appendix V for a description of the embedded assessment and scoring rubric). The embedded assessments were piloted in fall 2014 and spring 2015.

Teacher Survey – Six of the seven teachers who led Techbridge activities in the Greater Seattle expansion schools in 2014-2015 completed an online survey in late May/early June (see Appendix M for the teacher survey).[12] Teachers were asked about their responsibilities in the program, the impact the program had on themselves and the participating girls, and the successes and challenges of various program components (including role model visits and field trips). Teachers were also asked for their feedback about teacher meetings.

Teacher Interview – Members of the evaluation and research teams interviewed six Techbridge teachers during site visits to the Greater Seattle programs in May 2015; one teacher was interviewed by phone. Teachers were asked about various program elements, the impact of the program on themselves as teachers and their participating girls, successes and challenges in implementing the program at their school, and suggestions for improvements (see Appendix N for the teacher interview protocol).

Principal Interview – Members of the evaluation and research teams interviewed each of the school principals from the Greater Seattle schools in May 2015. The primary goal of these interviews was to solicit feedback from building administrators about the value of Techbridge to their school, and the impact of the program on their students and teachers (see Appendix R for the principal interview protocol).

District Leader Interview – In May 2015, members of the evaluation and research team jointly interviewed three members of the Highline Public Schools (the STEM Director, Science Specialist, and Family & Community Partnership Liaison), all of whom were heavily involved in supporting the expansion effort to the Greater Seattle area. Questions focus on the history and motivation for the district's partnership with Techbridge, as well as information about the district's related STEM initiatives.

Participant and Comparison School Records – EDC established a data sharing agreement with Highline Public Schools to allow the evaluation team to gather data about students' grades, test scores, and enrollment in science and mathematics classes. EDC requested Highline share data regarding 204-2015 participants (via a secure network) in October.

Parent Survey – This survey—available in English, Spanish, Vietnamese and Somali—was administered to the parents of Techbridge students in April and May 2015 at each program's year-end Family Night event and mailed home to families who were unable to attend (see Appendix O for the English version of the parent survey). The survey collected information about Techbridge's impact on parents and on their daughter's interest and confidence in science, engineering, and technology. Parents were also asked about the value of various Techbridge resources and events, and to share suggestions for improvements.

Parent Interview – The evaluation and research teams conducted year-end interviews and focus groups with parents of Techbridge participants from five schools; a focus group was conducted in Spanish at one of these schools for Spanish-speaking parents (see Appendix P for the parent interview protocol). Questions focused on Techbridge's impact on them as parents and their participating daughters, as well as recommendations for ways Techbridge could better support families.

Role Model Survey – Role models who visited a Techbridge program and/or hosted a field trip at their work site were invited to complete a survey in June 2015 about their experiences with Techbridge. The survey

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[12] One teacher did not respond to the survey invitation or multiple reminders.

solicited feedback regarding their training and their experiences as a role model (see Appendix X for the role model survey).

Techbridge Staff Interview (Main Office) – In August 2015, members of the evaluation and research teams interviewed Techbridge's Executive Director, Chief Operating Officer, and Chief Growth & Strategy Officer by phone. The interview focused on the program's components, as well as successes and challenges from a management perspective (see Appendix U for the Techbridge staff interview protocol for the main office).

Techbridge Staff Interview (Expansion Sites) – In May 2015, members of the evaluation and research teams jointly interviewed the Greater Seattle Program Coordinators. The interview, conducted in person, focused on the program's components, as well as successes and challenges thus far (see Appendix T for the Techbridge staff interview protocol for the expansion sites). The interview was conducted after the first Greater Seattle Executive Director had left the organization and before the new Executive Director was hired; for this reason, the interview did not include the Executive Director.

Dimensions of Success Ratings – A trained evaluation team member conducted observations of five Greater Seattle programs in November 2014 and April 2015 using the Dimensions of Success (DoS) observation rubric. The DoS was developed by PEAR (the Program in Education, Afterschool and Resiliency) at Harvard University, and is designed to help researchers, practitioners, and other stakeholders evaluate the quality of STEM learning opportunities in out-of-school time settings. (See Appendix H for two evaluation briefs regarding the fall and spring DoS results.) The observer also met individually with each Techbridge Program Coordinator to discuss the results, including strengths and possible areas for growth.

Observe Expansion Site Training – A member of the evaluation team attended the Techbridge staff onboarding in July 2014 and July 2015 to observe the trainings and present the evaluation and research plans to staff involved in data collection.

Observe Teacher Training – A member of the evaluation team attended the first Techbridge teacher training in August 2014 to observe the training and present the evaluation and research plans.

Attend AISL TB Committee Meetings – A member of the evaluation team participated in bi-monthly planning meetings that were held by the Techbridge leadership team in spring 2014.

Techbridge-Specific Fidelity Rubric – Data from multiple sources (including the DoS results, attendance records, student surveys, and interviews) are entered into a fidelity rubric the research and evaluation teams developed which identifies the Techbridge essentials—those critical components Techbridge identifies as essential for success. (See Appendix I for a draft of the rubric completed for 2014-2015.)

Techbridge Attendance Records – Greater Seattle Techbridge staff recorded the total number of students in attendance at each program each week and shared these data with the evaluation team.

Document Review – The evaluation team reviewed Techbridge documents, including curriculum and staff manuals, and Techbridge's reports to the NSF.

Appendix C: Student Survey Results

Table A. Number and Percent of Matched Student Surveys by Group (2014-2015 Surveys)

		Techbridge Participants				Comparison Students			
	School District	Number of Pre-Surveys	Number of Post-Surveys	Number of Matched Pre- & Post-Surveys	Percent of Pre-Surveys Matched to Post-Surveys	Number of Pre-Surveys	Number of Post-Surveys	Number of Matched Pre- & Post-Surveys[1]	Percent of Pre-Surveys Matched to Post-Surveys
Elementary Schools									
Beverly Park Elementary	Highline	26	21	18	69%	5	5	5	100%
Hazel Valley Elementary	Highline	18	22	12	67%	20	13	12	60%
Madrona Elementary	Highline	27	24	19	70%	30	16	13	43%
McMicken Heights Elementary	Highline	26	26	24	92%	26	18	16	62%
Mt. View Elementary	Highline	13	17	9	69%	22	17	17	77%
Middle Schools									
Chinook Middle School	Highline	14	14	11	79%	14	9	8	57%
Sylvester Middle School	Highline	17	12	11	65%	18	14	14	78%
TOTAL (MEAN MATCHING)		141	136	104	(73%)	135	92	85	(68%)

Table B. Techbridge Students' Grade Level (from Post-Surveys)

Grade Level	All Techbridge Students (n = 135) Number	Percent	Comparison Students (n = 92) Number	Percent
5th grade	62	46%	13	14%
6th grade	48	36%	56	61%
7th grade	18	13%	9	10%
8th grade	7	5%	14	15%

Table C. Race/Ethnicity of Techbridge Students (from Post-Surveys)

Race/Ethnicity	All Techbridge Students (n = 121) Number	Percent	Comparison Students (n = 81) Number	Percent
American Indian	0	0%	1	1%
Asian	20	17%	13	16%
Black/African American	15	12%	4	5%
Hispanic/Latina	54	45%	35	43%
White/Caucasian	8	7%	10	12%
Pacific Islander	6	5%	3	4%
Multi-racial	18	15%	15	19%

Table D. Whether Techbridge Qualify for Free or Reduced-Price Meals (from Salesforce records provided by Techbridge)

	All Techbridge Students (n = 186) Number	Percent
Yes	146	79%
No	40	22%

Table E. Techbridge Families' Income Level (from Salesforce records provided by Techbridge)

	All Techbridge Students (n = 136) Number	Percent
Less than $20,000	39	29%
$20,000-$39,999	62	46%
$40,000-$59,999	19	14%
$60,000-$79,999	8	6%
Over $80,000	8	6%

Table F. Techbridge Parents/Guardians' Education Level (from Salesforce records provided by Techbridge)

	Parent/Guardian 1 (n = 163)		Parent/Guardian 2 (n = 126)	
	Number	Percent	Number	Percent
Elementary school	17	10%	11	9%
Middle school	21	13%	18	14%
High school diploma or GED	52	32%	42	33%
Trade/vocational school certificate	17	10%	8	6%
2-year college degree	27	17%	25	20%
4-year college degree	19	12%	10	8%
Master's degree	5	3%	4	3%
PhD, MD, JD or other professional degree	1	0.6%	3	2%
Does not apply	4	2%	5	4%

Table G. Matched Student Pre/Post Survey Results

Respondents indicated their level of agreement on the following scale:

1 = Disagree a lot | 2 = Disagree | 3 = Disagree a little | 4 = Agree a little | 5 = Agree | 6 = Agree a lot

Topic	Matched Pre/Post-Survey Questions	Techbridge Girls				Comparison Girls				Techbridge Change Minus Comparison Change Score
			Mean Ratings (1-6 scale)		Mean Change (Post—Pre)		Mean Ratings (1-6 scale)		Mean Change (Post—Pre)	
		n	Fall 2014	Spring 2015		n	Fall 2014	Spring 2015		
Interest in SET	I like science.	105	5.36	4.99	-0.37***	85	4.76	4.64	-0.13	-0.24
	I like creating things with technology (like games or websites).	104	5.18	4.90	-0.28^{+}	85	4.48	4.32	-0.17	-0.11
	I like computer programming.	101	4.89	4.56	-0.33*	83	4.43	4.11	-0.33*	0.00
	I like figuring out how things work.	104	4.99	5.00	0.01	81	4.80	4.68	-0.12	0.13
	I like building, designing, and/or putting things together.	104	5.51	5.40	-0.11	83	5.10	4.88	-0.22	0.11
Understand SET's Relevance	I see how science is part of my life.	99	5.51	4.74	0.23	83	4.11	4.19	0.08	0.15
	Engineering is useful for solving the problems of everyday life.	98	4.77	5.04	0.28*	82	4.28	4.57	0.29^{+}	-0.02
	Engineers make a meaningful difference in the world.	100	5.18	5.29	0.11	83	4.77	4.80	0.02	0.09
	Most people should study some science.	101	5.05	4.87	-0.18	81	4.52	4.57	0.05	-0.23
Confidence in SET	I do well in activities that involve science.	102	4.95	4.54	-0.41	85	4.14	4.22	0.08	-0.49**
	I do well in activities that involve technology.	103	4.83	4.63	-0.20	85	4.34	4.09	-0.25	0.04
Sense of Belonging in SET	Someone like me could become an engineer.	103	4.45	4.63	0.18	82	4.00	4.21	0.21	-0.02
	Someone like me could become a scientist.	101	4.61	4.61	0.00	82	3.90	4.09	0.18	-0.18
	Someone like me could work in technology.	101	4.68	4.92	0.24^{+}	81	4.11	4.21	0.10	0.14

$^{+}$p < .10; *p < .05; **p < .01; ***p < .001

Topic	Matched Pre/Post-Survey Questions	Techbridge Girls				Comparison Girls				Techbridge Change Minus Comparison Change Score
		n	Mean Ratings (1-6 scale)		Mean Change (Post—Pre)	n	Mean Ratings (1-6 scale)		Mean Change (Post—Pre)	
			Fall 2014	Spring 2015			Fall 2014	Spring 2015		
Understand Gender Inequities in SET	I think engineering is a good career for women.	101	5.09	5.30	0.21	82	4.62	4.90	0.28	-0.07
Understand SET Careers & Educational Pathways	I know what scientists do.	103	4.50	4.71	0.20^{+}	84	4.29	4.24	-0.05	0.25
	I know what engineers do.	102	4.54	4.87	0.33*	84	4.19	4.21	0.02	0.31
	I know what people who work in technology do.	101	4.46	4.88	0.43**	83	4.12	4.24	0.12	0.31
	Knowing science will give me many career choices.	104	5.08	5.13	0.06	84	4.44	4.54	0.10	-0.04
	Knowing about engineering will give me many career choices.	102	4.97	5.15	0.18	80	4.50	4.50	0.00	0.18
	Knowing technology will give me many career choices.	98	5.08	5.24	0.16	81	4.56	4.60	0.05	0.11
	The types of things that people with careers in science, engineering, or technology do in their jobs.[13]	100	2.30	2.86	0.56	82	2.26	2.30	0.05	0.51***
	The kind of classes you need to take to have a career in in science, engineering, or technology.	101	2.17	2.60	0.44	80	2.21	2.36	0.15	0.29*
	How to find information about careers in science, engineering, or technology.	101	2.43	2.76	0.34	81	2.38	2.53	0.15	0.19
Interest in Pursuing SET Career	I can see myself working in a career that involves science, technology, or engineering.	99	4.47	4.59	0.11	78	3.91	3.83	-0.08	0.19
	I would like to be a scientist.	100	3.90	3.75	-0.15	81	3.14	3.16	0.03	-0.18
	I would like to be an engineer.	100	3.90	4.17	0.27	82	3.24	3.51	0.27	0.00
	I would like a job in technology.	103	4.26	4.55	0.29^{+}	82	3.59	3.61	0.02	0.27

$^{+}p < .10$; *p < .05; **p < .01; ***p < .001

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[13] This question and the next two were asked on a 1-4 scale.

Topic	Matched Pre/Post-Survey Questions	Techbridge Girls				Comparison Girls				Techbridge Change Minus Comparison Change Score
			Mean Ratings (1-6 scale)		Mean Change (Post—Pre)		Mean Ratings (1-6 scale)		Mean Change (Post—Pre)	
		n	Fall 2014	Spring 2015		n	Fall 2014	Spring 2015		
Understand SET Practices	Engineers design things perfectly the first time.	101	2.62	2.24	-0.39*	82	2.61	2.37	-0.24	-0.14
	I know what the engineering design process is.	100	3.53	4.65	1.12***	78	3.15	3.06	-0.09	1.21***
	I know how to use the engineering design process to build something.	101	3.53	4.73	1.20***	79	3.15	3.23	0.08	1.12***
	I know how to compare different designs to figure out what is the best way to solve a problem.	102	4.24	4.79	0.56***	78	3.73	3.77	0.04	0.52*
	If a project is not going well, I am able to make changes as needed.	103	5.00	5.04	0.04	81	4.37	4.43	0.06	-0.02
Growth Mindset & Perseverance	If I work hard, I will be more successful.	105	5.80	5.73	-0.07	83	5.89	5.58	-0.31**	0.25*
	I can’t change how smart I am.	104	3.83	3.08	-0.75**	83	3.63	3.34	-0.29	-0.46
	I learn more when I make mistakes.	103	5.39	5.27	-0.12	82	5.35	5.24	-0.11	-0.01
	I think I learn more when a task is challenging.	103	4.94	4.89	-0.05	81	4.63	4.94	0.31^{+}	-0.36^{+}
	I like doing work that I’ll learn from even if I make a lot of mistakes.	105	5.15	5.18	0.03	84	5.01	4.99	-0.02	0.05
Collaboration Skills	I work well with different types of students.	103	4.95	4.63	-0.32*	83	4.81	4.77	-0.04	-0.28
	Working with others is usually more fun than working alone.	103	5.10	5.09	-0.01	82	5.18	4.87	-0.32*	0.31
	I like being part of a team.	102	5.29	5.28	-0.01	79	5.13	4.92	-0.20	0.19
	I learn better when I am by myself.	101	3.44	3.46	0.02	80	3.33	3.49	0.16	-0.14
	I learn better when I am working with others.	101	4.84	4.82	-0.02	81	4.77	4.67	-0.10	0.08

$^{+}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$

Topic	Matched Pre/Post-Survey Questions	Techbridge Girls				Comparison Girls				Techbridge Change Minus Comparison Change Score
			Mean Ratings (1-6 scale)		Mean Change (Post—Pre)		Mean Ratings (1-6 scale)		Mean Change (Post—Pre)	
		n	Fall 2014	Spring 2015		n	Fall 2014	Spring 2015		
Public Speaking Skills and Confidence	I am comfortable speaking in front of a group of people.	99	3.65	3.67	0.02	79	3.46	3.80	0.34^{+}	-0.32
	I like to speak up in class.	102	3.43	3.67	0.24	80	3.24	3.43	0.19	0.05
	Presenting something in front of other people makes me feel proud.	103	3.92	4.18	0.26	82	3.83	4.11	0.28^{+}	-0.12
	I feel like I do a good job when I present to other people.	103	4.05	4.26	0.21	82	3.87	4.12	0.26	-0.04
Intention to Pursue SET Education	I will go to college.	103	5.86	5.83	-0.03	84	5.73	5.69	-0.04	0.01
	I plan to study science in college.	102	4.67	4.48	-0.19	84	3.85	4.12	0.27	-0.46*
	I plan to study computer science in college.	100	4.36	4.46	0.10	83	3.84	3.89	0.05	0.05
	I plan to study engineering in college.	102	4.33	4.35	0.02	82	3.73	3.87	0.13	-0.12
Families Support Daughters in SET	I talk about my career interests with my family.	101	4.70	4.61	-0.09	82	4.56	4.67	0.11	-0.20
	My family thinks science is interesting.	99	4.36	4.42	0.06	81	3.77	3.93	0.16	-0.10
	My family is interested in the courses I take.	98	4.93	4.98	0.05	79	4.76	4.75	-0.01	0.06
	My family would like it if I became a scientist, an engineer, or had a technology career when I grow up.	97	4.68	4.84	0.16	81	4.10	4.19	0.09	0.07
	My family encourages me to think about a career in science, engineering or technology.	98	4.23	4.63	0.40*	80	3.81	3.89	0.08	0.32

$^{+}$p < .10; *p < .05; **p < .01; ***p < .001

Table H. Techbridge Student Post-Only Survey Results

	n	Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	Agree a lot (6)	Mean (1-6 scale)
I learned about different kinds of careers in Techbridge this year.	134	0%	2%	4%	10%	32%	53%	5.31
I know it can take many tries to solve a problem because of Techbridge this year.	134	0%	2%	2%	13%	34%	50%	5.29
The Techbridge field trips and role models we had this year made me more interested in working in science, engineering or technology.	129	2%	3%	5%	9%	27%	54%	5.20
The Techbridge field trips and the role models we had this year helped me understand the importance of science, engineering and technology.	132	1%	4%	4%	8%	33%	51%	5.20
I am more confident trying new things because of Techbridge this year.	134	1%	2%	4%	18%	31%	46%	5.13
Techbridge helped me think about my career goals.	133	2%	2%	5%	12%	30%	48%	5.10
I have talked with my family about the things I've done in Techbridge this year.	132	2%	2%	6%	17%	27%	46%	5.06
Techbridge made me think more about what I will do after graduating from high school.	133	2%	2%	7%	17%	29%	44%	5.04
I became better at working in a team because of Techbridge this year.	132	3%	2%	5%	16%	30%	44%	5.01
Techbridge helped me see I am good at science.	132	2%	2%	9%	16%	36%	36%	4.92
In Techbridge this year, I learned to work well with girls whether I like them or not.	131	4%	2%	8%	14%	34%	40%	4.91
Techbridge increased my interest in studying engineering in college.	133	4%	4%	5%	21%	28%	38%	4.80
Techbridge helped me see I am good at engineering.	133	5%	4%	8%	15%	38%	30%	4.69
I am more comfortable speaking in front of a group of people because of Techbridge this year.	134	10%	6%	8%	22%	24%	31%	4.37

Appendix D: Student Focus Group Summary

(prepared by Colorado Evaluation & Research Consulting)

Coding the Student Focus Group Transcripts

In May 2015, six girl focus groups were conducted at four Techbridge sites in the Greater Seattle area. Sound recordings were made of the focus groups, and then transcripts were created from the audio files. The transcripts were coded deductively; that is, prior analyses informed the creation of the code book for this analysis. Codes were not used exclusively, so more than one code could be applied to a single excerpt of transcript.

Introduction to the Code Book

Five main codes were applied to the focus group transcripts: leadership/agency, engineering, purpose of Techbridge, recommendations, and interesting things to document. These four parent codes represent the categories of great meaning in this analysis. Each of those codes had up to six child codes, or sub-codes. There were up to six child codes for each parent code, and they represent areas of rich detail and more nuance.

Each instance of those child codes were then further coded into one of four grandchild codes: curriculum, interaction/implementation, school embedded structure, or unclear. Excerpts were coded with “curriculum” when a girl was describing something that was implemented as designed. The code “interaction/implementation” was used when a girl was focusing on what a program coordinator said or communicated in Techbridge. Excerpts were coded “school embedded structure” when a girl was describing how something was enhanced by its connection to the school setting and/or school community. The code “unclear” was used as a miscellaneous code when the other three codes did not apply, or when there was not enough context given to understand how the theme was conveyed.

The coding structure is represented visually in Table 1.

Table 1.
Structure of the Code Book

Parent Code	**Child Codes**	**Grandchild Codes**
Leadership/Agency	Communicating ideas Building consensus Developing relationships Executing a plan Self-reflection Peer support network	Curriculum, interaction/implementation, school embedded structure, or unclear
Engineering	Design process Career awareness Habits of mind New technical skills	Curriculum, interaction/implementation, school embedded structure, or unclear
Purpose of Techbridge	Growth Mindset STEM equity STEM opportunity Have fun	Curriculum, interaction/implementation, school embedded structure, or unclear
Recommendations	(Child codes label each excerpt by theme/topic)	(none)
Interesting Things	(Child codes label each excerpt by theme/topic)	(none)

The use of parent and child codes is represented in Figure 1.

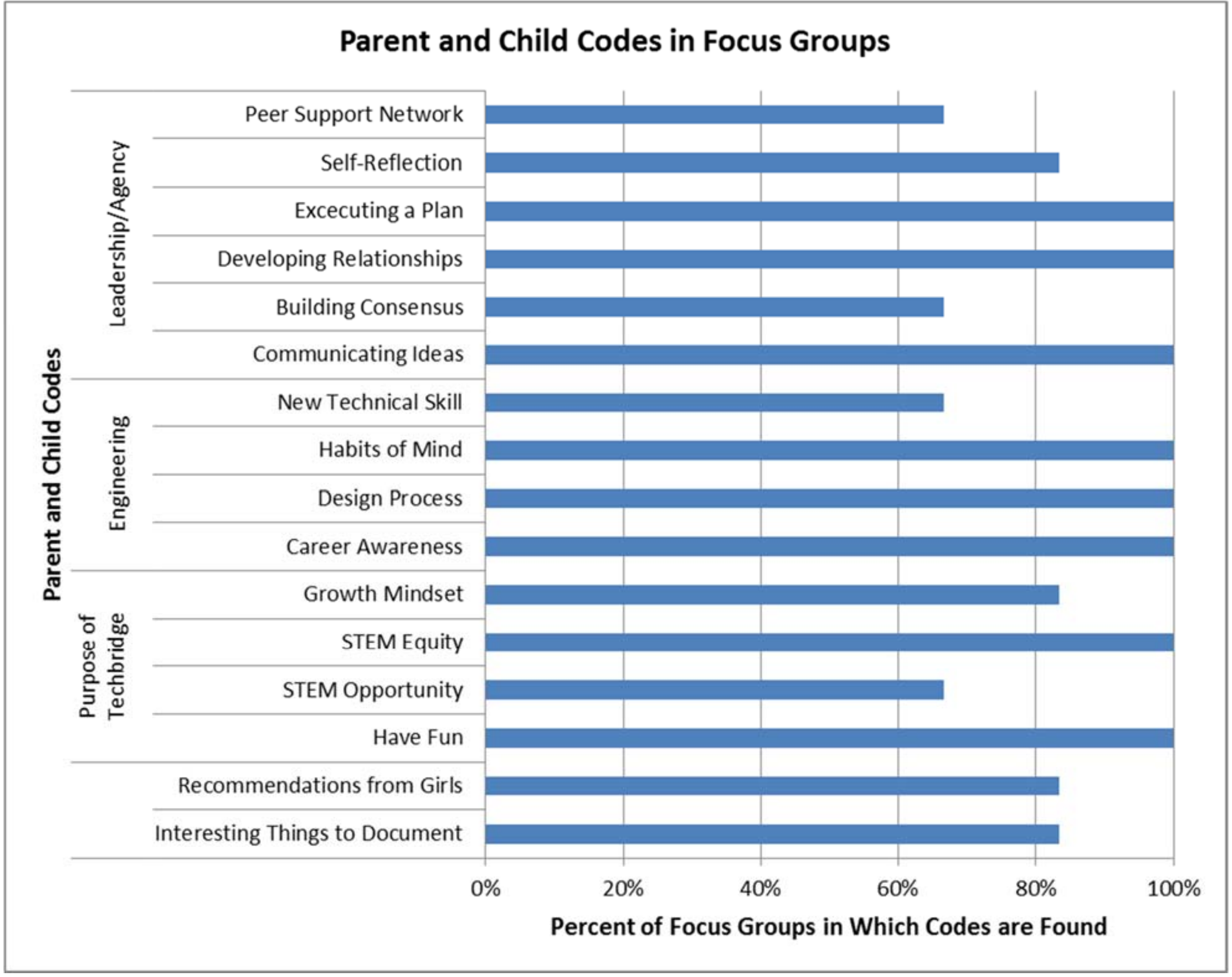

Figure 1. Percent of focus groups with each code.

Leadership / Agency

The parent code Leadership/Agency was applied 41 times and in all 6 focus group transcripts.

Communicating Ideas

Communicating Ideas was found in 14 excerpts across all 6 focus groups, in other words, all youth focus groups indicated an opportunity to build communication skills in their time at Techbridge. Based on the context of responses, analysis indicates the Techbridge curriculum itself encouraged this skill development (8 instances), and that the embedded structure of Techbridge within the school environment may have enhanced building communicative skill (2 instances). To some degree, the Techbridge facilitators played a role in supporting communication skill development through their interactions with youth (2 instances). Quote 1 below highlights how curriculum as designed led to girls' developing with regard to how they communicate ideas.

Quote 1, Communicating Ideas: “We get to get other people’s ideas to make like what people want to make. It’s nice to get to work together on a project instead of struggling by yourself and not having that other factor of support.”

The respondent said that working with others on a project means sharing ideas and not having to struggle alone without support. She enjoyed combining the ideas of other people to accomplish their work together. Working in pairs or small groups is common to Techbridge curriculum and practice.

The next excerpt shows how girls’ practice at communicating ideas at Techbridge helps them in their regular school day.

Quote 2, Communicating Ideas:

Interviewer:	Do you think you speak up more now than you did at the beginning of the year? Anybody?
Girl 1:	Yeah.
Girl 2:	Kind of.
Girl 3:	Way more.

For three of the girls who participated in this focus group, Techbridge has encouraged them to speak up more in school. The interviewer had been asking whether participating in Techbridge’s after-school program has affected them in their regular classes at school, and they said they were talking more at school.

The third excerpt here shows how girls practice communicating ideas through opportunities that arise because of the way Techbridge is implemented at a particular site.

Quote 3, Communicating Ideas: “On school Family Nights where the friends would come and then our inventions would be out. Sometimes there’s some that she’ll let us take home to show our parents like the soldering one.”

This Techbridge participant talked about the Program Coordinator allowing her to take her soldering project home to show her parents. She appreciated the opportunity to take be able to show her work to her family at home and talk about what she had worked on. This is not something that Techbridge encourages on a regular basis, but the program coordinator gave girls an additional opportunity to practice communicating their engineering ideas at home.

Building consensus

Building consensus was found in 4 excerpts across 4 different focus groups. Passage 1 below highlights how curriculum as designed led to girls’ developing with regard to how they build consensus.

Passage 1, Building Consensus:

Girl 1:	What’s good about group work is that you have more opinions, more options to choose from. But the bad thing about group work also is that sometimes you have a good idea but they don’t listen to you or they just find different things to do.

Girl 2:	I agree on one opinion, one option. You can't all agree on that because everyone has a separate opinion and you would think differently than others.
Interviewer 1:	What happens in that case? Do you ever try to convince other people that you have a good idea or do you tend to go with other ideas?
Girl 3:	Sometimes you combine the ideas together to find a way to do both of them but as one.
Girl 4:	Sometimes you try to find facts about it, like what's good about the idea that you can try out.

As mentioned above, working together is common practice at Techbridge. In this excerpt, girls describe a variety of ways to build consensus: merging ideas into one best solution, and presenting information to be able to have an informed debate about which idea is better. One girls says that "sometimes you can combine the ideas together", and another girl says they "try to find facts" or information about each idea so they can "try out" the ideas.

In the next excerpt, a respondent mentioned the influence of school in her thinking about building consensus when she references her teacher telling her that "two minds are better than one", and this girl felt that she had seen this idea come to fruition during her interactions at Techbridge.

Quote 2, Building Consensus: "How she was saying how two minds are better than one. We were doing this coding. It was kind of hard because you were doing it this way, but it wasn't the right way. But then your partner had some ideas and when you put them together it worked. It's like she got some ideas and then you got some ideas and when you put them together, it can finish the project."

The girl described how she and her partner were working on a coding project that was "kind of hard", but they were able to build consensus to "finish the project". They each had some ideas, and they "put them together" in a unified fashion that helped them work through the difficulties they had been experiencing in their coding.

Developing relationships

Developing Relationships was found in 14 excerpts across all 6 focus groups, in other words, all youth focus groups indicated an opportunity to develop relationships in their time at Techbridge. Based on the context of responses, analysis indicates the Techbridge facilitators played a large role in developing relationships through their interactions with youth (9 instances). Additionally, the Techbridge curriculum itself encouraged this (4 instances), and the embedded structure of Techbridge within the school environment may have enhanced relationship development (3 instances). Passage 1 below highlights how Techbridge facilitators led to girls' relationship development.

Passage 1, Developing Relationships:

Girl 1:	They help us and they make us feel like there's actually someone there to help us when we need it.
Girl 2:	They help us and then sometimes they're kind of funny which makes it more funny.

These two respondents were answering a question about how they get along with their teacher and Program Coordinator at Techbridge, and both were enthusiastic and appreciative of those relationships. One girl said they feel supported by the teacher and Program Coordinator, and the other enjoyed the humor they brought to Techbridge.

The next excerpt shows how girls' practice at developing relationships at Techbridge helps them in their regular school day.

Passage 2, Developing Relationships:

Interviewer: Okay. Anything you've learned about yourself?
Girl: I've learned that working together is a good thing. One time, there was a math class with my class and we had to go outside right after we came from the field trip. We had to work together to have these maps to go from one side to the other side. It was very difficult for because in my class some kids don't get along and we don't work together.
Interviewer: This was at class right? Not part of Techbridge but part of a school day, you were working on a group project?
Girl: Yeah, we learned the same thing.
Interviewer: You learned the same thing.
Girl: It was pretty cool.
Interviewer: Has it helped you in other areas besides Techbridge, like during the school year?
Girl: Some projects that we do in school are related, like the map we had to build. It was about working together. We also learned it in Techbridge. We learned to work together.

In this excerpt, the respondent described a difficult instance in which she was working on a group project in math class and that they have to work on other school projects too on occasion. She notes that they "learned to work together" in Techbridge, and her practice of developing relationships at Techbridge has helped her at times in school when "some kids don't get along" and don't work well together.

In the next excerpt, a girl describes developing new relationships because of a practice of having girls work with a variety of people at Techbridge.

Quote 3, Developing Relationships:

Interviewer: What do you like most about Techbridge?
Girl: When we build stuff and get to work with new people that didn't talk too much.

For this girl, her favorite thing about Techbridge is working with "new people". Rather than allow the girls to choose their own partners all the time, Program Coordinators may encourage girls to find someone they do not usually work with, or the girls may have to form groups randomly using a technique like drawing straws. In this excerpt, the respondent enjoys being able to spend time with someone she does not usually talk with very often.

Executing a Plan

Executing a Plan was found in 11 excerpts across all 6 focus groups, in other words, all youth focus groups indicated an opportunity to build communication skills in their time at

Techbridge. Quote 1 below highlights how curriculum as designed led to girls' developing with regard to how they execute a plan.

Quote 1, Executing a Plan:

Interviewer: What's good and not so good about the time limit and the group work?

Girl: The good thing is that some people work well under pressure, and also to learn how to deal with the real world where there's a deadline where you have to turn your project in. It shows you how to do that.

The respondent said that Techbridge's use of time limits for work is beneficial. She explains that there are deadlines in the "real world" and Techbridge is preparing participants for how to accomplish work within such constraints.

In the next excerpt, the respondent describes the steps the girls sometimes take when working on a Techbridge project.

Passage 2, Executing a Plan:

Interviewer: Do you do things in a certain order when you're doing projects?

Girl: Sometimes.

Interviewer: Like brainstorming...

Girl: Drafting it out first. You create it. Then you decorate it at the end. If you have time.

Interviewer: Yeah. Do you ever get to share with other people?

Girl: There's this thing that we do, she puts our thing in each table and you go around and look at other people's. A gallery walk.

This girl explained the steps for working on a project at Techbridge and is able to describe designing, building, decorating, and then sharing her work. She is able to show that she knows how to go about executing a plan to be able to complete a Techbridge project.

Quote 3, Executing a Plan: "On designing, I would make sure everything was fine because if somebody actually used it and something goes wrong, you have to make sure you have all the pieces that you need and when you build it, you also have to make sure the shape is all right for the person to be in it or to do something with it."

In the above excerpt, the respondent explains the necessity of drafting complete instructions and making sure that all the necessary materials are on hand. She notes that something could go wrong otherwise. Her time at Techbridge has shown her the importance of being able to follow and execute a plan to achieve good results.

Self-reflection

Self-reflection was found in 9 excerpts across 5 focus groups. Based on the context of responses, analysis indicates the Techbridge curriculum itself encouraged this skill development (3 instances) and that the Techbridge facilitators played a role in supporting self-reflection through their interactions with youth (2 instances). Quote 1 below highlights how curriculum as designed led to girls' self-reflection, in the girl's response to being asked whether she has had a chance to present or talk about what she's been learning at Techbridge to other people.

Quote 1, Self-reflection: “Almost every day, we do Techbridge and we’re done with the activity we’ve done, when we build stuff. We’ll all go and everyone will have a turn to go up and share what we’ve done and what was challenging and what was fun about it.”

This girl reports that “almost every day” she has the opportunity to self-reflect on what she did at Techbridge. After the have finished an activity, the girls take turns telling the group about what they have done and what was changing and fun about it. Built into the structure of their weekly Techbridge program is the opportunity to self-reflect on project challenges and what made it enjoyable.

In the next excerpt, Techbridge facilitators play a role in the girls’ self-reflection.

Passage 2, Self-reflection:
Interviewer: What have you learned about yourself in the program?
Girl 1: We all play a role in the world.
Interviewer: OK. How do you learn that in Techbridge?
Girl 1: Because they encourage girls to do more.
Girl 2: Because they’re like, “Oh, I give up,” and then they’re just like, “No, don’t give up, you can do this, and this, and this.”
Girl 2: Yeah.
Interviewer: They encourage you.
Girl 2: Yeah.

The girls in this excerpt describe how they have reached the conclusion that they “all play a role in the world” based on their interactions with Techbridge facilitators. The girls describe being encouraged by the adults, and this has helped them to view themselves as important and of deserving of a meaningful place in the world. Such self-reflection was aided by their interactions with Techbridge facilitators.

Peer Support Network

Peer Support Network was found in 7 excerpts across 4 of the focus groups transcripts. Based on the context of responses, analysis indicates the Techbridge curriculum itself encouraged this (2 instances) and that the Techbridge facilitators played a role in supporting the development of peer support networks through their interactions with youth (3 instances). Quote 1 below highlights how curriculum as designed led to the girls’ peer support network when the girl responds to a question about whether things are different when working in a partnership versus working alone.

Quote 1, Peer support network: “I feel like it’s cool, because you get to meet all these new people, you get to experiment, and you get to be creative and express yourself through good and positive things.”

This respondent said that having a chance to meet new people with whom to experiment and get creative is an important element of the program. Techbridge’s curriculum and practice is to have girls work on activities in pairs or small groups, and that causes this girl to feel supported in her work.

In the next excerpt, a girl describes how some of Techbridge’s practices have helped to build a peer support network.

Quote 2, Peer support network: “When we have Family Night and everybody is in groups and we had our own little stations, parents had to walk by all of them. When I first did it with a few of my friends in there, it wasn’t that hard because when one parent comes, we had our little note cards and then we would use those. We already knew the questions, so we just gave the answers that we had.”

This excerpt illustrates a way that Techbridge made space for the girls to practice speaking about their projects in preparation for Family Night. The girls practiced with their peers, which helped them to feel supported by each other because they were talking with someone who knew about and participated in the same work at Techbridge. Practicing by first presenting to their peers also prepared then for speaking their own family members and the families of other girl’s on Family Night.

In Passage 3 below, two girls describe feeling particularly supported by her female peers at Techbridge.

Quote 3, Peer support network:

Girl 1:	Sometimes when I’m around boys I get really nervous.
Girl 2:	Because they start laughing.
Girl 1:	Yeah, yeah. Being around girls and learning to speak out loud is good practice. It’s really comfortable.
Interviewer:	Easier and more comfortable. I’m seeing both of you nod as well. Yeah. Okay.

In this excerpt, the girls express their feelings about being part of the all-girl environment of Techbridge. They specify that boys “start laughing” and make them feel “really nervous”, but being with girls helps them to feel more comfortable. Being comfortable and feeling supported by their peer network helps them to practice talking out loud and sharing their ideas.

Engineering

The parent code Engineering was used 55 times and in all 6 focus group transcripts, making it the most commonly used code in this analysis.

Design Process

The design process was found in 13 excerpts across all six focus groups. This code refers to the ways in which girls describe, enact, and learn about the engineering design process in Techbridge. Seven of these instances were clear reflections of the curriculum, 4 were enhanced through interaction and through implementation choices made by program coordinators and teachers, and the remaining were unclear. We note design process is not a code that showed connections to school or classroom, perhaps because engineering design thinking is rarely a topic covered in elementary or middle school. Quote 1 below is a description from a girl’s perspective regarding how Techbridge curriculum is designed to apply the engineering design process, and implemented for guided exploration.

Quote 1, Design process: “First, we usually, (the Program Coordinator) makes us come to her with ideas, like brainstorm. Then, we write them down. Not create, just draw, and then she gives us the materials to make it, and then we test it by ourselves. We get the directions, but still get to do things creatively, kind of in our own way, so there's like a, it should probably fit a basic criteria and stuff but it's not like we're getting graded, if we fail and that's okay, because we learned from it, but we can also do things in our own way and express what we're supposed to be doing in our own interpretation of how it should be done."

The participant quote highlights the use of brainstorming and the structure of implementation with guidance from the Program Coordinator regarding those first generated ideas. The distinction made in the quote suggests the participants are asked to draw out the design before beginning to build. Testing is an element of the process, and conforming to project criteria are highlighted over following a specified set of steps.

The second passage relates to time constraints in Techbridge and the process of getting feedback from the Techbridge community.

Interviewer: What's the hardest thing that you've been asked to do as a part of Techbridge? It might be talking about your work or working with other people or specific tasks.
Speaker 2: When the time limit's over and your project is not finished and everyone else has a complete one.
Speaker 1: What happens in those cases?
Speaker 2: Sometimes in those cases... Usually when we do a project and we're finished, we show everyone. Like when we did the bridge building one, we tested it out. If we didn't finish our bridge, we just didn't show it. We just watched the others and gained experience.
Interviewer: So you learned from what they finished. Yeah. Yeah. Did you ever get a chance to show how far you got or was that less common?
Speaker 2: Yeah, sometimes I'm finished working on something shown, but not test it.

The participants in the focus group indicate that it is "hard" when they are unable to finish their design under the time constraints provided in Techbridge. The participant acknowledges disliking feeling behind on a project, but describes they can learn from others who were further along in the design. Speaker 2 also acknowledges she can present her work even before the testing phase of the design process so she can gain experience and share her knowledge.

In the third passage, a participant describes her project and some of the steps she took to solve an environmental problem. She describes her design steps and connects the work to that of an environmental engineer.

Passage 3, Design process

Interviewer: What kind of jobs have you learned about in Techbridge this year?
Participant: Environment engineer. Once we... had a massive plate with water and there was some oil. We had to learn how to take the oil out of the water. We got cotton, tissues and (removed the oil). That was cool. It was environment engineer or something like that?

For the participant, the design process is linked to the purpose of the challenge she incorporated, and the tie to a potential career was clear. This represents one instance where a passage has multiple "engineering" themes associated with it. This career connection leads to the next theme under the "engineering" parent code—career awareness.

Career Awareness

Techbridge intentionally brings engineering careers into every activity as a method for showing girls how STEM interest and aptitude can lead to possible futures for them and for their peers. The code occurred in 32 excerpts across all six focus groups.

Passage 1 shows how a middle school girl is becoming more mindful about technology careers as she reflects on her future.

Interviewer: What else have you learned about yourself?

Speaker 2: What I learned about myself is that I do more hands-on projects like what we have been doing. The more I get [inaudible 09:22] projects, the more I find different ways to build it or different routines.

Interviewer: So you're experimenting and exploring different ways to do things?

Speaker 2: Seeing things from a different perspective and understanding my ability to do detail oriented things. Different types of engineering… I used to want to be a technology engineer, and once I had the Techbridge experience of learning, I feel like there's more inside the technology part. You can either be a software or hardware engineer. There's many people involved.

Interviewer: It sounds like you knew you wanted to do something technology related and now you have more information about what those careers are.

The participant expressed initial interest in technology, and in the passage she describes how she came to understand her strengths as well as the multiple options she has for finding a career in technology.

In passage 2, a participant is describing her friends' seeming disinterest in STEM careers. She describes why the Techbridge program is so beneficial in exploring career options for girls.

Passage 2, Career awareness: "(My friends) might just not be interested in this type of career. Maybe they want to do something different so Techbridge isn't especially useful to them, but I think that's why this program is so good, because it gives girls that exposure. I think that just more girls need that little push to see, well, you can do this, and it's possible. So many other people have already done it, so if they can do it, you can, too."

Exposure, awareness, and encouragement are listed as ways Techbridge influences girls' career pathways in this quote from a participant.

The third passage is an extended conversation between interviewer and participants. The participants describe multiple ways in which the program is designed for maximum exposure to careers, through video clips, field trips, and role model visits.

Passage 3, Career Awareness

Interviewer: What kinds of jobs have you learned about in Techbridge this year? Maybe it's in a field trip or maybe it's when a role model came to visit. Can you think of different jobs that you learned about this year? No?

Speaker 3: We went to a field trip to one of the colleges and we visited many different things…We learned about circuit engineering, that was the last one we did, structural engineering, architecture.
Interviewer: Do you know more about if you had a job in that field, what that would be like?
Speaker 3: We watched some videos about real life experience of people who actually work there and what they're doing continuously.
Speaker 1: Any other ideas about careers and what sorts of careers you've seen in Techbridge?
Speaker 2: Well, a guest came to Techbridge and she worked at Amazon. What she did was (work on the system for) when you pay a bill and then it takes about a minute to go to the bank so that it can process and charge.
Interviewer: Oh cool. She worked on the programming that does that? Okay. Any other thoughts about careers? No? Let's say in September, 2014, what do you think you knew about engineering back then?
Speaker 2: Not much.

The third passage highlights three ways the Techbridge model intentionally brings career awareness into girls' programming. Through videos, fieldtrips, and trained role models, girls receive multiple messages about engineering careers, what problems engineers solve, and the local workplace realities for women in engineering. The interviewer probed to get a sense of what the girls knew prior to their Techbridge experience about engineering, and the first response indicated an initial lack of knowledge of the field.

Habits of mind

Themes emerged regarding girls' impressions of engineers' habits of mind, or the types of individuals who pursue the field. The "habits of mind" code occurred 14 times in the data set across all six focus groups. This section details different qualities focus group participants learned are important in engineering. The examples come from role models who tell them directly about these qualities as well as from girls' experiences practicing engineering design in the program.

Engineers are persistent (4) *"Some of the projects, when we don't understand and you just give up, but if you ask questions and look at demonstrations and you try again, you can get better at that one thing that you're doing."*

Engineers are creative (4) *"In (company) there was a bunch of people who got to design things. They told us it was kind of like art, but with more science and engineering?"*

Engineers are helpful (4)*"The Facebook role model said that whenever she walks in a room she thinks about how to make things better."*

Engineers show attention to detail (3) *"I would tell a girl working on a Techbridge project to take her time and follow the steps."*

Engineers are problem solvers (2) *"There's a lot of problems in engineering that you have to actually think about and analyze to know or solve."*

Engineers take risks (1) *"You've got to take the opportunity, a chance. If you take it, the probability is that you get one out of whatever that it is. But if you don't try it, you lose."*

New technical skills

The most notable thing about the skills codes is the lack of discussion of skill development in Techbridge. Rather than focus on skill development, Techbridge spends more effort on habits of mind and critical thinking. Much discussion within focus groups was about experiences, ways of thinking, and processes for problem solving, rather than the narrow learning objective of “skill building.” Two skills discussed across focus groups were soldering and computer programming.

> Quote 1: New technical skills*:“At first, we were kind of scared to try it because it’s like a really hot device and you can burn yourself with it. But once you see what you accomplish, you kind of decide to try it.”*

Soldering made an impression on the girls, based on the power of the device and the intimidation that it brought out in many girls. While safety was an issue for a few who note they burned themselves on the iron, soldering seemed a badge of honor for Techbridge girls—a risk they took. Passage 2 depicts a focus group conversation related to skill building in computer science.

Passage 2: New technical skills

> Interviewer: What else are you learning?
> Speaker 2: We’re learning different codes that we can do to make a program.
> Interviewer: What do those programs do?
> Speaker 2: Those programs can turn into games or websites, or even apps.

In the passage, girls describe programming in terms of coding as well as the application of the code—seeing the whole picture as well as the details involved in developing code.

Purpose of Techbridge

The parent code Purpose of Techbridge was used 45 times and in all 6 focus groups.

Growth Mindset

Growth Mindset was found in 12 excerpts across 5 of the focus groups. Based on the context of responses, analysis indicates that the Techbridge facilitators played a role in supporting communication skill development through their interactions with youth (5 instances) and the embedded structure of Techbridge within the school environment enhanced growth mindset (3 instances). To some degree, the Techbridge curriculum itself encouraged this skill development (1 instance). Quote 1 below highlights how interactions with Techbridge facilitators fostered a growth mindset.

Quote 1, Growth Mindset: “We get the directions, but still get to do things creatively, kind of in our own way. It should probably fit a basic criteria and stuff but it’s not like we’re getting graded, if we fail then that’s okay, because we learned from it, but we can also do things in our own way and express what we’re supposed to be doing in our own interpretation of how it should be done.”

The respondent demonstrated her understanding of a growth mindset by explaining that “if we fail then that’s okay”. From her interactions with Techbridge facilitators, she has come to see that completing a project in a particular way is not necessary but instead they can “do things in [their] own way” as long as their work fits a “basic criteria”. This girl has received feedback from the adults at Techbridge that has helped to show her that of greater importance is that girls have “learned from it” than to have achieved a certain, specific end product.

Quote two illustrates how the school-embedded nature of Techbridge has helped foster a growth mindset.

Quote 2, Growth Mindset: “We were doing this thing in Language Arts and they were talking about growth mindsets and fixed mindsets. When you start out with something, you’re not going to be good at it. I mean, sometimes there people who do just have this natural talent, that doesn’t mean you can’t get good at it just through hard work, because the more you do something, the better you get.”

In that excerpt, a girl explained that they had been talking in Language Arts class in school about fixed and growth mindsets. She has had experience with ideas around growth mindset at school and at Techbridge, which has given her more time to think about and practice growth mindset.

Passage 3 shows how curriculum as designed led to girls’ developing growth mindset.

Passage 3, Growth Mindset:
Interviewer: If I try hard, I will be more successful. What do you think when you hear that sentence?
Girl 1: Yes.
Girl 2: You are absolutely, 100% right.
Girl 3: Yeah.
Girl 4: You need to try your best.
Interviewer: You need to try your best.
Girl 5: You feel like you’re on top of the world.
Interviewer: You feel so good about yourself when you do it, right?
Girl 5: Yeah.
Interviewer: You feel like you’re on top of the world. What about Techbridge helps you maybe think about that?
Girl 5: Like I said, they encourage us and stuff, so...
Girl 1: Getting a chance to do it over again.

That excerpt illustrated the way Techbridge girls respond in enthusiastic support of growth mindset ideas. The interviewer asked about hard work leading to success, and several girls chimed in to agree with the interviewer. One said that the time and opportunity to “do it over again”, or redesign her project, has helped her to see that hard work will lead to success and that there is not a fixed endpoint to her work.

STEM Equity

STEM Equity was found in 15 excerpts across all 6 focus groups, in other words, all youth focus groups indicated that they saw STEM Equity as a purpose of Techbridge. Based on the context of responses, analysis indicates that the Techbridge facilitators played a role in supporting this (3 instances), as did Techbridge curriculum (2 instances) and the embedded structure of Techbridge within the school environment (1 instance). Quote One below highlights how curriculum as designed led to girls’ developing with regard to how they communicate ideas.

Quote 1, STEM Equity: “We’ve watched videos of people who work in those specific categories like structural engineer or a circuit engineer. We watched their daily routine and the perspective on things.”

The respondent said that they have viewed videos of female engineers working and have been able to understand what their work is like. Seeing female engineers at work, on video or in person, is common to Techbridge curriculum and practice.

The next excerpt shows how the school-embedded nature of Techbridge has helped girls view STEM equity as a purpose of Techbridge.

Passage 2, STEM Equity:

Girl 1: We were supposed to draw pictures of doctors and all that and they were drawing guys.
Interviewer: The boys were drawing boys and not girls?
Girl 1: There was mostly boys.
Girl 2: But then again, how is that their fault? Because their only role models are guys. You never see girls get out there.
Girl 1: Exactly, that’s why we need Techbridge.

The girls were describing a time at school when they were asked to draw pictures of doctors and many students (mostly boys, according to one girl) drew men as doctors. Another girl says that was not their “fault” because they only see male doctors “out there” in the real world. The first girl responds and says that this is the reason for Techbridge: to give girls opportunities to have female role models in science.

The third excerpt here shows how Techbridge enables girls are able to see themselves as capable.

Quote 3, STEM Equity: “Girls can do things a lot. Not just boys. Like the tech-ish things. I thought computer was like, oh it’s too much, you know. Now I actually really kind of like it.”

This Techbridge participant compared her capabilities to that of boys. In the past, she seems to have believed that computing and “tech-ish things” were for boys and thought computing and technology were “too much” for her. Now, however, she views herself and other girls as able to engage in such fields.

STEM Opportunity

STEM Opportunity was found in 4 excerpts across 4 different focus groups. Passage 1 below highlights how girls see Techbridge as an opportunity to become engaged in STEM.

Passage 1, STEM Opportunity:

Interviewer: Why did you decide to join Techbridge?
Girl: I would think that it’s a fun opportunity. If I know all these cool things and work with computers and technology, then I can probably help with my family.

The girl in this excerpt is excited to have had the opportunity to engage in STEM at Techbridge. She said she has learned “all these cool things” about computing and technology. Here the respondent explains that she may also be able to “help with [her] family” in the future, so she seems to be thinking of a STEM career as a viable way to assist her family financially. Through Techbridge, she has learned about STEM careers and can see herself in a STEM career in the future.

In the next two excerpts, girls respond to a question asking what their families think about them being in Techbridge.

Quote 2, STEM Opportunity: “My dad thinks that it’s really cool because they, especially my mom, because she does come to the Family Night and stuff like that. When we show her stuff that we did she thinks it’s like pretty cool because she didn’t get a chance to do it when she was a little kid. It’s nice to have this opportunity where I get to do different stuff.”

Quote 3, STEM Opportunity: “My mom’s always talking to me, she’s always saying, “I want so much for you, I want you to take advantage of every opportunity that you have, because I didn’t have those opportunities.”

In these two excerpts, the girls explain that their mothers have talked to them about the opportunities they did not have themselves. One mother has encouraged her daughter to “take advantage of every opportunity” because she was not offered those same opportunities. Both girls have come to see Techbridge as a positive opportunity for them.

Have Fun

Have Fun was found in 15 excerpts across all 6 focus groups, in other words, all youth focus groups indicated that girls view having fun as a purpose of Techbridge.

Based on the context of responses, analysis indicates that both the Techbridge curriculum (3 instances) and Techbridge facilitators (3 instances) encouraged girls to see Techbridge as fun. The embedded structure of Techbridge within the school environment also may have promoted girls’ view that Techbridge should be fun (1 instance). Passage 1 below highlights how curriculum as designed led to girls’ developing a perspective that Techbridge is supposed to be fun.

Passage 1, Have Fun:

Interviewer: What do you like most about Techbridge?
Girls 1: I like coming in and feeling confident about what’s going to happen next week. I’m excited for next week.
Girl 2: I like how they’re fun and they also help you learn about something new, but it’s...
Girl 1: In a fun way.
Girl 2: Entertaining too.

These two girls explain to the interviewer that they see Techbridge as a place with a constant stream of engaging activities. They say they learn new things in a “fun way” and that it’s “entertaining too.” Techbridge’s curriculum is designed to engage girls in STEM activities in a way that feels enjoyable to its participants.

The next excerpt shows how girls appreciate the way teachers and program coordinators at Techbridge help the girls to have fun.

Quote 2, Have Fun: “I usually have fun whenever I’m doing the project work, especially with another person. The rules here aren’t as strict as they are in the classroom, like when you’re working you can chat. It can get pretty loud, but we always listen to [the program coordinator] when she’s talking until, that makes it fun for me. I like learning about the different aspects of stuff.”

This respondent specified that she appreciates being able to work in pairs and “chat” while they work. She views the rules of Techbridge as more relaxed, which enables her to have more fun because the girls can talk with each other more. Teamwork and being able to engage socially with other girls makes Techbridge fun for her, and this fun atmosphere is created by her teacher and program coordinator at Techbridge.

The third excerpt here shows how Techbridge can show girls that science is fun.

Passage 3, Have Fun:

> Interviewer: Have you learned anything about yourself in Techbridge?
>
> Girl: I’ve learned that science is really fun and I might want to do it when I grow up.

This Techbridge participant responded to a question about what she had learned about herself through Techbridge, and she talked about her future in her answer. By participating in Techbridge, she has learned that “science is really fun”, which has then led her to consider a science career for her future.

Recommendations

Recommendations were found in 10 excerpts in 5 of the focus group transcripts:

- Seattle-based recommendations for fieldtrips (related to food science)
- Hold a Techbridge science fair
- Make sure fieldtrips are engaging, include activities
- More role models and field trips
- Better space for the number of girls
- More, and more substantial, materials
- Bringing in role models from the girls’ lives
- Recruit girls through interactive presentations with past participants sharing their work with potential participants. This could occur during open houses, in class presentations, or Techbridge-specific open houses open to all community members.
- Include field trip activities in which girls are engaging in the work of the company (e.g., do science experiments with the staff)
- Gender equity in Techbridge was discussed—allowing boys the opportunity to participate in Techbridge, either with the girls or alongside the girls

Interesting Things to Document

The parent code Interesting Things to Document was a way for coders to keep track of excerpts that were of interest but did not fit into another code. There also were not enough instances that could be grouped into themes such that a new parent code should have been created. This code was used 12 times in 5 of the transcripts.

- Students learned about dual credit on a field trip. Like AP courses, dual credit provides a low to no cost way to begin accruing college credit in high school. This sort of college going information is often less accessible to first generation college students, and it can help prepare for college paths with a leg up.
- Multiple students have familial role models in engineering, though it seems concentrated at particular schools. Sharing these family experiences through role model engagement can help support the family network and provide training to family members re: how to encourage their daughters/sisters/nieces. Asking family role models to become trained and visit across schools could help build on a legacy identity that honors local community ties and shows pathways towards engineering success.
- In its current state, Techbridge creates a gender divide that is not addressed at the school level in a systematic way—specifically, boys express jealousy and interest in Techbridge, but are provided little information about why they are not invited to the program. Men and boys may need information and encouragement to reject stereotypes regarding women's career opportunities, and assistance in understanding why Techbridge is focused to serve girls only.
- In one focus group, girls reject the idea that one's effort is the only factor that determines individual success. While promoting a growth mindset is very important for youth, acknowledging that other factors contribute or detract from youth success is vital. For example, girls who are not chosen for upper level courses could be discouraged if they assume they "did not try hard enough," when in fact discrimination could be a factor in the outcome.
- Considering field trip locations carefully is important, as some sites can perpetuate stereotypes. For example, visiting a campus where the majority of STEM students are male could deter student interest, particularly if the disparity is not addressed directly before, during, or following the field trip. Pre-field trip visits taken informally might bring up issues to address directly during the field trip itself, either by program coordinators and teachers or by field trip hosts.
- In one focus group, girls described a potential scenario in which girls helped one another consider career options. They described a sort of one on one advising situation tailored to girls' interests. The activity seemed notable because it gave the girls expert roles in discovering careers and also focused on building relationships with their peers.
- Math is an elusive concept in Techbridge—while math underlies much of the design work that girls do, there is limited talk about math and its use. In fact, some girls said there was no math in Techbridge, while others said there was lots of math in the program. This is an idea for potential study in other instruments; specifically it would be interesting to understand how program coordinators position math within the program. Given the way in which math can serve as a severe barrier to STEM higher education, it may be important to consider Techbridge's stance on math more directly.
- Workplace perks are appealing to girls—many of the discussions regarding field trips described the building, food options, and other perks like bringing animals to work. This is important, yet we noted that the work done in the workplace was often forgotten, or less clear after the fact than the work perks. Providing a balance of work/life balance details with career details could assist youth in retaining the career information as well as the motivation to join a company with great perks.

Appendix E: Teacher Survey Results

Table A. Teachers Rate Techbridge Training and Support

How helpful have the following aspects of Techbridge training and support been to you?	**n**	**Not at all helpful** (1)	**Slightly helpful** (2)	**Moderately helpful** (3)	**Very helpful** (4)	**Extremely helpful** (5)	**Mean** (1-5 scale)
Initial teacher training in the summer	6	0	0	0	2	4	4.7
Teacher meetings during the school year	5	0	0	1	0	4	4.6
Opportunities to interact with other Techbridge teachers, in a group or individually (online, informal conversations, etc.)	5	0	0	2	1	2	4.0
Debriefing meetings with your Techbridge program coordinator	6	0	1	1	2	2	3.8
Input/coaching from the Techbridge director/manager	5	0	2	1	1	1	3.2

Table B. Teachers Report Degree to Which Techbridge Program Elements Were Implemented in Their Programs

The table below has statements about things that may have happened in your Techbridge program this year. Please choose the answer that is closest to describing your Techbridge program overall.	**n**	**Not at all** (1)	**To a small extent** (2)	**To some extent** (3)	**To a large extent** (4)	**To a very large extent** (5)	**Mean** (1-5 scale)
Overall, the field trips were effective.	6	0	0	1	1	4	4.5
Our program talked about science, engineering and/or technology careers.	6	0	0	0	3	3	4.5
Our program emphasized the design process rather than product completion.	6	0	0	0	4	2	4.3
Our program promoted a growth mindset (that girls can improve at science, engineering and/or technology through time and experience).	6	0	0	1	3	2	4.2
Our program promoted positive peer relationships among girls.	6	0	0	0	5	1	4.2
Overall, the role model visits were effective.	6	0	1	1	1	3	4.0
The Techbridge curriculum was engaging for the girls.	6	0	0	1	4	1	4.0
Our program provided opportunities for girls to practice public speaking.	6	0	0	2	3	1	3.8
Our program talked about educational pathways that can lead to science, engineering and/or technology careers.	6	0	0	2	3	1	3.8
Our program talked about gender inequities in science, engineering and/or technology.	6	0	0	5	1	0	3.2
Our program talked about how to address gender inequities in science, engineering and/or technology.	6	0	2	3	1	0	2.8

Table C. Teachers Report Whether They Had the Decision-Making Control They Wished in Their Techbridge Program

To what degree did you feel like you had an appropriate role in making decisions about the following aspects of your Techbridge program?	**n**	**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**
Deciding on the program schedule	6	0	6	0
Recruiting girls to participate in the program	6	0	5	1
Choosing science, engineering and/or technology (SET) curriculum or activities	6	0	6	0
Facilitating activities	6	0	6	0
Organizing field trips	6	0	6	0
Involving role models in the program	6	0	5	1
Communicating with girls' families about the program	6	0	6	0
Other SET-related content of the program, such as SET career information	6	0	6	0

Table D. Teachers Report SET-Related Impacts Techbridge Had on the Girls in Their Program

Because of Techbridge, the majority of girls participating …	**n**	**Not at all** (1)	**To a small extent** (2)	**To some extent** (3)	**To a large extent** (4)	**To a very large extent** (5)	**Mean** (1-5 scale)
…increased their ability to use the engineering design process.	6	0	0	0	5	1	4.2
…are more likely to believe they can improve their abilities in SET with time, practice, and effort.	6	0	0	0	5	1	4.2
…are more knowledgeable about what SET professionals actually do.	6	0	0	0	5	1	4.2
…are more confident about their SET abilities.	6	0	0	0	6	0	4.0
…have increased knowledge of what education they need for a career in science, engineering, and/or technology.	6	0	0	1	5	0	3.8
…understand better how SET is relevant to their own lives.	6	0	0	2	4	0	3.7
…have more knowledge of gender inequities in SET.	6	0	1	4	1	0	3.0
…have more knowledge about how to address gender inequities in SET.	6	0	1	4	1	0	3.0
…have more knowledge about strategies to overcome gender inequities in SET.	6	0	1	4	1	0	3.0

Table E. Teachers Report Other Impacts Techbridge Had on the Girls in Their Program

Because of Techbridge, the majority of girls participating …	**n**	**Not at all** (1)	**To a small extent** (2)	**To some extent** (3)	**To a large extent** (4)	**To a very large extent** (5)	**Mean** (1-5 scale)
…speak up or share opinions with the larger group more readily.	5	0	0	0	4	1	4.2
…are more comfortable speaking in front of a group of people.	5	0	0	1	3	1	4.0
…are better able to construct an argument or explanation based on evidence.	5	0	0	0	5	0	4.0
…are more comfortable taking a leadership role in any activity (in Techbridge or elsewhere).	5	0	0	0	5	0	4.0
…are better at problem-solving.	5	0	0	0	5	0	4.0
…understand better the value of creativity in solving problems.	5	0	0	1	4	0	3.8
…understand better that it can take many tries to solve a problem.	5	0	0	1	4	0	3.8
…are better able to collaborate with their peers.	5	0	0	1	4	0	3.8
…communicate clearer/stronger arguments for their point of view.	5	0	0	2	3	0	3.6
…are more persistent in the face of challenges.	5	0	0	2	3	0	3.6

Table F. Teachers Report the Impact Techbridge Had on the Themselves as Teachers

This year, Techbridge increased my…	n	**Not at all** (1)	**To a small extent** (2)	**To some extent** (3)	**To a large extent** (4)	**To a very large extent** (5)	**Mean** (1-5 scale)
…interest in engaging girls in SET.	5	0	0	1	1	3	4.4
…knowledge of strategies to engage girls in SET.	5	0	0	0	3	2	4.4
…awareness of SET careers..	5	0	0	1	2	2	4.2
…knowledge about other SET resources and programs available for girls.	5	0	0	1	3	1	4.0
…ability to provide academic guidance for girls to pursue SET.	5	0	0	2	2	1	3.8

Appendix F: Role Model Survey Results

Table A. Preparation Received From Techbridge to Become a Role Model

	Role Models (n = 23)	
	Number	Percent
None	4	17%
Participated in preparation by phone from a Techbridge staff member	5	22%
Participated in online training for role models	2	9%
Attended an in-person training for Techbridge role models	13	57%
Other; please describe:	2	9%

Table B. Overall Helpfulness of the Techbridge Role Model Preparation

	Role Models (n = 18)	
	Number	Percent
Very helpful	7	39%
Somewhat helpful	9	50%
Only a little helpful	2	11%
Not at all helpful	0	0%
Very helpful	7	39%

Table C. Number of Times Role Models Visited a Techbridge Program During the Past Twelve Months

	Role Models (n = 20)	
	Number	Percent
0	13	65%
1	6	30%
2	1	5%
3 or more	0	0%

Table D. Number of Times Techbridge Students Made a Field Trip to Role Model Workplaces During the Past Twelve Months

	Role Models (n = 20)	
	Number	Percent
0	7	35%
1	11	55%
2	2	10%

Table E. Techbridge Role Model Survey Results

	n	Strongly Disagree (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	Strongly agree (6)	Mean (1-6 scale)
I know what Techbridge's expectations are for role models.	18	0%	6%	0%	0%	67%	28%	5.11
I followed Techbridge's suggestions while conducting outreach with Techbridge students.	15	0%	0%	7%	0%	53%	40%	5.27
I had an opportunity to share personal information about myself with the girls such as my hobbies, or what I liked at their age.	18	0%	0%	0%	6%	33%	61%	5.56
I was able to describe my job in a way the girls could understand.	18	0%	0%	0%	6%	50%	44%	5.39
I was able to make connections between my job and the girls' everyday lives.	18	0%	0%	0%	22%	33%	44%	5.22
(If your experiences involved hands-on projects) I was comfortable guiding girls' efforts in a hands-on project.	17	0%	0%	0%	12%	29%	59%	5.47
I felt comfortable answering the girls' questions.	18	0%	0%	0%	11%	28%	61%	5.50
I am more confident conducting outreach with K-12 students because of my experience as a Techbridge role model.	18	0%	0%	0%	28%	33%	39%	5.11
I am more effective conducting outreach with K-12 students because of my experience being a Techbridge role model.	17	0%	0%	0%	24%	35%	41%	5.18
Overall, the experience of being a Techbridge role model has been worthwhile.	18	0%	0%	0%	0%	39%	61%	5.61

Table F. Role Model Activities During Visits and Field Trips

	n	Yes, in every role model visit(s)/ field trip(s)	Yes, but only in some of my role model visit(s)/ field trip(s)	No, in none of my role model visit(s)/ field trip(s)	Not sure
I led a tour of my worksite or school.	18	33%	0%	56%	11%
I conducted an icebreaker activity (a warm-up or get-to-know you activity).	18	72%	11%	11%	6%
I told at least one personal story about myself.	19	74%	16%	5%	5%
I facilitated a hands-on activity with the girls.	18	72%	17%	6%	6%
I encouraged the girls to ask me questions.	19	79%	16%	0%	5%
I shared my educational pathway with the girls.	19	68%	16%	11%	5%
I shared about how I decided to work in science, engineering, or technology.	19	74%	16%	5%	5%

Table G. Likelihood of Next Year's Participation (n=16)

	Definitely Won't (1)	**Probably Won't** (2)	**Uncertain** (3)	**Probably Will** (4)	**Definitely Will** (5)	**Mean** (Scale 1-5)
Visit a Techbridge after-school program as a role model.	6%	13%	38%	13%	31%	3.50
Serve as a Techbridge role model on a field trip	0%	0%	38%	44%	19%	3.81
Coordinate with Techbridge to hold a field trip at my employer/job location.	0%	6%	56%	25%	13%	3.44
Serve as a role model for youth about having a career in science/technology (outside of Techbridge)	0%	13%	38%	19%	31%	3.69

Appendix G: Parent Survey Results

Table A. Parent Survey Response by School

	School District	Number	Percent
Elementary Schools			
Beverly Park Elementary	Highline	14	17%
Hazel Valley Elementary	Highline	12	14%
Madrona Elementary	Highline	14	17%
Mt View Elementary	Highline	9	11%
McMicken Heights Elementary	Highline	18	21%
Middle Schools			
Chinook Middle	Highline	8	10%
Sylvester Middle	Highline	9	11%
TOTAL		84	100%

Table B. Parent Survey Response by Language of Survey

	Number	Percent
English	60	71%
Spanish	23	27%
Vietnamese	1	1%
TOTAL	84	100%

Table C. Relationship of Survey Respondent to Techbridge Girl

	Number	Percent
Mother	49	70%
Father	14	20%
Guardian	2	3%
Other *(grandparent (2), aunt, friend, sister, both mother & father)*	5	7%
TOTAL	70	100%

Table D. Parents Report Their SET Attitudes and the Impact Techbridge Had on the Them as Parents

	n	**Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	**Agree a lot** (6)	**Mean** (1-6 scale)
I would support my daughter if she chooses to become a scientist, engineer and/or work in technology.	84	1%	0%	1%	2%	17%	79%	5.69
Someone like my daughter could become an engineer.	81	1%	0%	0%	2%	25%	72%	5.64
Learning more science will give my daughter many career choices.	83	1%	0%	0%	7%	30%	61%	5.49
Because of Techbridge, I have encouraged my daughter to participate in science, technology and/or engineering activities outside of school (like attending a summer camp, going to summer school in math, going to a science or tech museum, building things at	82	0%	4%	5%	17%	30%	44%	5.06
Techbridge helped me learn about science, technology and/or engineering activities my daughter can participate in (like museums, camps, classes, etc.).	80	0%	0%	1%	24%	44%	31%	5.05
Because of Techbridge, I have a better understanding of the education needed for a career in science, engineering, and/or technology.	83	1%	4%	2%	18%	39%	36%	4.98
Because of what I learned from Techbridge, I am able to talk with my daughter about science (and/or engineering or technology) careers.	82	1%	6%	4%	13%	40%	35%	4.91
Techbridge helped me learn about family activities to do with my daughter related to science, engineering, and/or technology.	83	1%	2%	8%	19%	31%	37%	4.89
Techbridge helped me learn about what a scientist, engineer, or technology worker actually does.	81	2%	6%	2%	19%	32%	38%	4.86

Table E. Parents Report if Daughter Talked about SET Jobs Before or After Techbridge *(only parents who answered both questions)*

Did/has your daughter talked about having a job in science, engineering, and/or technology…	**n**	**Yes**	**No**	**Don't know**
before she began attending Techbridge?	84	55%	39%	6%
since she began attending Techbridge?	84	75%	18%	7%

Table F. Parents Report on Various SET-Related Behaviors

	n	Yes	No	Don't know
Do you tell your daughter you want her to go to college?	84	98%	2%	0%
Has your daughter talked to you about what she does in Techbridge?	84	96%	2%	1%
Have you ever encouraged your daughter to study science, engineering or technology?	82	82%	10%	9%
Have you received any written materials from Techbridge about the activities your daughter has been doing this year (like newsletters, emails, links to Tumblr posts)?	83	82%	14%	4%
Do you or another adult in the immediate family do math, science, or engineering as a hobby or special interest?	83	51%	39%	11%
Do you or another adult in the immediate family currently work (or previously work) in a math, science, or engineering career?	82	38%	57%	5%

Table G. Parents Report the Impact Techbridge Had on Their Daughters

Because of Techbridge, my daughter…	n	**Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	**Agree a lot** (6)	**Mean** (1-6 scale)
...is more interested in science, engineering, and/or technology.	83	0%	0%	0%	8%	33%	59%	5.51
...believes that with hard work she can be better in science, engineering and/or technology.	80	0%	0%	0%	8%	43%	50%	5.43
...is more willing to try new things.	81	1%	0%	0%	12%	33%	53%	5.36
...knows more about how to prepare for a career in science, engineering, and/or technology.	80	0%	0%	0%	10%	50%	40%	5.30
...does not give up as easily when facing something difficult (such as a hard homework problem or a challenging project).	83	1%	0%	1%	16%	37%	45%	5.22
...is more interested in taking science, engineering or technology classes in high school.	81	0%	2%	2%	16%	31%	48%	5.20
...is more interested in studying science, engineering or technology in college.	80	0%	5%	0%	19%	24%	53%	5.19
...is more likely to share her ideas or opinions with others.	83	1%	1%	0%	20%	30%	47%	5.18
...is better able to communicate her ideas to other people.	84	1%	1%	0%	23%	30%	45%	5.14
...appears more comfortable speaking in front of a group of people.	80	3%	1%	3%	19%	33%	43%	5.05

Appendix H: Dimensions of Success Fall 2014 and Spring 2015 Reports

Techbridge Broad Implementation

Dimensions of Success Observations of Highline Programs in Fall 2014

INTERNAL REPORT PREPARED FOR

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January 2015

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Introduction and Methodology

As part of studying Techbridge's expansion to three new cities (funded by a National Science Foundation grant), the evaluation and research teams are conducting site visits to a sample of these new Techbridge programs. The evaluation team visited new Techbridge programs for the first time in the fall of 2014, when Techbridge began operating after-school programs at several schools in the Seattle, WA area. An observer from Education Development Center (EDC) who had been trained and certified[14] to use the Dimensions of Success (DoS) observation tool[15] observed five of the seven[16] Techbridge after-school programs located in the Highline Public School District.

The observed sessions were part of either Techbridge's digital media unit (during which girls craft short Claymation movies) or the mechanical engineering unit (where girls design catapults and rubber band cars, amongst other activities). Each program was observed for an entire session, which typically lasted 75 minutes (not including 15 minutes for snack). Observations took place in November 2014, several weeks after the programs had begun (the 5th-7th week out of the approximately 30 weeks of programming offered during the 2014-2015 school year).

The observer rated the sessions on each the 12 DoS dimensions. Table 1 (on the following page) shows the key questions associated with each DoS dimension. Each dimension is given a rating of 1 to 4, where "1" represents absent evidence, "2" represents inconsistent evidence, "3" represents reasonable evidence, and "4" represents compelling evidence. Ratings from eight of the 12 DoS dimensions will be used as part of the Techbridge Implementation Rubric, a tool designed by the evaluation/research teams (with input from Techbridge leadership) to describe best practices in Techbridge program implementation. The DoS dimensions that will be included in the Implementation Rubric are marked in the charts and descriptions within this report.

"With a Grain of Salt"

It is important to note a few caveats before presenting the results from this first round of observations using the DoS tool:

- The purpose of the DoS observations is not to rate Techbridge program coordinators or teachers, but rather to gather information about overall trends in implementation across several Techbridge programs.

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[14] To become a certified observer, the evaluation team member from EDC participated in a two-day DoS training webinar and conducted two practice observations which were subsequently reviewed by a DoS trainer.

[15] *Dimensions of Success: A* PEAR *Observation Tool*. (2013). Program in Education, Afterschool and Resiliency (PEAR) at Harvard University and McLean Hospital.

[16] Of the observed programs, three are located at elementary schools and two are located at middle schools.

- The DoS tool was developed to be used by a wide variety of out-of-school time programs that offer STEM programming. As such, some of the dimensions may be more or less relevant to Techbridge.
- Programs likely vary over the course of the year. The individual sessions that were observed may or may not have been representative of the Techbridge programs in fall 2014. Furthermore, this is the first year that Techbridge has operated programs in the Greater Seattle area, and it is expected that the programs will continue to evolve and improve as the entire Techbridge team gains more experience.
- Every effort was made to avoid including information that would identify individual Techbridge programs, staff, or teachers in this report. However, because only five sessions were observed, disguising the identity of the programs was somewhat challenging. A draft of the report was shared with the two program coordinators whose programs were observed so they could provide input before the report was shared with the Techbridge leadership team. The observer also met individually with each program coordinator to discuss the overall results, including strengths and possible areas for growth.

Table 1. Key Questions for each Dimensions of Success Dimension

FEATURES OF THE LEARNING ENVIRONMENT		
Organization • Are the activities delivered in an organized manner? • Are materials available and do transitions flow? • Is a back-up plan available if conditions change?	**Materials*** • Are the materials appropriate for the students, aligned with the STEM learning goals, and appealing to the students?	**Space Utilization** • Is the space utilized in a way that is conducive to out-of-school-time (OST) learning? • Are there any distractions that impact the learning experience?
ACTIVITY ENGAGEMENT		
Participation* • Are students participating in all aspects of activities equally? • Are some students dominating group work?	**Purposeful Activities*** • Are the activities related to the STEM learning goals?	**Engagement with STEM** • Are students doing the cognitive work while engaging in hands-on activities that help them explore STEM content?
STEM KNOWLEDGE AND PRACTICES		
STEM Content Learning* • Is STEM content presented accurately during activities? • Do the students' comments, questions, and performance during activities reflect accurate uptake of STEM content?	**Inquiry*** • Are students participating in the practices of scientists, mathematicians, engineers, etc.? • Are students observing, collecting data, building explanations, etc.?	**Reflection*** • Do students have opportunities to reflect and engage in meaning-making about the activities and related content?
YOUTH DEVELOPMENT IN STEM		
Relationships* • Are there positive student-facilitator and student-student interactions?	**Relevance*** • Is there evidence that the facilitator and students are making connections between the STEM content and activities and students' everyday lives and experiences?	**Youth Voice** • Are students encouraged to voice their ideas/opinions? • Do students make important and meaningful choices that shape their learning experience?

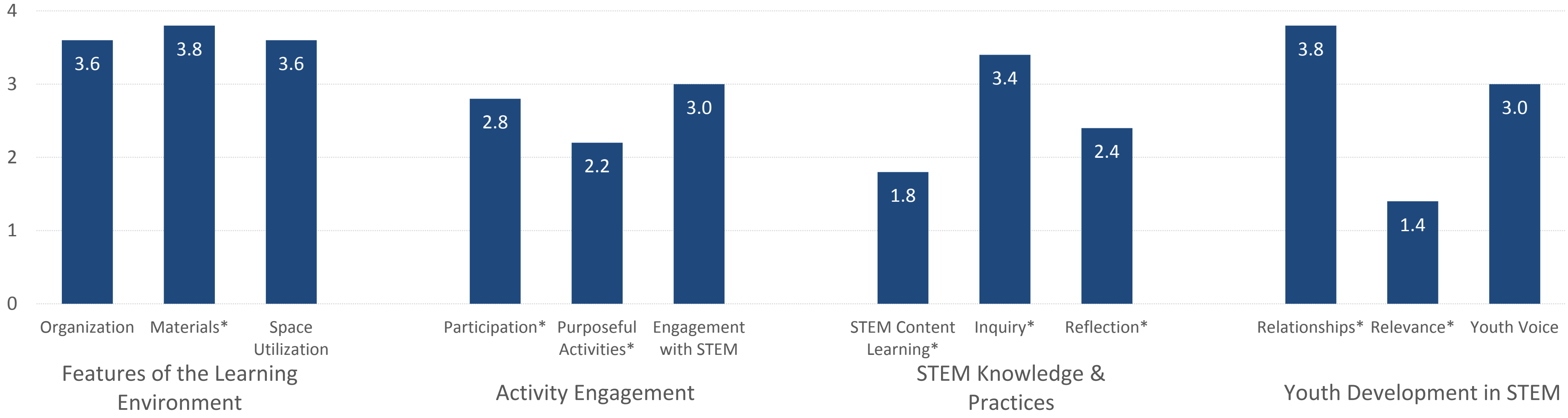
**Starred dimensions are included in the Techbridge Implementation Rubric*

DoS Findings

Chart 1 (below) shows the average (or "mean") ratings on each of the 12 DoS dimensions, while Chart 2 (on the following page) displays the distribution of ratings for each dimension. In general, the observed sessions received high ratings on the dimensions, using the DoS guideline that ratings of "3" or "4" indicate high quality. On eight of the 12 dimensions, the majority of observed sessions received ratings of "3" or "4." However, four dimensions—purposeful activities, STEM content learning, reflection, and relevance—received low ratings across the majority of program sessions observed. More than half of the observed sessions scored a "1" or "2" on these dimensions.

Chart 1. Mean Dimensions of Success Ratings

Observations of 5 Techbridge programs in November 2014 (Highline School District)

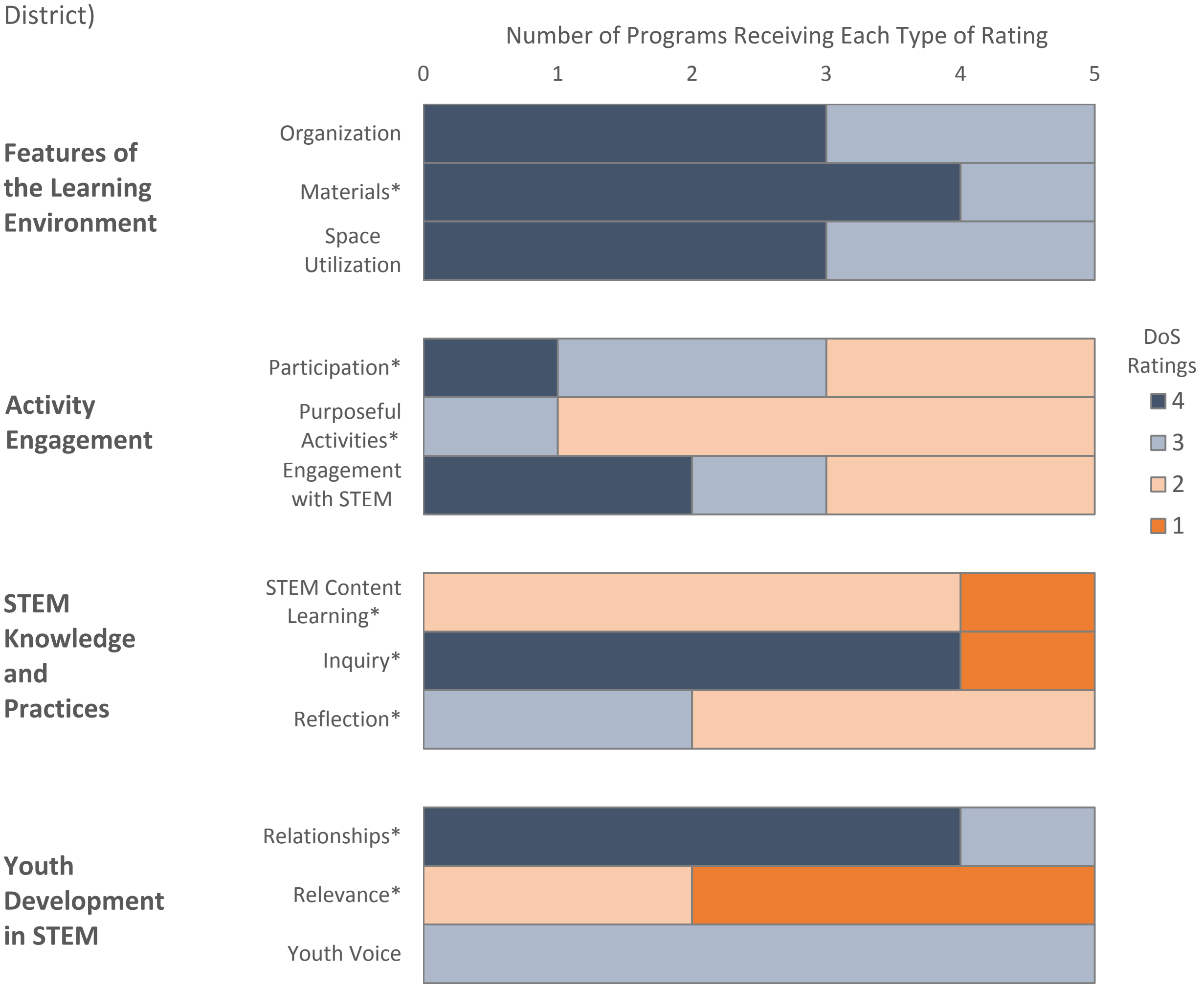


**Starred dimensions are included in the Techbridge Implementation Rubric*

The ratings for each dimension are discussed in greater detail below, grouped by the DoS tool's four domains: features of the learning environment, activity engagement, STEM knowledge and practices, and youth development in STEM.

Chart 2. Individual Dimensions of Success Ratings

Observations of 5 Techbridge programs in November 2014 (Highline School District)



**Starred dimensions are included in the Techbridge Implementation Rubric*

Features of the Learning Environment

The learning environment domain describes three features that make the environment appropriate for informal STEM programming: organization, materials, and space utilization. The observed Techbridge sessions were all very strong on these dimensions.

Organization. **All five observed sessions (100%) received a rating of "3" or "4" on the *organization* dimension,** which assesses the degree to which the observed activities were delivered in a way that reflects planning and preparation. This rating is based on whether the materials needed for the activities are available, whether the facilitators are able to adapt to changing situations, and the quality of transitions between activities during the session. In each of the observed sessions, all the necessary materials were prepared in advance and available when needed. For example, facilitators had a demonstration video cued up and ready to show at the beginning of one session. In another session, pre-packaged sets of materials for building rubber band cars were ready for girls to use, while in another, girls' in-progress Claymation projects were kept in clearly labelled boxes—each with girls' names—making it easy to distribute the materials to each team. The transitions between the initial icebreaker activity, main activity, and final reflection were consistently smooth across programs. For example, the facilitators typically gave students a 2-5 minute warning prior to each transition, such as when it was time for the girls to put away their materials and move on to the final reflection.

Materials. **All five observed sessions (100%) received a rating of "3" or "4"on the *materials* dimension,** which assesses both the appropriateness and the appeal of the materials used in the STEM learning activity.[17] In all the sessions, the materials were appropriate for the activities' learning goals and interesting to the girls. Girls appeared eager to use the materials and immediately jumped into the hands-on activities. The girls made comments indicating that they thought the activities were fun and appropriately challenging. For example, in one of the programs, a girl who was working on the Claymation project raised her arms into the air with her fists clenched and exclaimed, "*Yes!*" when she had achieved a milestone.

Space utilization. **All five observed sessions (100%) received a rating of "3" or "4" on the *space utilization* dimension,** which gauges the extent to which the physical space in which the STEM activity is held is conducive to STEM learning in an out-of-school-time setting. In each observed session, the resources and classroom set-up were conducive to exploration and learning. Tables and chairs were arranged in way that supported girls working together in small groups. The girls generally had sufficient space to work on their hands-on projects. There were no or minimal distractions that detracted from the girls' experience.

Activity Engagement

The activity engagement domain dimensions—student participation, purposeful activities, and student engagement with STEM—assess how the activity engages all students in learning about STEM.

Participation. **Three of the five observed sessions (60%) received a rating of "3" or "4" on the *participation* dimension,** which reflects the extent to which all students participate in the activities.[18] In a program that received a "4," all the girls had equal access to the materials and all the girls were engaged throughout the activity. On the few occasions where a girl made an off-topic comment during

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[17] Ratings from the DoS *materials* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *materials*."

[18] Ratings from the DoS *participation* dimension are included in the "recruitment of target audience" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations indicate a 3 or higher in *participation*, which, by definition, means that all students were engaged or at least prompted/encouraged by adults to engage throughout activity."

whole-group discussions, the facilitators immediately and gently but firmly prompted the girl to remain on- topic.

In contrast, in the sessions that received a “2” rating, participation in the activities was somewhat uneven over the course of the observation. In one session, all the girls actively participated in the hands-on activity. Near the end of the session, the facilitators asked the girls to test and share what they had made with the whole group. However, after each team shared what they had made, the girls did not stay to watch their peers’ presentations. By the end of the demonstration, only a few girls remained to watch their peers.

Purposeful activities. **One of the five observed sessions (20%) received a rating of “3” or “4” on the *purposeful activities* dimension**, which focuses on the structure of the learning activities, including the extent to which the students understand the goals of activities and the connections between them, as well as the degree to which each of activities relate to the STEM learning goals.[19] In the program that received a “3,” the facilitators clearly presented the learning goals of the initial icebreaker activity (as being about learning to present and be a respectful audience), as well as the goals of the concluding reflection activity (understanding the importance of perseverance).

Conversely, in the sessions that were rated a “2,” the goals related to science content or engineering concepts were unclear. The facilitators referred to related STEM concepts briefly or not at all (e.g., physics concepts or engineering principles associated with building catapults or rubber band cars; technology issues associated with shooting or editing Claymation videos), and engaged girls with questions about what they were doing or why to a limited extent (or not at all).

Engagement with STEM. **Three of the five observed sessions (60%) received a rating of “3” or “4” on the *engagement with STEM* dimension,** which measures the extent to which students are working in a way that is both “hands-on” and “minds-on” and that allows them to explore STEM content. In a session that received a rating of “4,” the activities were hands-on and minds-on. The girls had the hands-on opportunity to learn how to use tablets and editing software to make Claymation movies. The girls did most of the cognitive work themselves. At various points, the facilitators met with the teams to help the girls problem-solve issues with their movies (without actually solving the problem for the girls).

Sessions that rated low on this dimension typically involved hands-on activities, but the facilitators did not link the activity with STEM content (and therefore the activities were not as “minds-on”). For example, students were asked to build an object but were not prompted to think about why one design might work better than another, or how the activity related to with kinetic or potential energy.

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[19] Ratings from the DoS *purposeful activities* dimension are included in the “engineering design process” section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: “DoS observations show a 3 or higher in *purposeful activities*.”

STEM Knowledge and Practices

The STEM knowledge and practices domain measures the extent of students' STEM content learning, use of inquiry practices, and opportunities for reflection. These dimensions gauge the extent to which the activities help students understand STEM concepts, make connections, and engage in practices STEM professionals use.

STEM content learning. **None of the observed sessions received a rating of "3" or "4" on the *STEM content learning* dimension,** which assesses whether STEM content is presented accurately, whether facilitators makes connections across ideas to deepen students' understanding of the content, and whether students' comments and questions indicate that they understand the STEM content.[20] In the observed sessions, information about STEM content was presented very briefly, if at all. Students' comments and questions suggests that they might have been catching on to isolated facts or ideas, but were not delving deeper into STEM content. For example, one of the facilitators asked girls to write in their journals or talk amongst themselves at their tables *"about what you learned in mechanical engineering*." However, none of the girls' questions or comments during the brief group discussion that followed were related to STEM content. Rather, a few girls commented they had learned the value of teamwork. Students' comments and questions indicated that they were not making connections beyond memorization about the science content (repeating what they already knew about what potential energy is). Students' questions were primarily focused on the materials themselves rather than the goals of the activity.

Inquiry. **Four of the five observed sessions (80%) received a rating of "3" or "4" on the *inquiry* dimension,** which reflects the engagement of students in STEM practices, such as making observations, asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, engaging in argument from evidence, and sharing findings with peers.[21] In one session that received a "4" rating, the girls independently problem solved how to design and modify their catapults to achieve the goal, and did so together with their peers. In another session, a pair of girls was observed to talk through how they wanted to design their car to make it move:

> Girl 1: *We could put a hole in it, like this.* [Demonstrates]
> Girl 2: *This shape might not be the best one because it won't move.* [Demonstrates]
> Girl 1: *It might go like this…* [Demonstrates]
> Girl 2: *I'm talking about this…* [Demonstrates]

Reflection. **Two of the five observed sessions (40%) received a rating of "3" or "4" on the *reflection* dimension,** which measures the amount of explicit reflection of STEM content during the activity, and

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[20] Ratings from the DoS *STEM content learning* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *STEM content learning*."

[21] Ratings from the DoS *inquiry* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *inquiry*."

the degree to which students are able to engage in meaning-making about the activities and related content.[22] The DoS defines this dimension as whether there is evidence that students have multiple explicit opportunities to engage in meaningful reflection throughout the activities. In one session that received a "3," the facilitators asked the girls to reflect for about five minutes at the beginning of the activity (regarding what they had done the previous week) and again for about 10 minutes at the end of the activity. Girls' reflections suggest that some girls were beginning to make connections between the activity and the STEM content they were learning. For example:

> Facilitator: *Yours went the furthest. What did you do to make it go further?*
> [Girl demonstrates her catapult and says it used a string.]
> Facilitator: *Was it a two-part motion?*
> Girl: *It was a two-part motion. We let go of the string as we karate chopped it. The force was we let go of the cup and launched it.*

In contrast, in the sessions that received a "2," there was no time devoted to reflection about the activity either during the activity or immediately following it, or the facilitator briefly prompted for a reflection at the end of the activity, but the facilitator moved on after one or two responses and/or students' responses did not indicate they were sense-making.

Youth Development in STEM

The youth development in STEM domain includes the dimensions of relationships, relevance of activities, and presence of youth voice. These dimensions measure whether the facilitators and students have positive relationships, whether activities are relevant to students' lives and experiences, and whether students are encouraged to share their opinions and make meaningful choices.

Relationships. **All five observed sessions (100%) received a rating of "3" or "4" on the relationships dimension,** which assesses the nature of the relationship between the facilitator and the students and amongst the students, assessing whether the interactions suggest warm, positive relationships.[23] In all sessions, the facilitators had good rapport with their students and peer interactions were positive and friendly. The facilitators and girls were all respectful with one another. There were no negative judgments or criticism. The facilitators called girls by their names. Girls were cooperative and shared materials and ideas with one another. For example, two teams of girls were observed talking together about what they had each done:

> Girl 1: *What's [your video] about?*

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[22] Ratings from the DoS *reflection* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *reflection*."

[23] Ratings from the DoS *relationships* dimension are included in the "creating an integrated Techbridge/school partnership" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations indicate a score of at least 3 in *relationships*, indicating clear evidence of positive participant-participant, facilitator-participant, and facilitator-facilitator relationships."

Girl 2 from another team shows Girl 1 her tablet.
Girl 1: *That's awesome! Good job!*

In several sessions, there was frequent laughter, and the girls and facilitators sometimes joked with one another.

Relevance. **None of the observed sessions received a rating of "3" or "4" on the *relevance* dimension,** which focuses on the extent to which facilitators guide students in making connections between the STEM activities and their own lives or experiences, other subject areas, or in a broader context.[24] Across the observed sessions, facilitators made relatively few connections to students' lives. Facilitators sometimes made a connection between what the students were doing and what engineers do, such as in one session where one of the facilitators instructed girls as they were selecting supplies, "*Don't take more than you need, like engineers.*" In another session, a facilitator made a connection between the content of the activity and engineering educational pathways, asking, *"Does anybody know what classes you need to take in middle school or high school [to become an engineer]*?" However, these instances were brief and isolated. The facilitators and girls did not discuss how the activities were similar to other things they knew or to other context/concepts.

Youth voice. **All five observed sessions (100%) received a rating of "3" on the *youth voice* dimension,** which reflects the ways in which the STEM activity allows students to share their ideas and opinions, and give them genuine personal responsibility. Girls were often asked to share their ideas and opinions throughout the observed activities. For example, girls were able to choose how they wanted to design their project, what materials they wanted to use (from those provided), and whether and how they wanted to modify their designs.

Food for Thought (add salt as needed)

The following questions might be worthwhile for the Techbridge leadership team to consider.

- How do these DoS results compare to your understanding of what Techbridge programs "really" look like? Does anything surprise you?
- How do these DoS results compare to your understanding of what Techbridge programs <u>should</u> look like?
- How does the DoS align with other tools being used to measure Techbridge's implementation?
    - Which, if any, of the DoS domains are not relevant to Techbridge (and/or not important to measure)? Does the Techbridge Implementation Rubric include the "right" DoS dimensions? Currently, the Techbridge Implementation Rubric includes ratings from the following eight dimensions: *materials*, *participation*, *purposeful activities*, *STEM content*

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[24] Ratings from the DoS *relevance* dimension are included in the "role modeling for career exploration" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations indicate a score of at least 3 on *relevance*, which by definition shows activities are explicitly connected to broader context (e.g., career opportunities) or students' lives."

learning, *inquiry*, *reflection*, *relationships*, and *relevance*. It does not include the following four dimensions: *organization*, *space utilization*, *engagement with STEM*, and *youth voice*.
    - How does the DoS align with the Techbridge Essentials Coaching Guide?

- Based on these DoS results, are there areas that Techbridge might wish to focus on over the next 6-12 months (e.g., discuss during small team meetings, offer professional development, revise curriculum materials/guides)?
- Should we share information about both the DoS tool and the DoS results with the Techbridge teachers? If so, how?

Conclusion

The observed sessions received high ratings on most of the DoS dimensions. The same five programs will be observed again in spring 2015. The evaluation/research teams look forward to discussing the fall 2014 results with the Techbridge leadership team.

Techbridge Broad Implementation

Dimensions of Success Observations of Highline Programs in Spring 2015

INTERNAL REPORT PREPARED FOR

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7700 Edgewater Drive, Suite 519
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July 2015

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Introduction and Methodology

As part of studying Techbridge's expansion to new cities (funded by a National Science Foundation grant), the evaluation and research teams are conducting site visits to a sample of these new Techbridge programs. An observer from Education Development Center (EDC) who had been trained and certified[25] to use the Dimensions of Success (DoS) observation tool[26] observed five of the seven[27] Techbridge after-school programs located in the Highline Public School District in the fall of 2014 and the same programs again in the spring 2015. This report presents the results from the spring observations. (A January 2015 report presented the results from the fall observations.)

The observed sessions were part of the computer science unit (during which girls learn how to code with simple tools like Scratch), the electrical engineering unit (during which girls learn about electricity and how to build circuits), or a "flex" product engineering design activity. Each program was observed for an entire session, which typically lasted 75 minutes (not including 15 minutes for snack). Observations took place in April and May 2015, near the end of the 2014-2015 school year.

The observer rated the sessions on each the 12 DoS dimensions. Table 1 (on the following page) shows the key questions associated with each DoS dimension. Each dimension is given a rating of 1 to 4, where "1" represents absent evidence, "2" represents inconsistent evidence, "3" represents reasonable evidence, and "4" represents compelling evidence. Ratings from eight of the 12 DoS dimensions will be used as part of the Techbridge Implementation Rubric, a tool designed by the evaluation/research teams (with input from Techbridge leadership) to describe best practices in Techbridge program implementation. The DoS dimensions that will be included in the Implementation Rubric are marked in the charts and descriptions within this report.

"With a Grain of Salt"

As with our report describing the results from the fall DoS observations, it is important to note a few caveats before presenting the results from this second round of DoS observations:

- The purpose of the DoS observations for the Techbridge AISL evaluation is not to rate Techbridge program coordinators or teachers, but rather to gather information about overall trends in implementation across several Techbridge programs.
- The DoS tool was developed to be used by a wide variety of out-of-school time programs that offer STEM programming. As such, some of the dimensions may be more or less relevant to Techbridge.

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[25] To become a certified observer, the evaluation team member from EDC participated in a two-day DoS training webinar and conducted two practice observations which were subsequently reviewed by a DoS trainer.

[26] *Dimensions of Success: A* PEAR *Observation Tool*. (2013). Program in Education, Afterschool and Resiliency (PEAR) at Harvard University and McLean Hospital.

[27] Of the observed programs, three are located at elementary schools and two are located at middle schools.

- Programs likely vary over the course of the year. In the spring, the program coordinators and teachers were much more familiar with the Techbridge program model, their roles and their students, as well as somewhat more familiar with the DoS tool itself (following the fall DoS observations and debrief). While it is possible that differences in the fall and the spring ratings are related to the curriculum implemented during the fall vs. the spring, it is likely that the change in ratings was due in large part to professional growth.
- Every effort was made to avoid including information that would identify individual Techbridge programs, staff, or teachers in this report. However, because only five sessions were observed, disguising the identity of the programs was somewhat challenging. A draft of the report was shared with the two program coordinators whose programs were observed so they could provide input before the report was shared with the Techbridge leadership team. The observer also met individually with each program coordinator to discuss the overall results, including strengths and possible areas for growth.

Table 1. Key Questions for each Dimensions of Success Dimension

FEATURES OF THE LEARNING ENVIRONMENT		
Organization • Are the activities delivered in an organized manner? • Are materials available and do transitions flow? • Is a back-up plan available if conditions change?	**Materials*** • Are the materials appropriate for the students, aligned with the STEM learning goals, and appealing to the students?	**Space Utilization** • Is the space utilized in a way that is conducive to out-of-school-time (OST) learning? • Are there any distractions that impact the learning experience?
ACTIVITY ENGAGEMENT		
Participation* • Are students participating in all aspects of activities equally? • Are some students dominating group work?	**Purposeful Activities*** • Are the activities related to the STEM learning goals?	**Engagement with STEM** • Are students doing the cognitive work while engaging in hands-on activities that help them explore STEM content?
STEM KNOWLEDGE AND PRACTICES		
STEM Content Learning* • Is STEM content presented accurately during activities? • Do the students' comments, questions, and performance during activities reflect accurate uptake of STEM content?	**Inquiry*** • Are students participating in the practices of scientists, mathematicians, engineers, etc.? • Are students observing, collecting data, building explanations, etc.?	**Reflection*** • Do students have opportunities to reflect and engage in meaning-making about the activities and related content?
YOUTH DEVELOPMENT IN STEM		
Relationships* • Are there positive student-facilitator and student-student interactions?	**Relevance*** • Is there evidence that the facilitator and students are making connections between the STEM content and activities and students' everyday lives and experiences?	**Youth Voice** • Are students encouraged to voice their ideas/opinions? • Do students make important and meaningful choices that shape their learning experience?

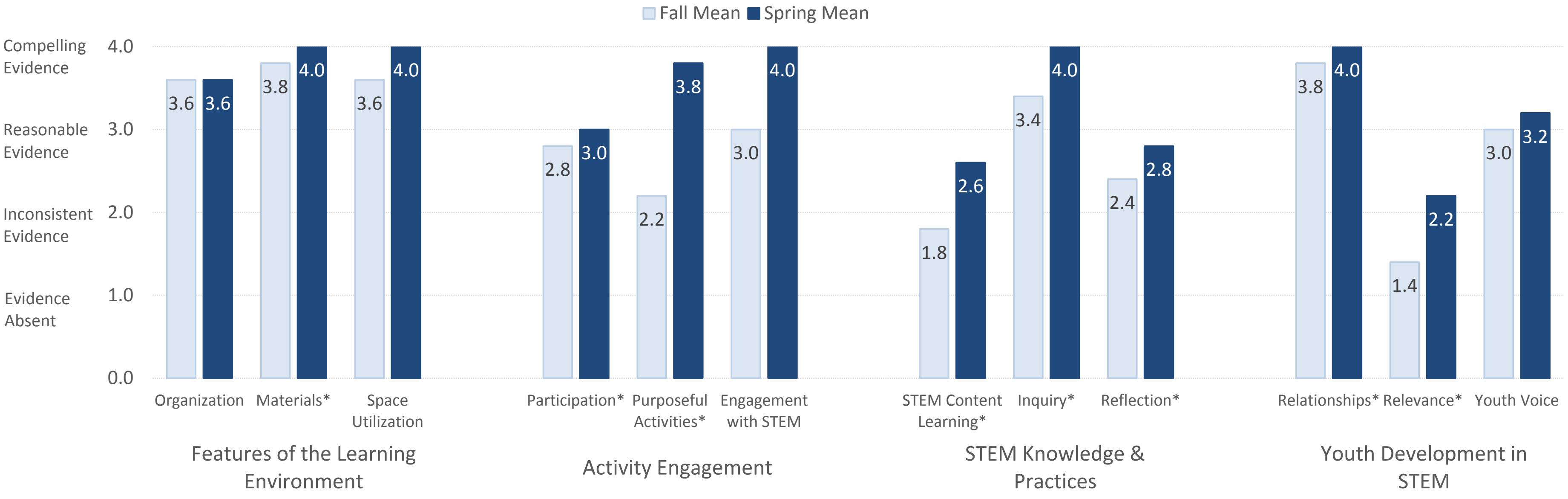
**Starred dimensions are included in the Techbridge Implementation Rubric*

DoS Findings

Chart 1 (below) shows the average (or "mean") ratings of each of the 12 DoS dimensions in fall 2014 (light blue) and spring 2015 (dark blue). The average DoS ratings in spring were higher on every dimension than the fall ratings. In the spring of 2015, the majority of observed sessions received ratings of "3" or "4" on 11 of the 12 dimensions (DoS guidelines are that ratings of "3" or "4" indicate high quality). The only dimension that received low ratings across the majority of observed program sessions in spring 2015 was relevance. However, it is important to note that the average relevance rating was higher in the spring than the fall.

Chart 1. Mean Dimensions of Success Ratings

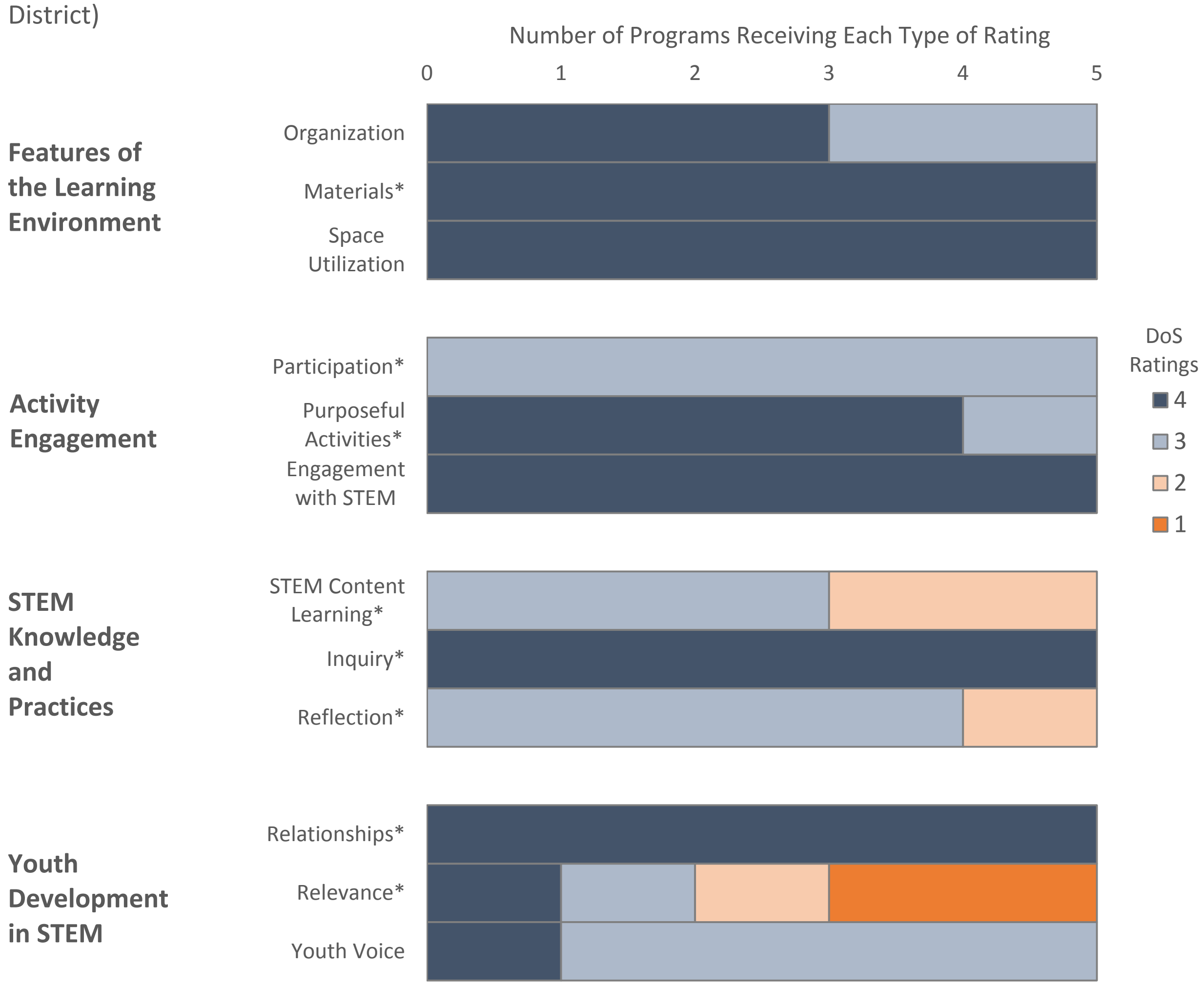
Observations of 5 Techbridge programs in November and April/May 2015 (Highline School District)



*Starred dimensions are included in the Techbridge Implementation Rubric

Chart 2. Individual Dimensions of Success Ratings

Observations of 5 Techbridge programs in April/May 2015 (Highline School District)



**Starred dimensions are included in the Techbridge Implementation Rubric*

Chart 2 (above) displays the distribution of ratings for each dimension from spring 2015. The ratings for each dimension are discussed in greater detail below, grouped by the DoS tool's four domains: features of the learning environment, activity engagement, STEM knowledge and practices, and youth development in STEM.

Features of the Learning Environment

The learning environment domain describes three features that make the environment appropriate for informal STEM programming: organization, materials, and space utilization. As in the fall, the observed Techbridge sessions in the spring were all very strong on these dimensions.

Organization. **All five observed sessions (100%) received a rating of "3" or "4" on the *organization* dimension,** which assesses the degree to which the observed activities were delivered in a way that reflects planning and preparation. (In the fall, all five observed sessions also received a rating of "3" or

"4" on the *organization* dimension.) This rating is based on whether the materials needed for the activities are available, whether the facilitators are able to adapt to changing situations, and the quality of transitions between activities during the session. As in the fall, in each of the observed spring sessions, all the necessary materials were prepared in advance and available when needed. For example, facilitators had Power Point slides, including demonstration videos, cued up and ready to show at the beginning of three of the sessions. The transitions between the initial icebreaker activities, main activities, and final reflections were consistently smooth across programs. For example, the facilitators typically gave students a 2-5 minute warning prior to each transition, such as when it was time for the girls to put away their materials and move on to the final reflection.

Materials. **All five observed sessions (100%) received a rating of "4"on the *materials* dimension,** which assesses both the appropriateness and the appeal of the materials used in the STEM learning activity.[28] (In the fall, all five observed sessions also received a rating of "3" or "4" on the *materials* dimension.) In all the sessions, the materials were appropriate for the activities' learning goals and interesting to the girls. Girls appeared eager to use the materials and immediately jumped into the hands-on and coding activities. The girls made comments indicating that they thought the activities were fun and appropriately challenging. For example, when a girl in one of the programs got a Snap Circuit component to work, she said, "I hear it! I feel it too."

Space utilization. **All five observed sessions (100%) received a rating of "4" on the *space utilization* dimension,** which gauges the extent to which the physical space in which the STEM activity is held is conducive to STEM learning in an out-of-school-time setting. (In the fall, all five observed sessions also received a rating of "3" or "4" on the *space utilization* dimension.) In each observed session, the resources and classroom set-up were conducive to exploration and learning. Tables and chairs were arranged in way that supported girls working together in small groups. The girls generally had sufficient space to work on their hands-on projects. There were no or minimal distractions that detracted from the girls' experience.

Activity Engagement

The activity engagement domain dimensions—student participation, purposeful activities, and student engagement with STEM—assess how the activity engages all students in learning about STEM. The spring DoS ratings in the activity engagement domain were notably higher than they were in the fall.

Participation. **All five of the five observed sessions (100%) received a rating of "3" on the *participation* dimension,** which reflects the extent to which all students participate in the activities.[29] (In the fall,

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[28] Ratings from the DoS *materials* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *materials*."

[29] Ratings from the DoS *participation* dimension are included in the "recruitment of target audience" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations indicate a 3 or higher in *participation*, which, by definition, means that all students were engaged or at least prompted/encouraged by adults to engage throughout activity."

three of the five observed sessions (60%) received a rating of "3" or "4" on the *participation* dimension.) DoS ratings for this dimension are determined by whether any students need promoting to participate: sessions where a few students need additional prompting to participate are rated a "3" while sessions where all students activity participate in all aspects of the activity are rated a "4."

The majority of the students participated in the activities during the observed sessions, but a few students needed additional prompting to participate during the observed time. For example, in one session, the majority of the girls who were working together in one group were observed to be talking about unrelated topics and only one student was engaged in working on the task at hand. One of the facilitators went over to the group to check in and ask what they were working on and helped get them back on track.

Purposeful activities. **All five of the observed sessions (100%) received a rating of "3" or "4" on the *purposeful activities* dimension**, which focuses on the structure of the learning activities, including the extent to which the students understand the goals of activities and the connections between them, as well as the degree to which each of activities relate to the STEM learning goals.[30] (In contrast, in the fall, only one of the five observed sessions (20%) received a rating of "3" or "4" on the *purposeful activities* dimension.) In one of the programs that received a "4," the facilitators clearly presented the learning goals of both the initial icebreaker activity (as being about the importance of following directions and staying safe), as well as the goals of the primary activity (using the engineering design process). For example, the facilitators said at various points during this session:

- *We have a challenge for you. You are going to be product design engineers. What do you think that means?*
- *You guys are going to get random materials and they are limited. Does anybody know what limited resources means? How about you turn to your partners and explain what limited resources means.*
- *I want you to write the [steps of the] engineering design process in your journals. I want you to think about this when you're designing your product.* Later the facilitator went to each table, repeated the instructions, and told the girls to use the engineering design process (reminding girls of the steps: identify first what it's going to be used for, then brainstorm, and then pick an idea).

During the introduction of another observed session, the facilitators connected the day's activities with what they had been working on the previous week; during the final reflection, the facilitators connected the various pieces of the activities together and related them to what scientists do.

Engagement with STEM. **All five of the observed sessions (100%) received a rating of "4" on the *engagement with STEM* dimension,** which measures the extent to which students are working in a way that is both "hands-on" and "minds-on" and that allows them to explore STEM content. (In the fall, three of the five observed sessions (60%) received a rating of "3" or "4" on the *engagement with STEM*

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[30] Ratings from the DoS *purposeful activities* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *purposeful activities*."

dimension.) In one of the sessions that received a rating of "4," the girls had the hands-on opportunity to learn how to program an avatar. The girls did most of the cognitive work themselves. The facilitators frequently walked around the room as the girls worked on their designs, normalizing the struggle of trying to come up with code and encouraging the girls to persevere. For example:

> Facilitator: *I want you to try it before I help.*
> Girl: *OK. We tried it and we failed.*
> Facilitator: *OK, try again. Change something. It's close. Try again.*
> [The two girls problem-solved on their own and ran their program again.]
> Girl: *Yes!*
> Facilitator: *See, you didn't need my help.*
> Girl: *I figured it out.*
> Facilitator: *You figured it out together.*

STEM Knowledge and Practices

The STEM knowledge and practices domain measures the extent of students' STEM content learning, use of inquiry practices, and opportunities for reflection. These dimensions gauge the extent to which the activities help students understand STEM concepts, make connections, and engage in practices STEM professionals use. The spring DoS ratings in the STEM knowledge and practices domain were notably higher than they were in the fall.

STEM content learning. **Three of the five (60%) observed sessions received a rating of "3" on the *STEM content learning* dimension,** which assesses whether STEM content is presented accurately, whether facilitators makes connections across ideas to deepen students' understanding of the content, and whether students' comments and questions indicate that they understand the STEM content.[31] (In contrast, in the fall, none of the five observed sessions received a rating of "3" or "4" on the *STEM content learning* dimension.) In the observed sessions that received ratings of "3," facilitators reviewed various concepts the girls had learned in earlier sessions (e.g., what coding blocks and conditional statements are, how they are used), and made connections between the activities the girls were asked to do and what STEM professionals actually do. Students' comments and questions indicated that students understand some of the STEM content well.

In contrast, in the two sessions that received a rating of "2," information about STEM content was presented very briefly, if at all. Students' comments and questions during the activities suggest that many of them understood some basic STEM concepts related to the activity topic, but were not necessarily making deeper connections amongst the ideas.

Inquiry. **All five of the observed sessions (100%) received a rating of "3" or "4" on the *inquiry* dimension,** which reflects the engagement of students in STEM practices, such as making observations,

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[31] Ratings from the DoS *STEM content learning* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *STEM content learning*."

asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, engaging in argument from evidence, and sharing findings with peers.[32] (In the fall, four of the five observed sessions (80%) received a rating of "3" or "4" on the inquiry dimension.) In one session that received a "4" rating, the girls had the opportunity to use STEM practices by tackling engineering design issues to solve a problem: designing a kitchen gadget using limited resources. Facilitators encouraged girls to use the steps of the engineering design process. The girls independently problem solved how to design and modify their gadgets, and did so together with their peers.

Girls also had the opportunity to work collaboratively. In another session, one girl was observed to show another girl in her group how to code something:

> Girl 1: *Go to 'controls.' Yeah, you want to do that instead of you have to keep on clicking.* [She takes the laptop from her partner and shows her partner what she did.] *See.*
> Girl 2 [Takes the computer back.]: *Oh, yeah, I get it now.*

Reflection. **Four of the five observed sessions (80%) received a rating of "3" on the *reflection* dimension,** which measures the amount of explicit reflection of STEM content during the activity, and the degree to which students are able to engage in meaning-making about the activities and related content.[33] (In contrast, in the fall, two of the five observed sessions (40%) received a rating of "3" or "4" on the *reflection* dimension.) The DoS defines this dimension as whether there is evidence that students have multiple explicit opportunities to engage in meaningful reflection throughout the activities. It is important to note that the Techbridge model emphasizes having explicit reflection time primarily as a closing activity, and not necessarily throughout the entire activity.

In one session that received a "3," the facilitators asked the girls to reflect for about 15 minutes at the end of the activity. Girls were given about 5 minutes to write in their journals answers to several reflection questions (e.g., What is something new you learned about software engineering that you didn't know before? Do you see yourself as a software engineer? Why or why not?). The facilitators then led a discussion with the girls about their thoughts related to each question. Girls' comments and questions suggest they were making meaningful connections between the activities and STEM concepts. For example, one girl said, "I don't really see myself as a software engineer. But it looks like a computer and I don't know how to do that well. I sort of get it and then I lose it."

In another session that received a "3," the facilitators checked in with pairs of girls throughout the activity and encouraged many of them to consider their designs and refine them. One facilitator said to a pair, "How could you make it better?" Another said, "What are you going to do with that [gestures to materials girl hasn't incorporated into design]? Use your resources. Think about how you might

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[32] Ratings from the DoS *inquiry* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *inquiry*."

[33] Ratings from the DoS *reflection* dimension are included in the "engineering design process" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations show a 3 or higher in *reflection*."

incorporate them." Essentially, the facilitators encouraged girls to reflect during the activity. (However, there was no time devoted to reflection about the activity immediately following it.)

In contrast, in the session that received a "2," there was no formal time devoted to reflection. Some girls were observed to do a limited amount of reflection as part of their preparation in small groups for Family Night (girls were instructed to prepare answers for the questions that parents would be asking them), but the facilitators were not observed to help to guide that reflection. For example, one exchange was as follows:

> Girl 1: *What do you like about computer coding?*
> Girl 2: *That you get to be creative.*
> Girl 1: *Let's write this down.*

Youth Development in STEM

The youth development in STEM domain includes the dimensions of relationships, relevance of activities, and presence of youth voice. These dimensions measure whether the facilitators and students have positive relationships, whether activities are relevant to students' lives and experiences, and whether students are encouraged to share their opinions and make meaningful choices. As in the fall, the observed Techbridge sessions in the spring received high ratings on relationships and youth voice. The observed Techbridge sessions received relatively lower ratings on relevance, although they were somewhat higher than the fall.

Relationships. **All five observed sessions (100%) received a rating of "4" on the relationships dimension,** which assesses the nature of the relationship between the facilitator and the students and amongst the students, assessing whether the interactions suggest warm, positive relationships.[34] (In the fall, all five observed sessions also received a rating of "3" or "4" on the *relationships* dimension.) In all sessions, the facilitators had good rapport with their students and peer interactions were positive and friendly. The facilitators and girls were all respectful with one another. There were no negative judgments or criticism. Girls were cooperative and shared materials and ideas with one another. For example, in one observed session, one pair of girls spontaneously moved over to help another pair on the other side of table; they set up their computers side-by-side, with a girl from one pair showing the girl from another pair how to program.

Relevance. **Two of the five observed sessions (40%) received a rating of "3" or "4" on the *relevance* dimension,** which focuses on the extent to which facilitators guide students in making connections between the STEM activities and their own lives or experiences, other subject areas, or in a broader

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[34] Ratings from the DoS *relationships* dimension are included in the "creating an integrated Techbridge/school partnership" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations indicate a score of at least 3 in *relationships*, indicating clear evidence of positive participant-participant, facilitator-participant, and facilitator-facilitator relationships."

context.[35] (In contrast, in the fall, none of the five observed sessions received a rating of "3" or "4" on the relevance dimension.) In one session that received a rating of "4," at several points the facilitators made connections with how what they were learning was related to STEM careers. Students also contributed to the discussions, demonstrating they were making connections between the activities and broader contexts. For example:

> Facilitator: *So what are some personality traits that software engineers may have? You met some on the field trip. What are traits you noticed or think you might need to have? Some things you may have noticed from people you met?*
> Girl 1: *Ambitious.*
> Facilitator: *Be ambitious. If you don't know what ambitious means, it's somebody who's not going to get set back. They won't give up. Something you have demonstrated in your coding of the mazes. What else?*
> Girl 2: *You need to like what you do.*
> Facilitator: *Like computer science.*
> Girl 3: *Don't get frustrated.*
> Facilitator: *But you will. What's something you should have, a good personality trait if you get frustrated?*
> Girl 4: *Don't give up.*
> Facilitator: *That gets back to ambitious. Somebody who doesn't give up.*

In another example, facilitators asked girls what other questions they had about software engineering.

> Girl: *Does a camera count as software engineering?*
> Facilitator: *They do have software. Yes, it's possible. They do have software to connect to the computer to upload photos. Yes, and there are software updates*.

In a session that received a "3" rating, the facilitators made several references about how the activities were relevant to a broader context. For example, facilitators linked the importance of following directions to staying safe when using technology (during the icebreaker activity), and how engineers often have limited resources when they design to the materials the girls were provided (for the kitchen gadget activity). The kitchen gadget activity also helped students link STEM concepts (the engineering design process) to engineering careers. However, the students themselves were not observed to substantially contribute to any discussions or demonstrations of relevance. (The DoS differentiates between ratings of "3" versus "4" based on whether both the facilitator and the students are actively involved in discussions of how the activity is relevant to students' lives. Sessions where the facilitator and students contribute to relevance discussions are rated a "4" and sessions where only the facilitator gives examples of relevance are rated a "3.")

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[35] Ratings from the DoS *relevance* dimension are included in the "role modeling for career exploration" section of the Techbridge Implementation Rubric. The Implementation Rubric includes the following indicator of success: "DoS observations indicate a score of at least 3 on *relevance*, which by definition shows activities are explicitly connected to broader context (e.g., career opportunities) or students' lives."

In the other observed sessions, facilitators made relatively few connections to students' lives, and these instances were brief and isolated. The facilitators and girls did not discuss how the activities were similar to other things they knew or to other context/concepts.

Youth voice. **All five observed sessions (100%) received a rating of "3" or "4" on the *youth voice* dimension,** which reflects the ways in which the STEM activity allows students to share their ideas and opinions, and give them genuine personal responsibility. (In the fall, all five observed sessions received a rating of "3" on the *youth voice* dimension.) Girls were often asked to share their ideas and opinions throughout the observed activities. Girls were able to choose how they wanted to design their project, what materials they wanted to use (from those provided), and whether and how they wanted to modify their designs.

Food for Thought (add salt as needed)

The following questions might be worthwhile for the Techbridge staff and leadership team to consider.

- How do these DoS results compare to your understanding of what Techbridge programs "really" look like? Does anything surprise you? How do these DoS results compare to your understanding of what Techbridge programs should look like?
- Why do you think the DoS ratings in the spring were higher than in the fall, especially along the dimensions of *purposeful activities*, *engagement with STEM*, *STEM content learning*, *reflection*, and *relevance*?
- Are there any areas for growth that Techbridge might want to address via curriculum design and/or professional development for staff and teachers? For example, are there additional ways to deepen students' understanding of the STEM content of the activities (to increase STEM content learning)? How might Techbridge help girls make more connections between the activities and students' lives (to increase the relevance)?
- What should Techbridge program staff and teachers know about the DoS? How, if at all, might these results help inform the staff at the new Washington, DC site?

Conclusion

The observed sessions received high ratings on almost all of the DoS dimensions in the spring. The average spring ratings were higher than fall ratings on 11 out of 12 dimensions—increasing, on average, half a point on a four-point scale.

Increases were consistent not only across the DoS dimensions, but also across observed programs. Four of the five observed programs had higher total DoS scores in the spring than the fall. In the fall, the total DoS scores for each program (the combined total of all the ratings on the 12 DoS dimensions) ranged from 31 out of a possible 48 to 39 out of 48. In the spring, the combined ratings ranged from 38 out of 48 to 45 out of 48.

The evaluation/research teams look forward to discussing the spring 2015 results with the Techbridge leadership team.

Appendix I: Fidelity Rubric for 2014-2015 (Draft)

Techbridge Implementation Rubric

Date: November, 2016

Site name: Seattle-Area Techbridge Programs implemented in 2014-2015 (first year of expansion)

Available data sources at the time of rating:

- Student pre- and post-surveys
- Parent surveys
- Teacher surveys
- Role model surveys
- Student focus groups
- Teacher interviews
- Parent interviews
- Principal and district leader interviews
- Techbridge staff interviews
- Demographic information regarding participants and their parents/guardians (from Salesforce)
- DoS observation ratings (fall and spring)
- Embedded assessment data (fall and spring)

Ratings on the scale from 0 to 3 are meant to reflect the overall achievement of the listed outcomes: 0 indicates none of the outcomes were reached, 1 indicates approximately 1/3 of the outcomes were reached, and so on. The first row in each section ("Best Practices") reiterates the goals as the research, evaluation, and Techbridge teams have defined them. The second row ("Scale-Up Indicators of Success") shows the barriers faced with achieving the best practices; specific indicators and evidence associated with achieving the best practices; and innovations the site.

Recruitment of target audience

Best Practices

- Scale-up staff[36], teachers, and administrators follow Techbridge's recruitment techniques as documented in the manual.
- Teacher and program coordinator teach with the understanding that all students can be successful in SET (e.g., demonstrate high expectations, growth mindset, promote risk taking).
- Enrolled students include an ethnically diverse population of young women/girls as well as girls with little previous expressed interest in STEM who persist in the program.

Score of

0 1 [✓ 2] 3

Scale-Up Indicators of Success

Barriers	**Indicator**	**Evidence** ● = Met; ◒ = Partially met; ○ = Not yet met	**Innovations**
Barriers faced in implementing Techbridge recruitment and engagement: ! Competing middle school clubs, after-school sports ! Some girls must take care of younger siblings	*Techbridge/school records indicate:* 50% or more of participants come from at least one underrepresented minority group (race/ethnicity = Latina, African American, Native American, or Pacific Islander) or socioeconomic status position ((expected) first-generation college student, free and reduced lunch recipient, if available in district data)	● **Met** - 77% of Techbridge participants come from underrepresented groups (Latina, African American, Native American, Pacific Islander or multi-racial) - 79% of all Techbridge participants qualified for free or reduced-price meals, compared to 68% within same schools - 75% of Techbridge parents report earning less than $40,000/year - 65% of parents have not earned a college degree (2- or 4-year)	Innovations in implementing Techbridge recruitment: ★ One school conducts home visits to all students and used these visits as a way to connect with Techbridge parents
	Student surveys indicate: At least 10% of girls entered Techbridge with mid- to low-interest and/or confidence in SET (pre-survey responses on survey items related to science activity show mean of 3.0 (disagree a little or lower))	◒ **Partially met** - 13% disagreed "I do well in activities that involve technology" - 11% disagreed "I like computer programming" - 10% disagreed "I like figuring out how things work" - 8% disagreed "I like creating things with technology" - 7% disagreed "I do well in activities that involve science" - 5% disagreed "I like science" - 2% disagreed "I like building, designing, and/or putting things together"	
	Techbridge attendance records indicate: Little difference in participation by race/ethnicity or SES[37]	**Unknown** - the evaluation team did not have access to Techbridge attendance records for individual students	
	DOS observations indicate: A 3 or higher in participation, which by definition means that all students were engaged or at least prompted/encouraged by adults to engage throughout activity	● **Met in spring** - Fall average DoS rating of 2.8 - Spring average DoS rating of 3.0	

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[36] For the purposes of this document, scale-up staff refers to the executive director and program coordinators at new sites.

[37] The purpose of this indicator is to show there is not a pattern of disengagement that relates to race/ethnicity, lack of academic legacy.

Support network for girls in SET

Best Practices

- Scale-up staff organize school-teacher-family-Techbridge staff communication patterns/processes in accordance with Techbridge guidelines (e.g., use of newsletters, defined patterns of calling home to remind of Family Nights, follow-up when students do not attend Techbridge activities).
- Scale up staff improve/develop local networks of support for girls in science (parents, teachers, etc.) (e.g., recognize the importance of local champions and find ways to recognize, support, and utilize champions to maximize effect).
- Teacher and program coordinator develop a learning environment that promotes positive peer relationships.
- Teacher and program coordinator develop school-to-home and school-to-community connections that support girls' participation in SET within and beyond Techbridge activities (e.g., organize Family Nights, provide written materials re: SET activities in the community, communicate personally with families).
- Students and families make a year-long commitment to Techbridge through the contract.
- Families receive and propagate Techbridge messages about SET (science is for all, girls are capable engineers).

Score of

0 1 2 [✓ 3]

Scale-Up Indicators of Success

Barriers	**Indicator**	**Evidence** ● = Met; ◒ = Partially met; ○ = Not yet met	**Innovations**
Barriers faced in implementing the Techbridge support network for girls: ! Many Techbridge families speak languages other than English. ! Many Techbridge families work, have child care responsibilities, and so visiting the program, participating in field trips, and/or attending Family Nights is difficult.	*Family surveys/interviews/focus groups indicate:* at least 75% of families report receiving communications from Techbridge (e.g., newsletters, tumblr posts, webpage links)	● **Met** - 82% of parents said they had received writing materials from Techbridge	Innovations in implementing the Techbridge support network for girls: ★ To discuss with Techbridge staff and add
	Family surveys/interviews/focus groups indicate: at least 75% of families report positive changes in their daughter because of Techbridge (at least 5 positive outcomes out of the 10 in the parent survey, Q1)	● **Met** - on each of 10 survey questions, >=94% of parents said Techbridge had a positive impact on their daughter	
	Family surveys/interviews/focus groups indicate: at least 75% of families report at least one way Techbridge influences the family (e.g., use of resources, ideas for home activities)	● **Met** - 91% said they had encouraged their daughter to participate in SET activities outside of school - 89% of parents said they are able to talk with their daughter about SET careers because of Techbridge - 88% said they learned about SET activities to do with their daughter	
	Family surveys/interviews/focus groups indicate: at least 75% of families have a better understanding of SET careers following daughter's participation	● **Met** - 89% of parents said Techbridge helped them learn about what SET workers actually do - 93% of parents said they have a better understanding of the education needed for a career in SET	
	Family surveys/interviews/focus groups indicate:	● **Met**	

		at least 75% of families are aware of at least one other SET opportunity available in their local area	- 99% of parents said Techbridge helped them learn about SET activities their daughter can participate in	
		Family surveys/interviews/focus groups indicate: at least 75% of families report valuing SET careers for their daughter/family member	● **Met** - 99% of parents said someone like their daughter could become an engineer - 99% of parents said learning more science would give their daughter many career choices - 98% of parents said they would support their daughter if she chooses to become a SET professional - 82% of parents said they have encouraged their daughter to student SET	
		Family surveys/interviews/focus groups indicate: at least 75% of families report discussing the program with the participant at least once during the school year	● **Met** - 96% of parents say their daughters have talked with them about Techbridge	
		Family surveys/interviews/focus groups indicate: at least 75% of girls discussed SET careers with family members at least once	● **Met** - 75% of parents said their daughter had talked about having a job in SET after participating in Techbridge (vs. 55% before Techbridge)	
		Student surveys indicate: at least 75% of girls have engaged in at least one non-Techbridge SET activity (post-survey)	● **Met** - 98% of girls said they had engaged in at least one non-Techbridge SET activity	

Engineering design process

Best Practices

- Scale-up staff and teachers follow the engineering design process steps as discussed in the curriculum for all/most hands-on activities (e.g., direct students towards reflection, redesign when prompted in materials).
- Teacher and Scale Up staff adopt (or are already familiar with) the engineering design process mindset (e.g., staff and teachers practice this approach in professional development in which trainers model the engineering design process).
- Teacher/Program Coordinator model the engineering design process mindset for students (e.g., focus on process questions not product questions, model reflection on design, consider variables that would need to be changed to improve a project).
- Students have opportunities to practice engineering design (e.g., focus time and talk on the design process not product; engage in reflection to improve next iterations).

Score of
0 1 [✓ 2] 3

Scale-Up Indicators of Success

Barriers	Indicator	Evidence ● = Met; ◒ = Partially met; ○ = Not yet met	Innovations
Barriers faced in implementing the engineering design process: ! Highline programs are 90 minutes instead of two hours, which reduces amount of time available for redesign and reflection	*Participant, teacher, and Program Coordinator surveys/interviews indicate:* a) teacher and Program Coordinator emphasized design, redesign, and process over product completion; b) teacher and Program Coordinator provided opportunities to discuss engineering designs during every hands-on activity	● **Met** - All six teachers who completed the survey said they had emphasized the design process rather than product completion to a "large" or "very large" extent	Innovations in implementing the engineering design process: ★ Some programs had girls use their journals to sketch their designs at the beginning of an activity and record their reflections at the conclusion of an activity
	Embedded Assessments indicate: 75% or more of participants receive at least a "3" on the NSTA engineering design process standards within the rubric	○ **Not yet met** - In fall, 27% of participants received a rating of at least a "3" - In spring, 72% of participants received a rating of at least a "3"	
	DOS observations indicate: show a 3 or higher in Purposeful Activities, Inquiry, Materials, STEM Content Learning, and Reflection	◒ **Partially met in spring** Average DoS ratings: - Materials (Fall = 3.8; Spring = 4.0) - Inquiry (Fall = 3.4; Spring = 4.0) - Purposeful Activities (Fall = 2.2; Spring = 3.8) - Reflection (Fall = 2.4; Spring = 2.8) - STEM Content Learning (Fall = 1.8; Spring = 2.6)	

Role modeling for career exploration

Best Practices

- Scale-up staff and role models structure Role Model experiences (including field trips) as suggested by the RMM training materials (i.e., they include an ice breaker, hands on activity, discussion of career relevance, reflection).
- Scale Up staff members cultivate a cadre of trained role models who interact with girls in a way that is age appropriate, engaging, focused on career relevance, and makes the professional seem relatable to girls.
- Teacher/Program Coordinator and role models facilitate experiences that allow for cognitive apprenticeship/ identity development (e.g., girls have an opportunity to think like engineers, have opportunities to relate to role models socially and professionally).
- Students interact with role models, participate in hands on activities with them, and have opportunities to learn about the day-to-day activities of role models' jobs.

Score of ○
0 1 2 3
To discuss with Techbridge staff and add

Scale-Up Indicators of Success

Barriers	Indicator	Evidence ● = Met; ◒ = Partially met; ◉ = Not yet met	Innovations
Barriers faced in implementing role modeling for career exploration: ! To discuss with Techbridge staff and add	*Participant surveys/focus groups indicate:* a) each girl has met 5 or more professional engineers/scientists; b) each girl can name and describe in developmentally appropriate language at least 2 SET careers; c) each girl states that she had something in common with at least one role model she met in the past year (enjoys puzzles, grew up in the same neighborhood, loves her dog) d) each girl had an opportunity to share and receive feedback on an engineering design with a SET professional	**Unknown** - Each program went on two field trips (to a community college and SET workplace) where they had the opportunity to interact with multiple SET professionals and/or students majoring in SET - 91% of participants who completed the post-survey said they had talked to a SET worker about their job - To discuss with Techbridge staff and add	Innovations in implementing role modeling for career exploration: ★ To discuss with Techbridge staff and add
	Surveys with role models/staff indicate:[38] 80% or more of the role models were prepared (formally through training or informally through document review/conversations with staff); 80% or more engaged with girls in a Techbridge style design challenge; 80% or more introduced themselves to girls with personal information, and 80% were confident they used appropriate language to describe their work to a young audience	● **Met** - 83% of the role models who completed the survey reported they had received formal or informal training from Techbridge - 89% of role models said they facilitated a hands-on activity with the girls during at least one of their visits - 100% of role models agreed that they shared personal information about themselves with the girls - 100% of role models said they were able to describe their job in a way the girls could understand	
	DOS observations indicate: score of at least 3 on relevance, which by definition shows activities are explicitly connected to broader context (e.g., career opportunities) or students' lives	◉ **Not yet met** - Fall average DoS rating of 1.4 - Spring average DoS rating of 2.2	

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[38] It may be important to triangulate data with staff to make sure the role model activities went as smoothly as role models describe.

Creating an integrated Techbridge/school partnership

Best Practices

- Scale-up staff implements teacher recruitment, hiring, and retention practices (e.g., accept applications, solicit recommendations from school administrators, follow teacher selection processes which include teacher observation, interviews as developed by Techbridge).
- Scale Up staff build partnerships with teachers who have characteristics proven to recruit and retain girls in the program, work well with program staff, and serve as strong SET role models (e.g., well regarded teacher who students like, exhibits interactive learning strategies).
- Teacher and program coordinator work as a team, developing a co-teaching "rhythm" together and in their interactions with girls (transitions are smooth, organization is evident, Program Coordinator and teacher have similarly positive interactions with students, though their roles may differ).
- Post-program debriefings are used to deal with gaps in communication/difficulties in partnership, and assist in partnership building.
- Students express respect and positive regard for the teacher and the program coordinator (e.g., students follow instructions, do not talk back, exhibit personal and professional courtesy).

Score of
0 1 2 [✓ 3]

Scale-Up Indicators of Success

Barriers	**Indicator**	**Evidence** ● = Met; ◒ = Partially met; ○ = Not yet met	**Innovations**
Barriers faced in creating an integrated Techbridge/school partnership: ! To discuss with Techbridge staff and add	*Surveys/interviews with teachers and program coordinators indicate:* all Techbridge program staff/teachers a) are satisfied their Techbridge program was effective in its implementation; b) are satisfied they are collaborating effectively (e.g., teacher and program coordinator hold debrief meetings weekly that lead to action items when needed); c) describe adequate leadership opportunities (teachers)	● **Met** - 5 out of 6 teachers who completed the teacher survey said the curriculum was engaging for the girls to a "large" or "very large" extent - 5 out of 6 teachers said the field trips were effective to a "large" or "very large" extent - 4 out of 6 teachers said the role model visits were effective to a "large" or "very large" extent - Teachers, staff and principals all indicated a high level of satisfaction with the program in interviews - All teachers indicated they "had a satisfactory level of leadership or control" over 6 of 8 Techbridge aspects (including deciding on the program schedule, choosing and facilitating activities, organizing field trips, and communicating with girls' families). One teacher each wanted less leadership of recruiting girls and involving role models.	Innovations in creating an integrated Techbridge/school partnership: ★ Highline Public Schools played integral role in selecting schools (5 of which had pre-existing focus and additional resources on STEM) and teachers, and maintaining close connections with Techbridge staff
	Girl Surveys/interviews/focus groups indicate: by group consensus or 75% of responses that participants are building positive relationships with Techbridge staff/teachers	● **Met** - Girls' responses to open-ended questions on the survey and in focus groups suggest that the vast majority built positive relationships with Techbridge staff/teachers	
	DOS observations indicate: score of at least a 3 in relationships, indicating clear evidence of positive participant-participant, facilitator- participant, and facilitator-facilitator relationships	● **Met** - Fall average DoS rating of 3.8 - Spring average DoS rating of 4.0	

Planning for and learning from evaluation

Best Practices

- Scale-up staff follow evaluation procedures for collecting, managing, and transferring data to evaluation/research team. Scale up staff perform formative assessment procedures in house as designed (e.g., observations of events/programming).
- Executive director, teachers and Program Coordinators develop/sustain a positive attitude towards evaluation, exhibiting a growth mindset and learning culture orientation to their work in Techbridge.
- Teacher/Program Coordinator plan for and implement changes in program delivery based on evaluation feedback. They use their debrief meetings to further provide feedback to one another and shape pedagogical practice.
- Families and girls provide actionable feedback to evaluators, researchers, staff, and teachers based on mutual trust.

Score of ○
0 1 2 3
To discuss with Techbridge staff and add

Scale-Up Indicators of Success

Barriers	**Indicator**	**Evidence** ● = Met; ◒ = Partially met; ○ = Not yet met	**Innovations**
Barriers faced in planning for and learning from evaluation:	*Researcher/evaluator observation indicate:* all staff make an effort to assist in data collection and analysis (when appropriate); all staff develop/sustain a positive attitude towards evaluation	● **Met** - All scale-up staff were supportive in data collection activities	Innovations in planning for and learning from evaluation:
! Large volume of required data collection for evaluation and research ! Embedded assessments were not well-integrated into the curriculum in 2014-2015	*Techbridge staff/scale-up staff interviews/surveys indicate:* all scale-up staff: a) adhere to formative assessment procedures that are designed for use in-house; b) use of formative and summative feedback to create actionable changes in the program(s); c) describe family and girl feedback as productive/useful; and d) staff at scale-up cities develop a “learning culture” within their local organization (e.g., suggest appropriate adaptations to the Techbridge curriculum and/or model and communicate about those changes with the central Techbridge office)	To discuss with Techbridge staff and add	★ Online version of student post-surveys was piloted in spring 2015 and was generally considered feasible
	Participant and family focus groups/interviews/surveys indicate: 75% or more of families participate in some form of data collection during the year (focus groups, interviews); 95% or more of girls participate in some form of data collection during the year	◒ **Partially met** - 84 parent surveys were completed (62% of the Techbridge girls in the Greater Seattle area who completed a student post-survey had parents who completed a parent survey) - Assume that >=95% of girls completed surveys	

Appendix J: Student Pre- and Post-Surveys for Techbridge Participants

techbridge
Inspire a girl to change the world

PARTICIPANT STUDENT SURVEY (Pre Fall 2014)

Date: ________________________

First Name: ____________________________________ **Last Name:** ____

Current School: ____ **Grade:** _______ **Date of Birth:** ______________ Month/day/year

Some of the questions in this survey ask about engineering and technology. What do we mean by those words?

When we talk about **technology**, we mean designing, building, and using tools (such as software) and machines (such as computers, digital cameras, or cell phones) to solve a problem or reach a goal.

Engineering uses math, science, and creativity to solve problems in the world. Engineers design, build, and test products, materials, buildings, and systems.

Please read each sentence below and think about how much it describes YOU. Once you decide how much you agree with the statement, put a check mark in the correct box. There are no right or wrong answers: only what is true for you.

1. INTEREST IN SCIENCE, ENGINEERING, AND TECHNOLOGY	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I like science.	○	○	○	○	○	○
b. I like creating things with technology (like games or websites).	○	○	○	○	○	○
c. I like computer programming.	○	○	○	○	○	○
d. I like figuring out how things work.	○	○	○	○	○	○
e. I like building, designing, and/or putting things together.	○	○	○	○	○	○
f. I do well in activities that involve science.	○	○	○	○	○	○
g. I do well in activities that involve technology.	○	○	○	○	○	○
h. I was interested in science and science-related things BEFORE I joined Techbridge.	○	○	○	○	○	○
i. I worked on science activities at home BEFORE I joined Techbridge.	○	○	○	○	○	○

2. SCIENCE AND ENGINEERING IN EVERYDAY LIFE	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I see how science is part of my life.	○	○	○	○	○	○
b. Engineering is useful for solving the problems of everyday life.	○	○	○	○	○	○
c. Engineers make a meaningful difference in the world.	○	○	○	○	○	○
d. Most people should study some science.	○	○	○	○	○	○

3. SCIENCE, ENGINEERING, AND TECHNOLOGY CAREERS	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I know what scientists do.	○	○	○	○	○	○
b. I know what engineers do.	○	○	○	○	○	○
c. I know what people who work in technology do.	○	○	○	○	○	○
d. Knowing science will give me many career choices.	○	○	○	○	○	○
e. Knowing about engineering will give me many career choices.	○	○	○	○	○	○
f. Knowing technology will give me many career choices.	○	○	○	○	○	○
g. I can see myself working in a career that involves science, technology, or engineering.	○	○	○	○	○	○
h. I would like to be a scientist.	○	○	○	○	○	○
i. I would like to be an engineer.	○	○	○	○	○	○
j. I would like a job in technology.	○	○	○	○	○	○

4. MY FUTURE	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I will go to college.	○	○	○	○	○	○
b. I plan to study science in college.	○	○	○	○	○	○
c. I plan to study engineering in college.	○	○	○	○	○	○
d. I plan to study computer science in college.	○	○	○	○	○	○
e. Someone like me could become an engineer.	○	○	○	○	○	○
f. Someone like me could become a scientist.	○	○	○	○	○	○
g. Someone like me could work in technology.	○	○	○	○	○	○
h. I think engineering is a good career for women.	○	○	○	○	○	○

5. HOW I LEARN	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. If I work hard, I will be more successful.	○	○	○	○	○	○
b. I can't change how smart I am.	○	○	○	○	○	○
c. I learn more when I make mistakes.	○	○	○	○	○	○
d. I think I learn more when a task is challenging.	○	○	○	○	○	○
e. I like doing work that I'll learn from even if I make a lot of mistakes.	○	○	○	○	○	○

6. ENGINEERING DESIGN PROCESS	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. Engineers design things perfectly the first time.	○	○	○	○	○	○
b. I know what the engineering design process is.	○	○	○	○	○	○
c. I know how to use the engineering design process to build something.	○	○	○	○	○	○
d. I know how to compare different designs to figure out what is the best way to solve a problem.	○	○	○	○	○	○
e. If a project is not going well, I am able to make changes as needed.	○	○	○	○	○	○

7. WORKING WITH OTHER PEOPLE	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I work well with different types of students.	○	○	○	○	○	○
b. Working with others is usually more fun than working alone.	○	○	○	○	○	○
c. I like being part of a team.	○	○	○	○	○	○
d. I learn better when I am by myself.	○	○	○	○	○	○
e. I learn better when I am working with others.	○	○	○	○	○	○
f. I am comfortable speaking in front of a group of people.	○	○	○	○	○	○
g. I like to speak up in class.	○	○	○	○	○	○
h. Presenting something in front of other people makes me feel proud.	○	○	○	○	○	○
i. I feel like I do a good job when I present to other people.	○	○	○	○	○	○

8. MY FAMILY	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I talk about my career interests with my family.	○	○	○	○	○	○
b. My family thinks science is interesting.	○	○	○	○	○	○
c. My family is interested in the courses I take.	○	○	○	○	○	○
d. My family would like it if I became a scientist, an engineer, or had a technology career when I grow up.	○	○	○	○	○	○
e. My family encourages me to think about a career in science, engineering or technology.	○	○	○	○	○	○

9. **Please read each sentence below and think about how much you know about each one. Once you decide how much you know about the sentence, put a check mark in the correct box. There is no “right” or “wrong” answer: only what is true for you.**

WHAT YOU KNOW	I don’t know anything about this	I know a little	I know some	I know a lot
a. The types of things that people with careers in science, engineering, or technology do in their jobs.	○	○	○	○
b. The kind of classes you need to take to have a career in in science, engineering, or technology.	○	○	○	○
c. How to find information about careers in science, engineering, or technology.	○	○	○	○

10. **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:

_____ Agriculture and Natural Resources (farmer, gardener, park ranger)
_____ Architecture (architect, builder, planner)
_____ Arts and Entertainment (artist, fashion designer, chef, baker, musician, singer, actor/actress)
_____ Business and Finance (accountant, secretary, receptionist, office manager)
_____ Computer Science (video game designer, app creator, coder)
_____ Education and Counseling (teacher, librarian, psychologist, social worker)
_____ Engineering (mechanical engineer, civil engineer, chemical engineer)
_____ Journalism (reporter, television news announcer, news photographer)
_____ Law, Law Enforcement, and Government (lawyer, police officer, politician)
_____ Medicine (doctor, nurse, pediatrician, dentist, physical therapist)
_____ Military (soldier, sailor, Marine, Coast Guard)
_____ Science (biologist, scientist, physicist)
_____ Sports (professional athlete, coach, referee, sports announcer)
_____ Transportation (airline pilot, truck driver, auto mechanic)
_____ Veterinary Care (veterinarian, vet tech)
_____ I don't expect to have a career
_____ I don't know
_____ If the career you have in mind is not on this list, please write your answer on the line below:

____

11. **Please check any of the activities you have done at least once since the end of last school year:**

ACTIVITIES YOU HAVE DONE SINCE THE END OF LAST SCHOOL YEAR	**No** (have not done this the end of last school year)	**Yes** (have done since the end of last school year)
a. met an engineer, scientist, or someone who works in technology	○	○
b. talked to an engineer, scientist, or someone who works in technology about her or his job	○	○
c. visited a science or technology museum	○	○
d. went to a science, technology, or engineering program besides Techbridge (like a Saturday program, science fair, or camp)	○	○
e. did science experiments at home, not for school	○	○
f. did engineering activities at home, not for school	○	○
g. created something with technology at home, in a library, or at a computer lab (like a personal website, a video game, or a project with LEDs)	○	○
h. tried to fix something at home, not for school	○	○
i. took something apart to understand how it worked	○	○
j. talked with my parents about what classes I might want to take in the future (in high school or college)	○	○
k. participated in a program (other than Techbridge) to help prepare for my future and college	○	○

12. How far do you think you will go in school? I will finish… (Check only one)

- ○ High school/G.E.D
- ○ Some college
- ○ 2-year college degree
- ○ 4-year college degree
- ○ Master's degree
- ○ Ph.D., M.D. or other professional degree
- ○ I'm not sure

13. How many years have you been in Techbridge? Please check one.

_____This is my first year ______ 2nd year ______3rd year _____4 or more years

14. Which best describes you? Please check all that apply.

______ American Indian/Alaska Native
______ Asian
______ African American/Black
______ Hispanic/Latina/Mexican/Mexican American
______ White
______ Native Hawaiian/Other Pacific Islander
______ Other (Please specify:___________________________________)

Please put your survey in an envelope and seal it.

Put your first and last name on the envelope.

Then hand the envelope to your Techbridge teacher.

☺☺ **Thank you very much!** ☺☺

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Techbridge Scale-up Study

Evaluation Information Form for Techbridge Students

We want to know what you think.

Techbridge has asked Education Development Center (EDC) to gather information about Techbridge to help them learn how the program is doing and to help make the program better. We will be gathering information from students participating in the program. You will be asked to complete a survey in the fall and again in the spring during a Techbridge meeting. The surveys ask about your experiences in Techbridge and about your interest in science, engineering, and technology.

The information you provide is confidential. After you complete a survey, you will put it in an envelope so that your answers cannot be seen by teachers or Techbridge staff. Only evaluators from EDC will see your answers. They will not share individual survey answers with anyone. Evaluators will not use your name in any of their reports. Your answers will never be identified as yours and will be combined with other students when reported. Your answers will not affect your school grades or relationships with your teachers.

You do not have to participate in the evaluation. You may skip any questions you do not want to answer on the survey. If you do not wish to complete the survey, put a blank survey in the envelope. The information you might provide if you participate is extremely valuable and will help Techbridge improve.

Thank you very much for helping us with this important project.

If you have any questions about the evaluation, please contact Ginger Fitzhugh at Education Development Center: gfitzhugh@edc.org (206) 395-4528 or Linda Kekelis, Executive Director of Techbridge: lkekelis@techbridgegirls.org or (510) 777-9170 x301.

If you have any questions regarding your rights as a participant in this study or feel you may have been harmed by this study, please contact EDC's Human Protections Program at 1-800-225-4276 ext. 2971 or HumanProtections@edc.org.

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STUDENT SURVEY (Post Spring 2015)

Date: ________________________

First Name: ____________________________________ **Last Name:** ____

Current School: _______________________________________ **Grade:** _________ **Date of Birth:** _________________Month/day/year

Some of the questions in this survey ask about engineering and technology. What do we mean by those words?

When we talk about **technology**, we mean designing, building, and using tools (such as software) and machines (such as computers, digital cameras, or cell phones) to solve a problem or reach a goal.

Engineering uses math, science, and creativity to solve problems in the world. Engineers design, build, and test products, materials, buildings, and systems.

Please read each sentence below and think about how much it describes YOU. Once you decide how much you agree with the statement, put a check mark in the correct box. There are no right or wrong answers: only what is true for you.

1. INTEREST IN SCIENCE, ENGINEERING, AND TECHNOLOGY	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I like science.	○	○	○	○	○	○
b. I like creating things with technology (like games or websites).	○	○	○	○	○	○
c. I like computer programming.	○	○	○	○	○	○
d. I like figuring out how things work.	○	○	○	○	○	○
e. I like building, designing, and/or putting things together.	○	○	○	○	○	○
f. I do well in activities that involve science.	○	○	○	○	○	○
g. I do well in activities that involve technology.	○	○	○	○	○	○

2. SCIENCE AND ENGINEERING IN EVERYDAY LIFE	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I see how science is part of my life.	○	○	○	○	○	○
b. Engineering is useful for solving the problems of everyday life.	○	○	○	○	○	○
c. Engineers make a meaningful difference in the world.	○	○	○	○	○	○
d. Most people should study some science.	○	○	○	○	○	○

3. SCIENCE, ENGINEERING, AND TECHNOLOGY CAREERS	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I know what scientists do.	○	○	○	○	○	○
b. I know what engineers do.	○	○	○	○	○	○
c. I know what people who work in technology do.	○	○	○	○	○	○
k. Knowing science will give me many career choices.	○	○	○	○	○	○
l. Knowing about engineering will give me many career choices.	○	○	○	○	○	○
m. Knowing technology will give me many career choices.	○	○	○	○	○	○
n. I can see myself working in a career that involves science, technology, or engineering.	○	○	○	○	○	○
o. I would like to be a scientist.	○	○	○	○	○	○
p. I would like to be an engineer.	○	○	○	○	○	○
q. I would like a job in technology.	○	○	○	○	○	○

4. MY FUTURE	Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	Agree a lot (6)
a. I will go to college.	○	○	○	○	○	○
b. I plan to study science in college.	○	○	○	○	○	○
c. I plan to study engineering in college.	○	○	○	○	○	○
d. I plan to study computer science in college.	○	○	○	○	○	○
e. Someone like me could become an engineer.	○	○	○	○	○	○
f. Someone like me could become a scientist.	○	○	○	○	○	○
g. Someone like me could work in technology.	○	○	○	○	○	○
h. I think engineering is a good career for women.	○	○	○	○	○	○

5. HOW I LEARN	Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	Agree a lot (6)
a. If I work hard, I will be more successful.	○	○	○	○	○	○
b. I can’t change how smart I am.	○	○	○	○	○	○
c. I learn more when I make mistakes.	○	○	○	○	○	○
d. I think I learn more when a task is challenging.	○	○	○	○	○	○
e. I like doing work that I’ll learn from even if I make a lot of mistakes.	○	○	○	○	○	○

6. ENGINEERING DESIGN PROCESS	Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	Agree a lot (6)
a. Engineers design things perfectly the first time.	○	○	○	○	○	○
b. I know what the engineering design process is.	○	○	○	○	○	○
c. I know how to use the engineering design process to build something.	○	○	○	○	○	○
d. I know how to compare different designs to figure out what is the best way to solve a problem.	○	○	○	○	○	○
e. If a project is not going well, I am able to make changes as needed.	○	○	○	○	○	○

7. WORKING WITH OTHER PEOPLE	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I work well with different types of students.	○	○	○	○	○	○
b. Working with others is usually more fun than working alone.	○	○	○	○	○	○
c. I like being part of a team.	○	○	○	○	○	○
d. I learn better when I am by myself.	○	○	○	○	○	○
e. I learn better when I am working with others.	○	○	○	○	○	○
f. I am comfortable speaking in front of a group of people.	○	○	○	○	○	○
g. I like to speak up in class.	○	○	○	○	○	○
h. Presenting something in front of other people makes me feel proud.	○	○	○	○	○	○
i. I feel like I do a good job when I present to other people.	○	○	○	○	○	○

8. MY FAMILY	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I talk about my career interests with my family.	○	○	○	○	○	○
b. My family thinks science is interesting.	○	○	○	○	○	○
c. My family is interested in the courses I take.	○	○	○	○	○	○
d. My family would like it if I became a scientist, an engineer, or had a technology career when I grow up.	○	○	○	○	○	○
e. My family encourages me to think about a career in science, engineering or technology.	○	○	○	○	○	○

9. Please read each sentence below and think about how much you know about each one. Once you decide how much you know about the sentence, put a check mark in the correct box. There is no "right" or "wrong" answer: only what is true for you.

WHAT YOU KNOW	I don't know anything about this	I know a little	I know some	I know a lot
a. The types of things that people with careers in science, engineering, or technology do in their jobs.	○	○	○	○
b. The kind of classes you need to take to have a career in in science, engineering, or technology.	○	○	○	○
c. How to find information about careers in science, engineering, or technology.	○	○	○	○

10. 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:

_____ Agriculture and Natural Resources (farmer, gardener, park ranger)
_____ Architecture (architect, builder, planner)
_____ Arts and Entertainment (artist, fashion designer, chef, baker, musician, singer, actor/actress)
_____ Business and Finance (accountant, secretary, receptionist, office manager)
_____ Computer Science (video game designer, app creator, coder)
_____ Education and Counseling (teacher, librarian, psychologist, social worker)
_____ Engineering (mechanical engineer, civil engineer, chemical engineer)
_____ Journalism (reporter, television news announcer, news photographer)
_____ Law, Law Enforcement, and Government (lawyer, police officer, politician)
_____ Medicine (doctor, nurse, pediatrician, dentist, physical therapist)
_____ Military (soldier, sailor, Marine, Coast Guard)
_____ Science (biologist, scientist, physicist)
_____ Sports (professional athlete, coach, referee, sports announcer)
_____ Transportation (airline pilot, truck driver, auto mechanic)
_____ Veterinary Care (veterinarian, vet tech)
_____ I don't expect to have a career
_____ I don't know
_____ If the career you have in mind is not on this list, please write your answer on the line below:

____

11. Please check any of the activities you have done at least once since the beginning of the school year:

ACTIVITIES YOU HAVE DONE SINCE THE END OF LAST SCHOOL YEAR	**No** (have not done this the end of last school year)	**Yes** (have done since the end of last school year)
a. met an engineer, scientist, or someone who works in technology	○	○
b. talked to an engineer, scientist, or someone who works in technology about her or his job	○	○
c. visited a science or technology museum	○	○
d. went to a science, technology, or engineering program besides Techbridge (like a Saturday program, science fair, or camp)	○	○
e. did science experiments at home, not for school	○	○
f. did engineering activities at home, not for school	○	○
g. created something with technology at home, in a library, or at a computer lab (like a personal website, a video game, or a project with LEDs)	○	○
h. tried to fix something at home, not for school	○	○
i. took something apart to understand how it worked	○	○
j. talked with my parents about what classes I might want to take in the future (in high school or college)	○	○
k. participated in a program (other than Techbridge) to help prepare for my future and college	○	○

12. WHAT I LEARNED AT TECHBRIDGE THIS YEAR	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I learned about different kinds of careers in Techbridge this year.	○	○	○	○	○	○
b. I am more confident trying new things because of Techbridge this year.	○	○	○	○	○	○
c. I know it can take many tries to solve a problem because of Techbridge this year.	○	○	○	○	○	○
d. I am more comfortable speaking in front of a group of people because of Techbridge this year.	○	○	○	○	○	○
e. Techbridge helped me see I am good at science.	○	○	○	○	○	○
f. Techbridge helped me see I am good at engineering.	○	○	○	○	○	○
g. Techbridge made me think more about what I will do after graduating from high school.	○	○	○	○	○	○
h. Techbridge helped me think about my career goals.	○	○	○	○	○	○
i. Techbridge increased my interest in studying engineering in college.	○	○	○	○	○	○
j. I became better at working in a team because of Techbridge this year.	○	○	○	○	○	○
k. In Techbridge this year, I learned to work well with girls whether I like them or not.	○	○	○	○	○	○
l. I have talked with my family about the things I've done in Techbridge this year.	○	○	○	○	○	○
m. The Techbridge field trips and the role models we had this year helped me understand the importance of science, engineering and technology.	○	○	○	○	○	○
n. The Techbridge field trips and role models we had this year made me more interested in working in science, engineering or technology.	○	○	○	○	○	○

13. If you could give Techbridge a grade, what would it be? Please circle your answer.

A B C D F

Please tell us WHY you gave Techbridge this grade.

____

____

____

14. What did you like MOST about Techbridge? ____

Why? ____

____

____

15. How far do you think you will go in school? I will finish… (Check only one)

- ○ High school/G.E.D
- ○ Some college
- ○ 2-year college degree
- ○ 4-year college degree
- ○ Master's degree
- ○ Ph.D., M.D. or other professional degree
- ○ I'm not sure

16. How many years have you been in Techbridge? Please check one.

_____This is my first year _______ 2nd year _______3rd year _____4 or more years

17. Which best describes you? Please check all that apply.

_______ American Indian/Alaska Native
_______ Asian
_______ African American/Black
_______ Hispanic/Latina/Mexican/Mexican American
_______ White
_______ Native Hawaiian/Other Pacific Islander
_______ Other (Please specify:___________________________________)

Please put your survey in an envelope and seal it.

Put your first and last name on the envelope.

Then hand the envelope to your Techbridge teacher.

☺☺ **Thank you very much! We hope to see you in Techbridge again next year.** ☺☺

Appendix K: Student Pre- and Post-Surveys for Comparison Students

COMPARISON STUDENT SURVEY (Pre Fall 2014)

Date: ________________________

First Name: ___________________________________ **Last Name:** ____

Current School: ____ **Grade:** ________ **Date of Birth:** __________________
Month/day/year

Some of the questions in this survey ask about engineering and technology. What do we mean by those words?

When we talk about **technology**, we mean designing, building, and using tools (such as software) and machines (such as computers, digital cameras, or cell phones) to solve a problem or reach a goal.

Engineering uses math, science, and creativity to solve problems in the world. Engineers design, build, and test products, materials, buildings, and systems.

Please read each sentence below and think about how much it describes YOU. Once you decide how much you agree with the statement, put a check mark in the correct box. There are no right or wrong answers: only what is true for you.

1. INTEREST IN SCIENCE, ENGINEERING, AND TECHNOLOGY	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I like science.	○	○	○	○	○	○
b. I like creating things with technology (like games or websites).	○	○	○	○	○	○
c. I like computer programming.	○	○	○	○	○	○
d. I like figuring out how things work.	○	○	○	○	○	○
e. I like building, designing, and/or putting things together.	○	○	○	○	○	○
f. I do well in activities that involve science.	○	○	○	○	○	○
g. I do well in activities that involve technology.	○	○	○	○	○	○

2. SCIENCE AND ENGINEERING IN EVERYDAY LIFE	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I see how science is part of my life.	○	○	○	○	○	○
b. Engineering is useful for solving the problems of everyday life.	○	○	○	○	○	○
c. Engineers make a meaningful difference in the world.	○	○	○	○	○	○
d. Most people should study some science.	○	○	○	○	○	○

3. SCIENCE, ENGINEERING, AND TECHNOLOGY CAREERS	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I know what scientists do.	○	○	○	○	○	○
b. I know what engineers do.	○	○	○	○	○	○
c. I know what people who work in technology do.	○	○	○	○	○	○
r. Knowing science will give me many career choices.	○	○	○	○	○	○
s. Knowing about engineering will give me many career choices.	○	○	○	○	○	○
t. Knowing technology will give me many career choices.	○	○	○	○	○	○
u. I can see myself working in a career that involves science, technology, or engineering.	○	○	○	○	○	○
v. I would like to be a scientist.	○	○	○	○	○	○
w. I would like to be an engineer.	○	○	○	○	○	○
x. I would like a job in technology.	○	○	○	○	○	○

4. MY FUTURE	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I will go to college.	○	○	○	○	○	○
b. I plan to study science in college.	○	○	○	○	○	○
c. I plan to study engineering in college.	○	○	○	○	○	○
d. I plan to study computer science in college.	○	○	○	○	○	○
e. Someone like me could become an engineer.	○	○	○	○	○	○
f. Someone like me could become a scientist.	○	○	○	○	○	○
g. Someone like me could work in technology.	○	○	○	○	○	○
h. I think engineering is a good career for women.	○	○	○	○	○	○

5. HOW I LEARN	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. If I work hard, I will be more successful.	○	○	○	○	○	○
b. I can't change how smart I am.	○	○	○	○	○	○
c. I learn more when I make mistakes.	○	○	○	○	○	○
d. I think I learn more when a task is challenging.	○	○	○	○	○	○
e. I like doing work that I'll learn from even if I make a lot of mistakes.	○	○	○	○	○	○

6. ENGINEERING DESIGN PROCESS	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. Engineers design things perfectly the first time.	○	○	○	○	○	○
b. I know what the engineering design process is.	○	○	○	○	○	○
c. I know how to use the engineering design process to build something.	○	○	○	○	○	○
d. I know how to compare different designs to figure out what is the best way to solve a problem.	○	○	○	○	○	○
e. If a project is not going well, I am able to make changes as needed.	○	○	○	○	○	○

7. WORKING WITH OTHER PEOPLE	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I work well with different types of students.	○	○	○	○	○	○
b. Working with others is usually more fun than working alone.	○	○	○	○	○	○
c. I like being part of a team.	○	○	○	○	○	○
d. I learn better when I am by myself.	○	○	○	○	○	○
e. I learn better when I am working with others.	○	○	○	○	○	○
f. I am comfortable speaking in front of a group of people.	○	○	○	○	○	○
g. I like to speak up in class.	○	○	○	○	○	○
h. Presenting something in front of other people makes me feel proud.	○	○	○	○	○	○
i. I feel like I do a good job when I present to other people.	○	○	○	○	○	○

8. MY FAMILY	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I talk about my career interests with my family.	○	○	○	○	○	○
b. My family thinks science is interesting.	○	○	○	○	○	○
c. My family is interested in the courses I take.	○	○	○	○	○	○
d. My family would like it if I became a scientist, an engineer, or had a technology career when I grow up.	○	○	○	○	○	○
e. My family encourages me to think about a career in science, engineering or technology.	○	○	○	○	○	○

9. Please read each sentence below and think about how much you know about each one. Once you decide how much you know about the sentence, put a check mark in the correct box. There is no "right" or "wrong" answer: only what is true for you.

WHAT YOU KNOW	I don't know anything about this	I know a little	I know some	I know a lot
a. The types of things that people with careers in science, engineering, or technology do in their jobs.	○	○	○	○
b. The kind of classes you need to take to have a career in in science, engineering, or technology.	○	○	○	○
c. How to find information about careers in science, engineering, or technology.	○	○	○	○

10. 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:

_____ Agriculture and Natural Resources (farmer, gardener, park ranger)
_____ Architecture (architect, builder, planner)
_____ Arts and Entertainment (artist, fashion designer, chef, baker, musician, singer, actor/actress)
_____ Business and Finance (accountant, secretary, receptionist, office manager)
_____ Computer Science (video game designer, app creator, coder)
_____ Education and Counseling (teacher, librarian, psychologist, social worker)
_____ Engineering (mechanical engineer, civil engineer, chemical engineer)
_____ Journalism (reporter, television news announcer, news photographer)
_____ Law, Law Enforcement, and Government (lawyer, police officer, politician)
_____ Medicine (doctor, nurse, pediatrician, dentist, physical therapist)
_____ Military (soldier, sailor, Marine, Coast Guard)
_____ Science (biologist, scientist, physicist)
_____ Sports (professional athlete, coach, referee, sports announcer)
_____ Transportation (airline pilot, truck driver, auto mechanic)
_____ Veterinary Care (veterinarian, vet tech)
_____ I don't expect to have a career
_____ I don't know
_____ If the career you have in mind is not on this list, please write your answer on the line below:

____

11. Please check any of the activities you have done at least once since the end of last school year:

ACTIVITIES YOU HAVE DONE SINCE THE END OF LAST SCHOOL YEAR	**No** (have not done this the end of last school year)	**Yes** (have done since the end of last school year)
a. met an engineer, scientist, or someone who works in technology	○	○
b. talked to an engineer, scientist, or someone who works in technology about her or his job	○	○
c. visited a science or technology museum	○	○
d. went to a science, technology, or engineering program (like a Saturday program, science fair, or camp)	○	○
e. did science experiments at home, not for school	○	○
f. did engineering activities at home, not for school	○	○
g. created something with technology at home, in a library, or at a computer lab (like a personal website, a video game, or a project with LEDs)	○	○
h. tried to fix something at home, not for school	○	○
i. took something apart to understand how it worked	○	○
j. talked with my parents about what classes I might want to take in the future (in high school or college)	○	○
k. participated in a program to help prepare for my future and college	○	○

12. How far do you think you will go in school? I will finish… (Check only one)

- ○ High school/G.E.D
- ○ Some college
- ○ 2-year college degree
- ○ 4-year college degree
- ○ Master's degree
- ○ Ph.D., M.D. or other professional degree
- ○ I'm not sure

13. Which best describes you? Please check all that apply.

_______ American Indian/Alaska Native
_______ Asian
_______ African American/Black
_______ Hispanic/Latina/Mexican/Mexican American
_______ White
_______ Native Hawaiian/Other Pacific Islander
_______ Other (Please specify:___________________________________)

Please put your survey in an envelope and seal it.

Put your first and last name on the envelope.

Then hand the envelope to your teacher.

☺☺ **Thank you very much!** ☺☺

Techbridge Scale-up Study

Evaluation Information Form for Comparison Students

We want to know what you think.

Techbridge has asked Education Development Center (EDC) to gather information about a program called Techbridge to help them learn how the program is doing and to help make the program better. We will be gathering information from students participating in the program as well as students who are not in the program. You will be asked to complete a survey in the fall and again in the spring. The surveys ask about your interest in science, engineering, and technology.

The information you provide is confidential. After you complete a survey, you will put it in an envelope so that your answers cannot be seen. Only evaluators from EDC will see your answers. They will not share individual survey answers with anyone. Evaluators will not use your name in any of their reports. Your answers will never be identified as yours and will be combined with other students when reported. Your answers will not affect your school grades or relationships with your teachers.

You do not have to participate in the evaluation. You may skip any questions you do not want to answer on the survey. If you do not wish to complete the survey, put a blank survey in the envelope.

Thank you very much for helping us with this important project.

If you have any questions about the evaluation, please contact Ginger Fitzhugh at Education Development Center: gfitzhugh@edc.org (206) 395-4528 or Linda Kekelis, Executive Director of Techbridge: lkekelis@techbridgegirls.org or (510) 777-9170 x301.

If you have any questions regarding your rights as a participant in this study or feel you may have been harmed by this study, please contact EDC's Human Protections Program at 1-800-225-4276 ext. 2971 or HumanProtections@edc.org.

COMPARISON STUDENT SURVEY (Post Spring 2015)

Date: ________________________

First Name: ____________________________________ **Last Name:** ____

Current School: ____ **Grade:** ________ **Date of Birth:** ___________________
Month/day/year

Some of the questions in this survey ask about engineering and technology. What do we mean by those words?

When we talk about **technology**, we mean designing, building, and using tools (such as software) and machines (such as computers, digital cameras, or cell phones) to solve a problem or reach a goal.

Engineering uses math, science, and creativity to solve problems in the world. Engineers design, build, and test products, materials, buildings, and systems.

Please read each sentence below and think about how much it describes YOU. Once you decide how much you agree with the statement, put a check mark in the correct box. There are no right or wrong answers: only what is true for you.

1. INTEREST IN SCIENCE, ENGINEERING, AND TECHNOLOGY	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)
a. I like science.	○	○	○	○	○	○
b. I like creating things with technology (like games or websites).	○	○	○	○	○	○
c. I like computer programming.	○	○	○	○	○	○
d. I like figuring out how things work.	○	○	○	○	○	○
e. I like building, designing, and/or putting things together.	○	○	○	○	○	○
f. I do well in activities that involve science.	○	○	○	○	○	○
g. I do well in activities that involve technology.	○	○	○	○	○	○

2. SCIENCE AND ENGINEERING IN EVERYDAY LIFE	**Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	**Agree a lot** (6)
a. I see how science is part of my life.	○	○	○	○	○	○
b. Engineering is useful for solving the problems of everyday life.	○	○	○	○	○	○
c. Engineers make a meaningful difference in the world.	○	○	○	○	○	○
d. Most people should study some science.	○	○	○	○	○	○

3. SCIENCE, ENGINEERING, AND TECHNOLOGY CAREERS	**Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	**Agree a lot** (6)
a. I know what scientists do.	○	○	○	○	○	○
b. I know what engineers do.	○	○	○	○	○	○
c. I know what people who work in technology do.	○	○	○	○	○	○
d. Knowing science will give me many career choices.	○	○	○	○	○	○
e. Knowing about engineering will give me many career choices.	○	○	○	○	○	○
f. Knowing technology will give me many career choices.	○	○	○	○	○	○
g. I can see myself working in a career that involves science, technology, or engineering.	○	○	○	○	○	○
h. I would like to be a scientist.	○	○	○	○	○	○
i. I would like to be an engineer.	○	○	○	○	○	○
j. I would like a job in technology.	○	○	○	○	○	○

4. MY FUTURE	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I will go to college.	○	○	○	○	○	○
b. I plan to study science in college.	○	○	○	○	○	○
c. I plan to study engineering in college.	○	○	○	○	○	○
d. I plan to study computer science in college.	○	○	○	○	○	○
e. Someone like me could become an engineer.	○	○	○	○	○	○
f. Someone like me could become a scientist.	○	○	○	○	○	○
g. Someone like me could work in technology.	○	○	○	○	○	○
h. I think engineering is a good career for women.	○	○	○	○	○	○

5. HOW I LEARN	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. If I work hard, I will be more successful.	○	○	○	○	○	○
b. I can’t change how smart I am.	○	○	○	○	○	○
c. I learn more when I make mistakes.	○	○	○	○	○	○
d. I think I learn more when a task is challenging.	○	○	○	○	○	○
e. I like doing work that I’ll learn from even if I make a lot of mistakes.	○	○	○	○	○	○

6. ENGINEERING DESIGN PROCESS	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. Engineers design things perfectly the first time.	○	○	○	○	○	○
b. I know what the engineering design process is.	○	○	○	○	○	○
c. I know how to use the engineering design process to build something.	○	○	○	○	○	○
d. I know how to compare different designs to figure out what is the best way to solve a problem.	○	○	○	○	○	○
e. If a project is not going well, I am able to make changes as needed.	○	○	○	○	○	○

7. WORKING WITH OTHER PEOPLE	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I work well with different types of students.	○	○	○	○	○	○
b. Working with others is usually more fun than working alone.	○	○	○	○	○	○
c. I like being part of a team.	○	○	○	○	○	○
d. I learn better when I am by myself.	○	○	○	○	○	○
e. I learn better when I am working with others.	○	○	○	○	○	○
f. I am comfortable speaking in front of a group of people.	○	○	○	○	○	○
g. I like to speak up in class.	○	○	○	○	○	○
h. Presenting something in front of other people makes me feel proud.	○	○	○	○	○	○
i. I feel like I do a good job when I present to other people.	○	○	○	○	○	○

8. MY FAMILY	👎 Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	👍 Agree a lot (6)
a. I talk about my career interests with my family.	○	○	○	○	○	○
b. My family thinks science is interesting.	○	○	○	○	○	○
c. My family is interested in the courses I take.	○	○	○	○	○	○
d. My family would like it if I became a scientist, an engineer, or had a technology career when I grow up.	○	○	○	○	○	○
e. My family encourages me to think about a career in science, engineering or technology.	○	○	○	○	○	○

9. Please read each sentence below and think about how much you know about each one. Once you decide how much you know about the sentence, put a check mark in the correct box. There is no "right" or "wrong" answer: only what is true for you.

WHAT YOU KNOW	I don't know anything about this	I know a little	I know some	I know a lot
a. The types of things that people with careers in science, engineering, or technology do in their jobs.	○	○	○	○
b. The kind of classes you need to take to have a career in in science, engineering, or technology.	○	○	○	○
c. How to find information about careers in science, engineering, or technology.	○	○	○	○

10. 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:

_____ Agriculture and Natural Resources (farmer, gardener, park ranger)
_____ Architecture (architect, builder, planner)
_____ Arts and Entertainment (artist, fashion designer, chef, baker, musician, singer, actor/actress)
_____ Business and Finance (accountant, secretary, receptionist, office manager)
_____ Computer Science (video game designer, app creator, coder)
_____ Education and Counseling (teacher, librarian, psychologist, social worker)
_____ Engineering (mechanical engineer, civil engineer, chemical engineer)
_____ Journalism (reporter, television news announcer, news photographer)
_____ Law, Law Enforcement, and Government (lawyer, police officer, politician)
_____ Medicine (doctor, nurse, pediatrician, dentist, physical therapist)
_____ Military (soldier, sailor, Marine, Coast Guard)
_____ Science (biologist, scientist, physicist)
_____ Sports (professional athlete, coach, referee, sports announcer)
_____ Transportation (airline pilot, truck driver, auto mechanic)
_____ Veterinary Care (veterinarian, vet tech)
_____ I don't expect to have a career
_____ I don't know
_____ If the career you have in mind is not on this list, please write your answer on the line below:

____

11. Please check any of the activities you have done at least once <u>since the beginning of this school year</u>:

ACTIVITIES YOU HAVE DONE <u>SINCE THE END OF LAST SCHOOL YEAR</u>	**No** (have <u>not</u> done this the end of last school year)	**Yes** (have done since the end of last school year)
l. <u>met</u> an engineer, scientist, or someone who works in technology	○	○
m. <u>talked to</u> an engineer, scientist, or someone who works in technology about her or his job	○	○
n. visited a science or technology museum	○	○
o. went to a science, technology, or engineering program (like a Saturday program, science fair, or camp)	○	○
p. did science experiments at home, not for school	○	○
q. did engineering activities at home, not for school	○	○
r. created something with technology at home, in a library, or at a computer lab (like a personal website, a video game, or a project with LEDs)	○	○
s. tried to fix something at home, not for school	○	○
t. took something apart to understand how it worked	○	○
u. talked with my parents about what classes I might want to take in the future (in high school or college)	○	○
v. participated in a program to help prepare for my future and college	○	○

12. How far do you think you will go in school? I will finish… (Check only one)

○ High school/G.E.D
○ Some college
○ 2-year college degree
○ 4-year college degree
○ Master's degree
○ Ph.D., M.D. or other professional degree
○ I'm not sure

13. Which best describes you? Please check all that apply.

_______ American Indian/Alaska Native
_______ Asian
_______ African American/Black
_______ Hispanic/Latina/Mexican/Mexican American
_______ White
_______ Native Hawaiian/Other Pacific Islander
_______ Other (Please specify:___________________________________)

Please put your survey in an envelope and seal it.

Put your first and last name on the envelope.

Then hand the envelope to your teacher.

☺☺ **Thank you very much!** ☺

Appendix L: Participant Focus Group Protocol

Techbridge Scale-Up Evaluation
Focus Group Guide for Girls
Spring 2015

Introduction:

"My name is XXXX. I work for a group called [Evaluation & Research Associates or Colorado Evaluation & Research Consulting]. Techbridge has asked my group and another organization called [Evaluation & Research Associates/Colorado Evaluation & Research Consulting] to conduct a research study about Techbridge to help them learn how the program is doing and to help make the program better. I'm visiting the Techbridge programs to talk with some of the girls who have been participating in the program. I'm interested in learning about what you've been doing and learning in the program, and your ideas for how to make it better.

We will meet for about half an hour and I will first ask you some specific questions about Techbridge to get the conversation started. You can then add any other ideas or thoughts related to the program. Participation in the focus group is voluntary and you can leave at any time without consequences. You also don't have to answer a particular question if you don't want to.

I'm going to write down some notes as we talk. To make it easier for me to take notes, I would like to audio record our conversation today. I will only record the conversation if everybody in the group is comfortable with it. [Ask for each girl's permission]

The information you share in this focus group is confidential. I will not share my notes or the audio recordings with your teachers or anyone at Techbridge. I won't use your name in any of our reports.

Since we're in a group, we'll want to have a few ground rules so that everybody feels comfortable—like let one person finish talking before adding your ideas.

Do you have any questions for me before we begin?

Let's get started!"

Date: ____________________________

School: ______________________________________

Number of girls in focus group: ___________________

[Lower priority questions in italics]

About Techbridge:

"We're going to start by doing a quick icebreaker activity, similar to the ones you do at the beginning of your Techbridge meetings. Please describe yourself using one or two words that start with the same letter as the first letter of your first name. I'll start: My name is Ginger. I'm gentle and genuine." Go around room.

1. What grade are you in?

2. Why did you join Techbridge?
3. Please tell me about some of the things you have been doing in Techbridge. What has been your favorite part of Techbridge so far this year? Why is it your favorite?

4. Tell me about you get along with [program coordinator name] and [teacher name].
    a. How do they help you? How could they help you more?
    b. Do you talk about topics besides Techbridge (like school work, outside interests, family?)

5. What field trips have you gone on in Techbridge? Please tell me about them. What did you learn?

6. What role models have come to your Techbridge program? Please tell me about them. What did the role models talk about?
    a. Did you find that you had anything in common with the role models you met? How were they *like you* (have a pet, liked to fix things, like to read)?
    b. *Have you met people like the Techbridge role models before—either through school or outside of school?*

Identity and Learning:

7. When you think about engineers or engineering, what comes to mind for you?

8. What have you been learning in Techbridge? *(prompts: science/technical skills, how to present to others, using trial and error to solve problems, how to work with other people, relevance of SET to the world, about science/technology careers)*
    a. How would you describe what you've learned in Techbridge about engineering design to a friend who wasn't in Techbridge?
    b. What specific kinds of jobs have you learned about Techbridge this year (perhaps on field trips or during role model visits)? Did the role models (or Techbridge teachers) talk about what things would help you pursue that kind of career (like the kinds of classes to take, or other activities to pursue in or outside of school)?
    c. Have you had an opportunity to present what you've been learning in Techbridge to other people (like at a Techbridge Family Night event or to the other girls in a Techbridge meeting)? [If yes] Tell me about the most recent time you presented. How did you feel about how it went? What have you learned from your experiences presenting to other people in Techbridge?
    d. Can you share some examples of how things you've learned in Techbridge might be useful to you later in life, like perhaps when you are in college or you have a job?

9. We've been talking about some of the skills you've learned in Techbridge (like facts or how to do certain things). What have you learned about yourself in Techbridge? *(prompts: like the kinds of things you enjoy, the kinds of things you're good at, or things that are hard to do but are still important to do; e.g., to persevere, to speak up, to try something new, to work with other people, to take a leadership role)*

10. I'm going to read a sentence and I'd like you to tell me what you think of it: *"If I try hard, I will be more successful."* What do you think when you hear *"If I try hard, I will be more successful"*? Is there anything you've learned in Techbridge that relates to this idea?

About Plans for the Future:

11. Do any adults in your life (in Techbridge or outside of Techbridge) talk with you about the classes you should take in school, college or possible careers? If so, what advice do you get about school? Careers?
    a. Do you know what courses would be helpful to take to prepare for a career in science, engineering, or technology?
    b. Do you expect that you will be able to choose which math or science classes you take in high school? Why or why not? What math courses do you expect to take in middle school/high school? What science courses do you expect to take in middle school/high school?
    c. Are there science or engineering courses you would love to take but you aren't sure are offered at your school? What are they?
    d. Is there anyone close to you (like a parent, older brother or sister, cousin, aunt or uncle, or family friend) who has studied science, engineering or technology in college and/or had a job in science, engineering or technology?
    e. Has anyone in Techbridge talked to you about their experiences specifically as a woman in a science, engineering, or technology career? What do you remember about what they said? Did what they said make you think differently about pursuing in a career in science, engineering or technology? How?

12. When you finish high school, what are some of the possibilities that you are thinking about doing? *(prompts: college, what would like to study, career)*
    a. Tell me about how you became interested in that subject/career. Why are interested in that subject/career?
    b. Did you have that subject/career idea before joining Techbridge?
        i. *If not*: What about Techbridge made you become interested in it?
        ii. Have Techbridge field trips and/or role models had any influence on your plans for your future education/career choices? *If yes:* How?
    c. Do you think someone like you could become a scientist, engineer or work in technology? Why or why not?

Closing Questions:

13. What do you like most about Techbridge? Why?

14. What would make Techbridge a better program?

Thank you so much! It's so helpful to talk with girls who have been in the program.

Appendix M: Teacher Survey

2015 Techbridge Teacher Survey

Welcome to the survey for Techbridge teachers!

Your responses are a key factor in evaluating and improving the Techbridge program. You will be asked questions about your experiences as a Techbridge teacher. The survey should take about 10-15 minutes to complete. Your responses will be aggregated before reporting and no identifying information will be reported.

Your Experience as a Techbridge Teacher

How helpful have the following aspects of Techbridge training and support been to you? *Select N/A if you did not experience a particular aspect of training or support.*

	Not at all helpful	Slightly helpful	Moderately helpful	Very helpful	Extremely helpful	N/A (Did not experience)
Initial teacher training in the summer	○	○	○	○	○	○
Teacher meetings during the school year	○	○	○	○	○	○
Debriefing meetings with your Techbridge program coordinator	○	○	○	○	○	○
Input/coaching from the Techbridge director/manager	○	○	○	○	○	○
Opportunities to interact with other Techbridge teachers, in a group or individually (online, informal conversations, etc.)	○	○	○	○	○	○

What was the most valuable aspect of training or support Techbridge provided?

____

____

How can Techbridge improve its training and support for Techbridge teachers?

____

____

What efforts did you make to recruit and retain girls from groups underrepresented in science, engineering and technology (e.g., girls who are African American, Hispanic/Latina, or who are English Language Learners) in your Techbridge program? *Select all that apply.*

- ☐ Reaching out to individual girls from underrepresented groups
- ☐ Asking other teachers for recommendations of girls from underrepresented groups
- ☐ Reaching out to families of girls from underrepresented groups
- ☐ Working with other school clubs or groups that already serve girls from underrepresented groups
- ☐ Creating flyers or materials in multiple languages
- ☐ Portraying a diverse group of girls on flyers or Techbridge materials
- ☐ Making activities/curriculum relevant to girls from underrepresented groups
- ☐ Ensuring facilities and activities are accommodating for girls with disabilities
- ☐ Making sure role models are diverse and/or otherwise similar to girls from underrepresented groups in the program
- ☐ Other efforts (please describe): ____

Did you include any non-Techbridge curriculum (or activities) in your Techbridge program?

- ○ Yes
- ○ No

If yes, please describe:

____

____

The table below has statements about things that may have happened in your Techbridge program this year. *Please choose the answer that is closest to describing your Techbridge program overall.*

	Not at all	**To a small extent**	**To some extent**	**To a large extent**	**To a very large extent**
The Techbridge curriculum was engaging for the girls.	❍	❍	❍	❍	❍
Overall, the role model visits were effective.	❍	❍	❍	❍	❍
Overall, the field trips were effective.	❍	❍	❍	❍	❍
Our program emphasized the design process rather than product completion.	❍	❍	❍	❍	❍
Our program promoted a growth mindset (that girls can improve at science, engineering and/or technology through time and experience).	❍	❍	❍	❍	❍
Our program provided opportunities for girls to practice public speaking.	❍	❍	❍	❍	❍
Our program promoted positive peer relationships among girls.	❍	❍	❍	❍	❍
Our program talked about science, engineering and/or technology careers.	❍	❍	❍	❍	❍
Our program talked about educational pathways that can lead to science, engineering and/or technology careers.	❍	❍	❍	❍	❍
Our program talked about gender inequities in science, engineering and/or technology.	❍	❍	❍	❍	❍
Our program talked about how to address gender inequities in science, engineering and/or technology.	❍	❍	❍	❍	❍

Please add any additional information to explain your answers in the table above:

____

____

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
Deciding on the program schedule	○	○	○
Recruiting girls to participate in the program	○	○	○
Choosing science, engineering and/or technology (SET) curriculum or activities	○	○	○
Facilitating activities	○	○	○
Organizing field trips	○	○	○
Involving role models in the program	○	○	○
Communicating with girls' families about the program	○	○	○
Other SET-related content of the program, such as SET career information	○	○	○

Please add any additional information to explain your answers in the table above:

____

____

Techbridge's Impact on the Girls

The table below has statements about possible SET-related effects of Techbridge on the girls who participate. *Please choose the answer that is closest to how you feel based on your observations of the girls in your program.*

Because of Techbridge, the <u>majority</u> of girls participating …	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
…understand better how SET is relevant to their own lives.	❍	❍	❍	❍	❍
…are more confident about their SET abilities.	❍	❍	❍	❍	❍
…increased their ability to use the engineering design process.	❍	❍	❍	❍	❍
…are more likely to believe they can improve their abilities in SET with time, practice, and effort.	❍	❍	❍	❍	❍
…have more knowledge of gender inequities in SET.	❍	❍	❍	❍	❍
…have more knowledge about <u>how to address</u> gender inequities in SET.	❍	❍	❍	❍	❍
…have more knowledge about strategies to overcome gender inequities in SET.	❍	❍	❍	❍	❍
…are more knowledgeable about what SET professionals actually do.	❍	❍	❍	❍	❍
…have increased knowledge of what education they need for a career in science, engineering, and/or technology.	❍	❍	❍	❍	❍

The table below has statements about other possible effects of Techbridge on the girls, such as those related to problem solving, leadership, and persistence. *Please choose the answer that is closest to how you feel based on your observations of the girls in your program.*

Because of Techbridge, the <u>majority</u> of girls participating …	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
…are more comfortable speaking in front of a group of people.	❍	❍	❍	❍	❍
…communicate clearer/stronger arguments for their point of view.	❍	❍	❍	❍	❍
…speak up or share opinions with the larger group more readily.	❍	❍	❍	❍	❍
…are better able to construct an argument or explanation based on evidence.	❍	❍	❍	❍	❍
…are more comfortable taking a leadership role in any activity (in Techbridge or elsewhere).	❍	❍	❍	❍	❍
…are better at problem-solving.	❍	❍	❍	❍	❍
…understand better the value of creativity in solving problems.	❍	❍	❍	❍	❍

Because of Techbridge, the majority of girls participating …	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
…understand better that it can take many tries to solve a problem.	○	○	○	○	○
…are more persistent in the face of challenges.	○	○	○	○	○
…are better able to collaborate with their peers.	○	○	○	○	○

In what key areas have you seen Techbridge girls demonstrate the most growth?

____

____

How have your students benefitted from role model visits and field trips this year?

____

____

What about the role model visits or field trips would you like to see changed?

____

____

Experience of the Families of Techbridge Girls

In what ways did you engage (or assist Techbridge to engage) the families of girls participating in Techbridge? *Check all that apply.*

- ☐ Shared information on Techbridge activities
- ☐ Created opportunities for girls to showcase what they had done or learned in Techbridge with their families
- ☐ Shared ideas for SET-related activities to do at home
- ☐ Shared SET-related resources that could be accessed at home, electronically, or in the local community
- ☐ Shared other SET programs or educational opportunities for girls
- ☐ Shared information on why it is important to involve girls in SET
- ☐ Shared strategies on how to engage girls in SET
- ☐ Shared information on career opportunities in SET fields
- ☐ Other, please specify: ____

What strategies were successful for engaging the families of girls participating in Techbridge?

____

____

What were barriers to engaging the families of girls participating in Techbridge (e.g., language issues, computer access, transportation issues, time)?

____

____

How do you think families were affected by Techbridge (through their own experiences or their daughters' experiences)?

____

____

Techbridge's Impact on You

The table below has statements about possible effects of Techbridge on you as a Techbridge teacher this year. *Please choose the answer that is closest to how you feel.*

This year, Techbridge increased my…	Not at all	To a small extent	To some extent	To a large extent	To a very large extent
…interest in engaging girls in SET.	○	○	○	○	○
…knowledge of strategies to engage girls in SET.	○	○	○	○	○
…awareness of SET careers.	○	○	○	○	○
…knowledge about other SET resources and programs available for girls.	○	○	○	○	○
…ability to provide academic guidance for girls to pursue SET.	○	○	○	○	○

How has Techbridge influenced you as a teacher (e.g., the way you teach in your regular classroom, the curriculum you use during the school day)? *Please provide 1-2 examples.*

____

____

Finally, what suggestions do you have for improving the Techbridge program or your experience as a Techbridge teacher?

____

____

Thank you for completing this survey. Your responses will help us improve Techbridge! Have a great summer!

Appendix N: Teacher Interview Protocol

Techbridge Scale-Up Evaluation
Teacher Interview Guide
Spring 2015

Introduction: “*Techbridge is in the second year of a five-year evaluation and research project. The study is investigating Techbridge’s expansion to three new cities, including the program’s effect on participating girls’ skills and interest in science, technology and engineering.*

I am interviewing teachers who facilitated a Techbridge program in Highline this year. As part of the interview, I am interested in learning about the activities your program has done this year, your views about Techbridge, and what it has meant to you as a teacher. We won’t use your name or other identifying information in connection with anything you say. Information gathered from interviews will be used to inform and improve the program and to inform research on afterschool programming for girls.

The interview will last about 45 minutes. To facilitate my note-taking, I would like to audio record our conversation today. Would that be OK with you [refer to consent form]? If at any point during the interview you would prefer not to answer a question, let me know and we will skip to the next question.

Do you have any questions about the study before we begin?

Let’s get started!”

Date: ______________________________

Teacher Name: ____

School: ____

Scale-Up city ___________________________

Grade(s): ______________________________

Subject(s): ____

Techbridge Meeting Schedule: ____

Program Coordinator Partner:___________________________

Techbridge program introduction and implementation

1) Please tell me about how you got involved in Techbridge. Why did you decide to participate?

2) How would you describe the goals and mission of Techbridge?

3) What makes your school a good place to have a Techbridge program?

4) How did Techbridge prepare you for your role in the program this year? (*probes to make sure they address all possibilities= formal training, informal training, documentation, web or print resources, formal and informal coaching from Techbridge staff, observations of other programs)* Did you feel well-prepared?

Recruitment and retention

5) What practices or strategies did you find successful in your program to recruit or retain girls in Techbridge?

6) What were challenges related to recruiting or retaining girls in Techbridge?

    a) Did successes and challenges differ in any way based on student demographics? (e.g., Were underrepresented girls such as girls who are African American, Hispanic or Latina, or girls with disabilities more difficult/easier to recruit? Did they respond to different strategies than girls from more representative ethnic groups/more privileged backgrounds?)

    b) Was the Techbridge application process (the package of forms families are asked to complete to enroll their child in Techbridge) a barrier for any girls or their families? If so, what issues did you experience? Do you have any suggestions for ways to improve the application process?

Role modeling for career exploration

7) In what ways were girls introduced to SET (science, engineering and technology) CAREERS at your Techbridge program? *(probe with role model visits, field trips, design challenges, use of online career resources like NGCP's FabFems)*

    a) Which types of Techbridge activities engaged students **most** in learning about SET careers?

8) In what ways were girls introduced to SET (science, engineering and technology) EDUCATIONAL PATHWAYS at your Techbridge program? *(probe with role model discussions, conversations with teachers and program coordinators)*

    a) Which types of Techbridge activities engaged students **most** in learning about SET educational pathways?

9) Did you, Techbridge staff, role models, or other adults address the topic of women in SET careers during the program? Please describe these discussions, if applicable.

    a) If yes, did the discussions involve strategies for overcoming gender inequities in SET? If so, what strategies were described?

Engineering design and problem solving

10) What teaching strategies did you find most helpful in guiding girls through the engineering design process?

11) How did girls' use of the engineering design process change over time in the program? Did scaffolding of girls' design activities change over time, and if so, in what ways? [if needed as a prompt: *"For example, did girls have more control over project design later in the year? Did projects become more complex over time?"]*

Girls' gains in leadership

"Techbridge is interested in learning more about how Techbridge girls are developing leadership capabilities. For the purposes of this project, we define leadership very broadly: as a person's capacity to cooperate effectively, seek and provide feedback, communicate their point of view, and seek out/ accept new opportunities."

12) In what ways (if any) have girls' leadership abilities developed since being a part of Techbridge?
    a) If applicable, please share a brief story or example of how girl(s) participating in Techbridge increased their leadership skills or how their increased leadership skills were evident.
    b) If you believe the girls developed leadership abilities, what elements of the program do you think contributed to these changes?
13) Please think back to a time during the program when you felt that one of the girls was really benefitting from Techbridge. Describe what you observed.

Building a network of support for girls in SET

14) What were the most successful strategies in engaging the families of girls participating in Techbridge?

15) Do you have any insights about how accessible Techbridge is for families from different groups?

16) What were barriers to engaging the families of girls participating in Techbridge (transportation, time, language issues, etc.)? What could Techbridge do to address these barriers?

17) How has the Techbridge program influenced families of girl participants (if at all)?

    a) Tell a story of how Techbridge influenced a family you know.

Personal and professional development

18) In what ways did you have opportunities to serve as a leader in your work with Techbridge? Were these opportunities right for you, or would you have wanted more/fewer opportunities to lead or make decisions about your school's program?

19) How is your work with Techbridge influencing or changing your teaching practice?

Learning from evaluation

20) Have you had an opportunity to use project feedback (including evaluation results) to improve the Techbridge program at your location? If so, please describe how (*prompt for process*).

21) Did you learn from Techbridge about how project feedback (including evaluation results) has been used to improve the program? If so, please describe something you learned.

Closing question

22) Is there anything else you'd like to share?

Thank you very much for your time. The information you have shared has been very helpful.

Appendix O: Parent Survey

Techbridge Parent Survey

School:____ **Today's Date:**____________________

	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)	**Not sure** (0)
f. Because of Techbridge, my daughter is more interested in science, engineering, and/or technology.	○	○	○	○	○	○	○
g. Because of Techbridge, my daughter is more interested in taking science, engineering or technology classes in high school.	○	○	○	○	○	○	○
h. Because of Techbridge, my daughter is more interested in studying science, engineering or technology in college.	○	○	○	○	○	○	○
i. Because of Techbridge, my daughter knows more about how to prepare for a career in science, engineering, and/or technology.	○	○	○	○	○	○	○
j. Because of Techbridge, my daughter believes that with hard work she can be better in science, engineering and/or technology.	○	○	○	○	○	○	○
k. Because of Techbridge, my daughter appears more comfortable speaking in front of a group of people.	○	○	○	○	○	○	○
l. Because of Techbridge, my daughter is more willing to try new things.	○	○	○	○	○	○	○
m. Because of Techbridge, my daughter does not give up as easily when facing something difficult (such as a hard homework problem or a challenging project).	○	○	○	○	○	○	○
n. Because of Techbridge, my daughter is more likely to share her ideas or opinions with others.	○	○	○	○	○	○	○
o. Because of Techbridge, my daughter is better able to communicate her ideas to other people.	○	○	○	○	○	○	○

	👎 **Disagree a lot** (1)	**Disagree** (2)	**Disagree a little** (3)	**Agree a little** (4)	**Agree** (5)	👍 **Agree a lot** (6)	**Not sure** (0)
a. Techbridge helped me learn about science, technology and/or engineering activities my daughter can participate in (like museums, camps, classes, etc.).	○	○	○	○	○	○	○
b. Because of Techbridge, I have encouraged my daughter to participate in science, technology and/or engineering activities outside of school (like attending a summer camp, going to summer school in math, going to a science or tech museum, building things at home, etc.).	○	○	○	○	○	○	○
c. Techbridge helped me learn about family activities to do with my daughter related to science, engineering, and/or technology.	○	○	○	○	○	○	○
d. Techbridge helped me learn about what a scientist, engineer, or technology worker actually does.	○	○	○	○	○	○	○
e. Because of what I learned from Techbridge, I am able to talk with my daughter about science (and/or engineering or technology) careers.	○	○	○	○	○	○	○

	Disagree a lot (1)	Disagree (2)	Disagree a little (3)	Agree a little (4)	Agree (5)	Agree a lot (6)	Not sure (0)
f. Because of Techbridge, I have a better understanding of the education needed for a career in science, engineering, and/or technology.	○	○	○	○	○	○	○
g. Learning more science will give my daughter many career choices.	○	○	○	○	○	○	○
h. I would support my daughter if she chooses to become a scientist, engineer and/or work in technology.	○	○	○	○	○	○	○
i. Someone like my daughter could become an engineer.	○	○	○	○	○	○	○

	Yes	No	Not sure
a. Has your daughter talked to you about what she does in Techbridge?	○	○	○
b. Have you received any written materials from Techbridge about the activities your daughter has been doing this year (like newsletters, emails, links to Tumblr posts)?	○	○	○
c. Did your daughter ever talk about having a job in science, engineering, and/or technology before she began attending Techbridge?	○	○	○
d. Has your daughter talked about having a job in science, engineering, and/or technology since she began attending Techbridge?	○	○	○
e. Do you or another adult in the immediate family currently work (or previously work) in a math, science, or engineering career?	○	○	○
f. Do you or another adult in the immediate family do math, science, or engineering as a hobby or special interest?	○	○	○
g. Have you ever encouraged your daughter to study science, engineering or technology?	○	○	○
h. Do you tell your daughter you want her to go to college?	○	○	○

Techbridge sent out the following resources this year: Techbridge newsletters, the Summer Programs Guide, and the Holiday Activity List. How did you use these resources?

How has Techbridge made a difference for your daughter?

How has Techbridge changed your family's attitude or interest in science, technology, and engineering? Is there anything your family is doing or thinking differently because of Techbridge?

Please use this space for suggestions or other comments for Techbridge staff:

Relationship to Techbridge participant:

- ○ Mother
- ○ Father
- ○ Guardian
- ○ Other, Please specify: ______________________

Thank you so much for your time and thoughts!

Appendix P: Parent Focus Group/Interview Protocol

Techbridge Scale-Up Evaluation
Family Interview Guide
(for implementation Spring 2015-2018)

<u>Introduction</u>: "*Techbridge is in the [second/third/fourth/fifth] year of a five year evaluation and research project. The study is investigating Techbridge's expansion to three new cities, including the program's effect on participating girls' skills and interest in science, technology and engineering.*
I am interviewing parents of girls who participated in a Techbridge program in [city] this year. As part of the interview, I am interested in learning about the impact of Techbridge your program on your daughter, her interests, and your views about Techbridge.

We won't use your name or other identifying information in connection with anything you say. Information gathered from interviews will be used to inform and improve the program and to inform research on afterschool programming for girls. The interview will last about 45 minutes.

To facilitate my note-taking, I would like to audio record our conversation today. Would that be OK with you [refer to consent form]? If at any point during the interview you would prefer not to answer a question, let me know and we will skip to the next question.

Do you have any questions about the study before we begin?

Let's get started!"

Date: ___________________________

Parent Name: ____

School: ____

Scale-up city: ___________________________

Before we get started, please tell me the name of your Techbridge girl and how you are related to her. *(Prompts: Is she your daughter, granddaughter, niece, etc.? Is she your only daughter? Is she your only daughter in Techbridge?)*

Techbridge Girl(s) Name(s): ____________________________

Interviewee's relationship with Techbridge girl: ____

Use the girl's name and caregiver's relationship to the girl throughout the interview.

<u>Girl Outcomes</u>

1. Why did you decide/agree to have [name of girl] participate in Techbridge?
    a. What did you hope she would gain from this program?
    b. What could Techbridge or [name of school] do to encourage more parents to enroll their daughters in the program? *(prompts: obstacles that prevent participation, like parent awareness of the program, transportation issues afterschool, other competing afterschool responsibilities)*

2. What has [name of girl] been learning in Techbridge? *(prompts: science/technical skills, how to present to others, using trial and error to solve problems, how to work with other people, relevance of SET to the world, about science/technology careers)*
    a. Have you noticed any differences in how [name of girl] communicates with other people since she started Techbridge? *(Prompts: For example, is she more or less likely to share her ideas or opinions? When she talks about her ideas or opinions, does she make clearer or less clear arguments?)*

<u>Mentors</u>

3. Does [name of girl] know any adults who have a job in science, engineering, or technology (like a family member, a family friend, someone she met through Techbridge, school or somewhere else)?
    a. If so, please describe who this person is and what kind of work they do in science, engineering, or technology (if you know).
    b. Do you think [name of girl's] relationship with this person has influenced how she views science, engineering, or technology? If so, how?

<u>Educational Pathways</u>

4. Do you think [name of girl] will take more (or more advanced) science, engineering, or technology classes in high school?
    a. What do think are the most important influences on [name of girl]'s plans for what classes she plans to take in high school? *(Prompts: Techbridge, parents, peers, teachers, classes, other programs she's participated in)*
    b. How, if at all, has Techbridge influenced what classes she plans to take in high school?

5. Does [name of girl] plan to go to college?
    a. What subjects is she interested in studying in college?
    b. Has Techbridge had an influence on what she is thinking about studying? If so, how?
    c. What do you think of [name of girl's] current interests for what she is thinking of studying in college?

6. How does [name of girl] get information about classes to take? *(Prompt for Techbridge)*
    a. Do you give [name of girl] academic guidance? If yes, what do you say?
    b. Have you or other family members talked with [name of girl] about what she plans to study in college? If so, what have you talked about?
    c. Do you feel you have influence over her plans for going to college or what she studies there?
    d. What would help parents feel more comfortable talking about college with their daughters? *(prompts re: feel need knowledge/expertise in what college is like, subject matter)*

Careers

7. Do you talk about careers with [name of girl]?
    a. If so, what types of things do you talk about? *(Prompts: education, salary, women in science, engineering, or technology fields)*
    b. Have your conversations about careers changed since [name of girl] has been part of Techbridge? If so, how?

8. Do you feel comfortable talking about science, engineering, or technology careers with [name of girl]?
    a. If you don't talk with [name of girl] about science, engineering, or technology careers, what holds you back?
    b. What would help you feel more comfortable talking about science, engineering, or technology careers with [name of girl]?
    c. Has Techbridge helped prepare you to talk about science, engineering, or technology careers with [name of girl]? How did Techbridge help you?

Family Night

9. Have you attended any of the Techbridge Family Nights [refer to dates when they were held]?
    a. Why did you attend or not attend?
    b. What do you think might prevent some families from attending Family Nights?
    c. What did you like best about the Techbridge Family Nights?
    d. How could the Family Nights be improved?

Techbridge Resources

10. Techbridge has various written and online resources for parents (an online Techbridge Tumblr page, Summer Programs Guide, and the Holiday Activity List).
    a. Have you seen any of Techbridge's resources?
    b. If so, have you used any of Techbridge's resources? How did you use these resources?
    c. What could improve the Techbridge resources?

    d. What do think might prevent parents from accessing/using parent or family resources from Techbridge?

11. Has [name of girl] participated (or plan to participate) in any science, engineering, or technology activities outside Techbridge – such as visiting museums or attending summer camps that may have been suggested by Techbridge?

12. What kinds of activities, programs or resources does your community have for girls and families to learn more about science, engineering, or technology?

Techbridge would like to make it possible for more girls to participate in other science, engineering, or technology activities outside of school—like science-related summer camps or going to science or tech museums. There may be a lot of reasons why this would be difficult for some girls and their families (such as cost of the activities, lack of transportation, and other academic or family priorities).

13. What do you think some of the barriers to participating in science, engineering, or technology activities outside of school could be for girls in Techbridge?
    a. What could Techbridge do that might help make it easier for more girls to participate in other non-Techbridge science, engineering and technology activities outside of school?

Family Impact

14. We've talked about how Techbridge has influenced [name of girl]. How has Techbridge made a difference for you or your family? *(Prompts: How has Techbridge changed your and other family members' attitudes about science, technology, and engineering? Interest in science, technology, and engineering?)*

15. What are the best ways for Techbridge to communicate with you and other parents? *(Prompts: phone, text, email, written notes)*

16. How could Techbridge improve your experience as a parent [or other role] of a Techbridge girl?

17. How could Techbridge better support [name of girl]?

Closing Thoughts

18. What else would you like to share about Techbridge?

Appendix Q: Role Model Survey

Techbridge Role Model Survey

Welcome to the annual survey for role models involved in the Techbridge program!

Your responses are a key factor in evaluating and improving the Techbridge program. This survey should take about 10-15 minutes to complete. You will be asked questions about your preparation and experiences as a Techbridge role model. Your responses will be aggregated before reporting and no identifying information will be reported.

Role Model Training and Expectations

Please answer the following questions about your experiences with Techbridge's role model training and expectations.

1. What preparation have you received from Techbridge to become a role model? ***(check all that apply; check "none" if you have not received any training from Techbridge)***

- ☐ None
- ☐ Participated in preparation by phone from a Techbridge staff member
- ☐ Participated in online training for role models
- ☐ Attended an in-person training for Techbridge role models
- ☐ Other; please describe: ____________________________________

2. How would you rate the overall helpfulness of the Techbridge role model preparation you received?

- ○ Very helpful
- ○ Somewhat helpful
- ○ Only a little helpful
- ○ Not at all helpful
- ○ N/A – I did not receive any preparation from Techbridge

3b. If you rated the helpfulness as "Only a little helpful" or "Not at all helpful," please explain your answer.

Role Model Experience

Next – please share a bit about your role model experience.

4. How many times did you visit a Techbridge program during the past twelve months?

○ 0
○ 1
○ 2
○ 3 or more

5. How many times did Techbridge students make a field trip to your workplace or your school during the past twelve months?

○ 0
○ 1
○ 2

6. Please indicate your level of agreement to each statement. If you have had multiple opportunities to serve as a role model, please consider all of your experiences together when responding. *Choose "Not Applicable" for any questions that do not apply to you.*

	Strongly Disagree	**Disagree**	**Disagree a little**	**Agree a little**	**Agree**	**Strongly Agree**	***Not Applicable***
a. I know what Techbridge's expectations are for role models.	○	○	○	○	○	○	○
b. I followed Techbridge's suggestions while conducting outreach with Techbridge students.	○	○	○	○	○	○	○
c. I had an opportunity to share personal information about myself with the girls such as my hobbies, or what I liked at their age.	○	○	○	○	○	○	○
d. I was able to describe my job in a way the girls could understand.	○	○	○	○	○	○	○
e. I was able to make connections between my job and the girls' everyday lives.	○	○	○	○	○	○	○
f. *(If your experiences involved hands-on projects)* I was comfortable guiding girls' efforts in a hands-on project.	○	○	○	○	○	○	○
g. I felt comfortable answering the girls' questions.	○	○	○	○	○	○	○
h. I am more <u>confident</u> conducting outreach with K-12 students because of my experience as a Techbridge role model.	○	○	○	○	○	○	○

	Strongly Disagree	Disagree	Disagree a little	Agree a little	Agree	Strongly Agree	*Not Applicable*
i. I am more <u>effective</u> conducting outreach with K-12 students because of my experience being a Techbridge role model.	○	○	○	○	○	○	○
j. Overall, the experience of being a Techbridge role model has been worthwhile.	○	○	○	○	○	○	○

7. Please indicate what you did during your role model visit(s)/field trip(s).

	Yes, in <u>every</u> role model visit(s)/ field trip(s)	Yes, but only in <u>some</u> of my role model visit(s)/ field trip(s)	No, in <u>none</u> of my role model visit(s)/ field trip(s)	Not sure
a. I led a tour of my worksite or school.	○	○	○	○
b. I conducted an icebreaker activity (a warm-up or get-to-know you activity).	○	○	○	○
c. I told at least one personal story about myself.	○	○	○	○
d. I facilitated a hands-on activity with the girls.	○	○	○	○
e. I encouraged the girls to ask me questions.	○	○	○	○
f. I shared my educational pathway with the girls.	○	○	○	○
g. I shared about how I decided to work in science, engineering, or technology.	○	○	○	○

Future Plans for Role Modeling

8. Please indicate how likely you are to do the following in the next year.

	Definitely Won't	Probably Won't	Uncertain	Probably Will	Definitely Will
a. Visit a Techbridge afterschool program as a role model.	○	○	○	○	○
b. Serve as a Techbridge role model on a field trip	○	○	○	○	○
c. Coordinate with Techbridge to hold a field trip at my employer/job location.	○	○	○	○	○
d. Serve as a role model for youth about having a career in science/technology (outside of Techbridge)	○	○	○	○	○

8b. If circumstances other than your Techbridge experience will affect your decision to volunteer (e.g., job change, moving from the area), please describe:____

9. What have <u>you</u> gained from your experience as a role model?

10. Techbridge would like to have a diverse group of role models, including those who have similar racial/ethnic backgrounds to the girls in Techbridge, those who are young/early in their careers, and those who grew up in this community. <u>Do you have suggestions about ways that Techbridge can recruit individuals who fit these criteria to be role models?</u>

11. What additional information or support from Techbridge would be helpful to you as a role model?

12. Please use this space for any other comments or suggestions related to being a role model for the Techbridge program.

Thank you very much for completing the Techbridge Role Model Survey!

Appendix R: School Leader Interview Protocol

Techbridge Scale-Up Evaluation
School Leader Interview Guide
Spring 2015

Introduction: *"Thank you for talking with me today. This interview is part of a larger data collection effort that will allow us to better understand the scale-up process of Techbridge to new locations around the country, including in the Highline School District. It should take about 30 minutes. The topics we'll be covering relate to the project's plans over this past year, project resources, ownership, and incentive. At the end of the interview there will be time for you to add any comments or thoughts we haven't covered.*

To facilitate my note-taking, I would like to audio record our conversation today. Would that be OK with you [refer to consent form]? If at any point during the interview you feel unwilling to answer a question, let me know and we will skip to the next question.

Do you have any questions about the interview process before we begin?

Let's get started!"

Date: ______________________________

Principal Name: ____

School: ____

Scale-Up city ___________________________

I'd like to start with some background questions about Techbridge and your school community.

1. First, what is your role in the Techbridge program? How have you been involved in the past year?

2. We'd like to ask you a few questions about how and why your school became involved with Techbridge.
    a. How did your school become involved in Techbridge?
    b. What drew you and your school to the project? *[If applicable, based on response to 2a; if district made decision, skip to next item]*
    c. How does Techbridge fit with your school's goals or mission? How does Techbridge help you achieve your goals or mission, if applicable?
    d. Why is your school community a good place to have a Techbridge program?

3. We are interested in understanding opportunities girls at your school have for building math, science, and technology skills and knowledge. Can you describe those opportunities at your school, and in the school your students typically attend next?

4. Could you describe the families served by your school? [Probe specifically for demographics, language needs, level and types of interactions with school and school personnel, barriers faced in making connections like work schedules, etc.]

5. Do you know if the Techbridge application process (the package of forms families are asked to complete to enroll their child in Techbridge) was a barrier for any girls or their families? If so, what issues did you experience? Do you have any suggestions for ways to improve the application process?

Next, we'd like to ask you a few questions about Techbridge's implementation in your school.

6. What knowledge, skills and abilities do the teacher and staff members involved in Techbridge at your school have that have helped your school implement the program?

7. Have you had an opportunity to attend a Techbridge Family Night?
    a. If yes: What were your impressions of the event? Did participation in the event seem similar to other family events held at your school?
    b. If yes: Did the girls and families in attendance represent the diversity of your school? If not, which students were over represented? Underrepresented? If not, do you have any suggestions for improving diverse attendance in Techbridge, including at Family Night?

8. Do you have any insights about how accessible Techbridge is for families from different groups?

9. Have you noticed or become aware of any differences in the attitudes, science or engineering knowledge, or behavior of girls involved in Techbridge? Please describe. [*If you do not have any direct contact with Techbridge girls but have second hand knowledge of such changes, please share.]*

One area of interest for the evaluation has to do with resources for implementing Techbridge.

10. Is the support you receive from Techbridge sufficient to implement the program at your school?
    a. If not: What additional support from Techbridge would be helpful in making the program successful?

11. Please describe the school resources that have been allocated to Techbridge since you began the project, such as staff time, equipment, project space, funding, etc.

12. One of the project's goals is to continue Techbridge beyond the grant period. Have you thought about continuing the project after the grant ends?
    a. If yes: What plans do you have to continue Techbridge?
    b. If yes: What would help facilitate Techbridge at your school beyond this grant funding?
    c. If yes: Do you have any thoughts about good funding partners for Techbridge?

Finally, now that the first year of implementation of Techbridge in your district is nearing its end, we'd like to ask you a few questions reflecting back on how it's gone.

13. To what degree has the implementation and impacts met your original expectations or vision for the project at your school?

14. Is there any part of hosting Techbridge at your school that is a disincentive or challenge?
    a. If yes: Have you resolved that challenge? If yes: How?

15. What has been the greatest success of Techbridge thus far?

16. Are there any factors we have not already discussed that you think have significantly affected Techbridge this past year, negatively or positively (e.g., staffing changes, school policies, funding)? If so, what were these issues and how did they affect the project?

17. At this point in the project, are you interested in learning about our results regarding Techbridge participants? If so, what are you interested in learning about?

18. Is there anything else you would like to add?

Thank you very much for your time. The information you have shared has been very helpful.

Appendix S: School Leader Interview Protocol

Techbridge Scale-Up Evaluation
District Interview Guide
Spring 2015

Introduction: *"Thank you for talking with me today. This interview is part of a larger data collection effort that will allow us to better understand the scale-up process of Techbridge to new locations around the country, including in [school district]. It should take about 30 minutes. The topics we'll be covering relate to the project's plans over this past year, project resources, ownership, and incentive. At the end of the interview there will be time for you to add any comments or thoughts we haven't covered.*

To facilitate my note-taking, I would like to audio record our conversation today. Would that be OK with you [refer to consent form]? If at any point during the interview you feel unwilling to answer a question, let me know and we will skip to the next question.

Do you have any questions about the interview process before we begin?

Let's get started!"

Staff interviewed: ____

Date and time of interview: ____

I'd like to start with some background questions.

19. First, what is your role related to the Techbridge program at your district? How have you been involved over the past year?

20. We'd like to ask you a series of questions about how and why your district became involved with Techbridge.
    a. How did your district find out about Techbridge?
    b. What drew you and your district to the project? How does Techbridge fit with your district's goals or mission?
    c. We understand that Highline School District received a Race to the Top federal grant to establish STEM academies at several schools, and that many of these schools host Techbridge programs. How does Techbridge relate to this initiative?
    d. We are interested in understanding any other opportunities girls in your district have for building math, science, and technology skills and knowledge. Can you describe those opportunities in your district (besides Techbridge and any programs you've already described)?
    e. Why is this community a good place to have Techbridge programs (in terms of the people who live in your district, the educational resources that are available in the district, etc.)?

21. Could you describe the families served by your district? [Probe specifically for demographics, language needs, level and types of interactions with school and school personnel, barriers faced in making connections like work schedules, etc.]

22. How were the schools that are hosting Techbridge programs selected?
    a. Now that we're reaching the end of the first year that Techbridge programs have been implemented, do you think the "right" schools were selected? Why or why not?

One area of interest for the evaluation has to do with resources for implementing Techbridge.

23. One of the project's goals is to continue Techbridge beyond the grant period. Have you thought about continuing Techbridge after the grant ends?
    a. If yes:
        i. What plans do you have to continue Techbridge?
        ii. What would help your district support Techbridge beyond this grant funding?
        iii. Do you have any thoughts about good funding partners for Techbridge?
    b. If not:
        i. Why not?
        ii. Is there anything that would make it more likely that your district might consider supporting Techbridge beyond the grant? If so, what would help?

Now that the first year of implementation of Techbridge in your district is nearing its end, we'd like to ask you a few questions reflecting back on how it's gone.

24. Have you had an opportunity to see any of the Techbridge programs in action or attend a Techbridge Family Night? If yes: What were your impressions of the program?

25. We're interested in hearing about what working with the Techbridge program and its staff has been like so far from a district perspective.
    a. Who have you had contact with at Techbridge? What have you communicated about?
    b. Do you have any feedback about your interactions with Techbridge over the course of the year? Would you prefer to have more communication with Techbridge (or less)? How come?
    c. Have you communicated about Techbridge with any of the schools that host the program? If so, please describe your role in communicating with schools about Techbridge.

26. Are there any factors we have not already discussed that you think have significantly affected Techbridge this past year, negatively or positively (e.g., staffing changes, school policies at the district level, funding, other afterschool program offerings in the district)? If so, what were these issues and how did they affect the project?

27. To what degree has the implementation of Techbridge met your original expectations or vision for the project in your district?

28. What has been the greatest success of Techbridge thus far?

29. At this point in the project, are you interested in learning about our results regarding Techbridge participants? If so, what are you interested in learning about?

30. What advice would you give to other school districts that are considering partnering with Techbridge? [Probe re: communication expectations/processes, establishing MOU between district and Techbridge, staff roles/responsibilities, school selection, evaluation/research expectations like data sharing, etc.]

31. If you were to embark on this process with Techbridge again, is there anything you would change or do differently?

32. Is there anything else you would like to add?

Thank you very much for your time. The information you have shared has been very helpful.

Appendix T: Techbridge Staff Interview Protocol (Expansion Sites)

Techbridge Scale-Up Evaluation
New City Staff Interview Guide

Introduction: *"Thank you for talking with me today. This interview is part of a larger data collection effort that will allow us to better understand the scale-up process of Techbridge. It should take about 90 minutes. At the end of the interview there will be time for you to add any comments or thoughts we haven't covered.*

To facilitate my note-taking, I would like to audio record our conversation today. Would that be OK with you [refer to consent form]? If at any point during the interview you feel unwilling to answer a question, let me know and we will skip to the next question.

Do you have any questions about the interview process before we begin?

Let's get started!"

Staff interviewed: ________

Date and time of interview: ________________

Organization level

1. Please briefly describe your current role.

2. How do you interface with other people involved in Techbridge?

   a. Elizabeth Hodges (Techbridge Seattle Executive Director)
   b. Techbridge Program Coordinators (TBD)
   c. Linda Kekelis (Techbridge CEO/ Executive Director, Oakland)
   d. Kelly Greenwood (Techbridge Chief Growth and Strategy Officer)
   e. Matt Hurley (Techbridge Director of Programs, Oakland)
   f. Jennifer Wei (Techbridge Chief Operating Officer)
   g. Emily McLeod (Techbridge Director of Curriculum)
   h. [for later years] Executive Director, Program Coordinators, city 2; Executive Director, Program Coordinators, city 3
   i. Any other Techbridge staff involved in the scale-up project?
   j. School administrators from the partnering schools (add names if possible)

3. How would you describe the VISION of Techbridge? What is the main issue the program is addressing, and how does the program aim to solve it?

4. Think about your introduction to the Techbridge organization.

   a. Were there moments or experiences that particularly helped you understand the goals, values, or practices of Techbridge? What were they? What did they help you understand/realize about the organization?

   b. Conversely, were there any goals, values, or practices that took longer to understand, or were confusing to you at first? What were they? Are you still struggling with any of these ideas? [If not, "How did you eventually learn the concept?"]

5. How could the introduction or training new Techbridge staff at expansion sites received be improved?

District/school level

6. What knowledge, skills and abilities have you found are most important for the teachers to have to be able to implement Techbridge successfully?

   a. From your perspectives, what do you think motivates teachers to become involved in Techbridge? (For example, do teachers join for the money? To support students in a general way? To learn new STEM activities? Because they are particularly interested in gender diversity in STEM?) How might those motivations support and hinder program quality and implementation?

7. What formal training has Techbridge provided to the expansion site teachers during this school year? What, if any, informal follow-up support has Techbridge provided?

   a. How would you describe program coordinators' roles in supporting teacher development in Techbridge?

   b. How would you improve the training of Techbridge teachers?

8. Sometimes a project works in some settings, but needs adjustments in a new setting. Have you or the teachers made any changes or adjustments to Techbridge at particular schools (e.g., in terms of how the program is implemented)? If yes (for each change): What was the change or adjustment? Who made the change, and through what processes (e.g., conversations with Oakland staff, executive director, school personnel?)? Why was the change made? What steps have been taken to document the change and create opportunities for the change to inform practice across sites?

   (Prompts: curriculum, staffing, role models, field trips, training, meeting structure, participation, and support as areas of change)

   Family/Community level

9. What should we know about the families you work with in terms of culture, background, assets and barriers to college success? How have these characteristics influenced your program?

10. Please describe how you have communicated with the Techbridge girls' families. What resources have you provided them, and in what ways (in person communication, newsletters, phone calls, tumblr, blogs, texts)?

11. What evidence (if any) do you have that families are changing attitudes/knowledge about science, engineering, and technology (SET) careers and activities?[39]

12. In what ways have you formed connections with community organizations? How have these collaborations a) informed practice, or b) provided additional resources/support for girls?

13. Please briefly describe the role model program as implemented in Seattle. How did you identify role models to participate this year? What kinds of training and support were provided? How did the role models decide what to do with the girls?

    a. How successful were role modeling activities, in your opinions? Did the success differ by site? By role model? By event type?

Program/Girl Level

14. What recruiting strategies have been most effective in recruiting girls in Techbridge at your schools? Did these strategies differ by any of the following variables [Socioeconomic status, language status, ethnicity, initial interest in SET]? What retention strategies (if any) have you implemented to keep girls engaged?

15. Techbridge is interested in whether and how girls learn that intelligence is malleable, or that they can improve their intelligence with effort (e.g., growth mindset/perseverance). Do you have any insight to share? Specifically:

    a. Are girls developing these capabilities in program? Tell a story or share an example of a participant who has shown development of the growth mindset.

    b. How do teachers and program coordinators support growth mindset development through the *way program activities are structured? (if needed probe with these examples: " such as the emphasis on effort, description of project work as cyclical*")

    c. How do teachers and program coordinators support growth mindset development through *interactions with girls?*

---

[39] Please note we will be collecting evidence of this in multiple ways, but would like your perspective to enhance our understanding of families' understanding of SET.

16. Techbridge is interested in whether and how girls learn about the engineering design process. Do you have any insight to share? Specifically:

    a. Are girls developing these capabilities in program? Tell a story or share an example of a participant who has shown developed understanding of the engineering design process.

    b. How do teachers and program coordinators support girls' learning the engineering design process through the *way program activities are structured? (if needed probe with these examples: " such as the emphasis on design challenges, redesign, presentations focused on process*")

    c. How do teachers and program coordinators support engineering design thinking through *interactions with girls?*

17. Techbridge is interested in whether and how girls learn about SET careers. Do you have any insight to share? Specifically:

    a. Are girls learning specifics about SET careers in program? Are they hearing messages that relate to the impact of SET on society?

    b. How do teachers and program coordinators support girls' learning about careers through the *way program activities are structured? (if needed probe with these examples: " such as the direct description of careers that relate to design challenges, such as direct connections made to skills needed in the workforce*")

    c. How do teachers and program coordinators support SET careers through *interactions with girls?*

18. Techbridge is interested in whether and how girls develop skills in leadership and team work. Do you have any insight to share? Specifically:

    a. Are girls developing these capabilities in program? Tell a story or share an example of a participant who has shown growth in leadership or team work.

    b. How do teachers and program coordinators support leadership and cooperative capability development through the *way program activities are structured? (if needed probe with these examples: " such as the emphasis on group projects where girls trade roles, or projects where girls use presentation and critique*")

    c. How do teachers and program coordinators support leadership and cooperative capability development through *interactions with girls?*

19. What curriculum units have the scale-up programs used this year? Have any of the units been more challenging to implement than others? If so, what factors made them more challenging? How did you address the problem(s) you faced with regard to curriculum?

20. Co-teaching (like you did with a teacher in Techbridge) can be challenging, as individuals bring different backgrounds, skills, motivations to teach, time commitments, and relationships with students to the collaborative endeavor. What have you learned about co-teaching in your experiences at school sites?

    a. What communication strategies facilitate good cooperation with Techbridge teachers?

    b. Have there been any teacher-program coordinator relationships that haven't worked well? What (if anything) have you tried to improve the partnership?

    c. Consider balance between teacher and program coordinator responsibility in the following areas. Where would you like more/less support from teacher(s)?

        i. Deciding on the program schedule
        ii. Recruiting girls to participate in the program
        iii. Choosing science, engineering and/or technology (SET) curriculum or activities
        iv. Facilitating activities
        v. Organizing field trips
        vi. Involving role models in the program
        vii. Communicating with girls' families about the program
        viii. Other SET-related content of the program, such as SET career information

Summary Questions

21. What have you all learned about the Techbridge Scale-up project so far?

22. In what ways has Techbridge Seattle planned for and used feedback to improve the program this year? What lessons have you learned thus far?

23. Techbridge operates in a larger context and other factors could influence the program, such as school/district policies and priorities, the availability of other afterschool activities, etc. Are there any factors we have not already discussed that you think have significantly affected the project this past year? If so, what were these factors and how did they affect the project?

24. Is there anything else you would like to add?

Questions for the Executive Director: (these items would be asked of the executive director without the program coordinators present)

25. Based on your experiences visiting Techbridge Oakland program sites and Oakland main office, how does the design and implementation of the programs at your site compare to the design and implementation of the existing Techbridge programs, as far as you know *(prompts: curriculum, staffing, advisory committee, role models, field trips, training, meeting structure, participation, and support)*? How is your site like the Techbridge model, and how is it different?

26. Why did you choose to partner with [School district name(s)]?

    a. How did you decide which schools to partner with? In what ways did district contextual factors (school focus, administrator buy-in) shape the decisions regarding which schools became partners?

    b. What do you think motivated schools/school administrators to become involved in Techbridge? How might those motivations support and/or hinder Techbridge implementation?

27. How were the Techbridge teachers selected to become involved in the scale-up project? What teacher characteristics were prioritized for teacher selection?

28. Please describe how (your city) and Oakland shared responsibility for this formal and informal training. How were decisions made regarding which team members were involved? Which elements of training were handled by Oakland staff or by Seattle staff?

29. What knowledge, skills, and abilities have you found are most important for program coordinators to have (or develop over time) to implement Techbridge successfully?

30. What features of the management of the project (local and over distance) have been important in keeping Techbridge stable and effective in Seattle (such as face to face communication with Techbridge staff, use of connections with Techbridge Oakland for funding leads)? What have been challenges and what suggestions do you have for future organization and management of Techbridge at new sites?

31. Based on your current experience of Techbridge, how do you imagine it can be sustained beyond the years of the grant? (prompt: school partnerships, funding, curriculum development, human resources)

Appendix U: Techbridge Staff Interview Protocol (Main Office)

Techbridge Scale-Up Evaluation
Staff Interview Guide

Introduction: *"Thank you for talking with me today. This interview is part of a larger data collection effort that will allow us to better understand the scale-up process of Techbridge. It should take about 90 minutes. At the end of the interview there will be time for you to add any comments or thoughts we haven't covered.*

To facilitate my note-taking, I would like to audio record our conversation today. Would that be OK with you [refer to consent form]? If at any point during the interview you feel unwilling to answer a question, let me know and we will skip to the next question.

Do you have any questions about the interview process before we begin?

Let's get started!"

Staff interviewed: ________

Date and time of interview: ________________

Organization level

1. Please briefly describe your current role in Techbridge, and primarily on your role in the Scale Up of Techbridge.

2. How do you interface with other people involved in Techbridge Scale Up?

   a. Techbridge Seattle Executive Director
   b. Techbridge Seattle Program Coordinators [for later years: City2/City3]
   c. [for later years] Executive Director, Program Coordinators, city 2; Executive Director, Program Coordinators, city 3
   d. Martha Pena (Techbridge Director of Programs, Oakland)
   e. Emily McLeod (Techbridge Director of Curriculum)
   f. Any other Techbridge staff involved in the scale-up project?
   g. School administrators from the partnering schools (if applicable)

3. How were cities selected for scale up? What were the most important factors in choosing cities? [For years 4 and 5: Reflecting back on the reasons these three cities were chosen for scale up, would you change your criteria for making scale-up decisions? Would you change any of the cities based on your experiences?]

4. How does the design and implementation of the scale up programs at [city1, city2, city3][40] compare to the design and implementation of the existing Techbridge programs, as far as you know *(prompts: curriculum, staffing, advisory committee, role models, field trips, training, meeting structure, participation, and support)*?

    a. How is [city1/city2/city3] like the original Techbridge model, and how is it different?

Personnel

5. Reflecting back on the reasons that the scale-up staff were selected (hindsight being a wonderful thing), what would you say has been learned about the processes of hiring executive directors at a distance? Of hiring program coordinators in collaboration with executive directors?

    a. What characteristics, experiences, background knowledge, social networks, education, and/or dispositions seem most advantageous in an executive director? Please remember all information will remain confidential in our reporting, and we will make every effort to mask identities in our write-ups. Did this list shift, or did priorities change when considering new city contexts and the distance from the Techbridge Oakland staff, culture, and practices?

    b. What knowledge, skills, and abilities have you found are most important for <u>program coordinators</u> to have (or develop over time) to implement Techbridge successfully? Did this list shift, or did priorities change when considering new city contexts and the distance from the Techbridge Oakland staff, culture, and practices?

    c. What knowledge, skills and abilities have you found are most important for the <u>teachers</u> to have to be able to implement Techbridge successfully? Did this list shift, or did priorities change when considering new city contexts and the distance from the Techbridge Oakland staff, culture, and practices?

6. What formal training has Techbridge provided to the expansion sites during the Scale Up?

    a. Please describe how [city1/city2/city3] and the Techbridge Oakland staff shared responsibility for formal and informal training of program coordinators and teachers. How were decisions made regarding which team members were involved? Which elements of training were handled by Oakland staff or by [city] staff?

    b. How could the training of Techbridge staff and teachers at Scale Up sites be improved?

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[40] As applicable, ask the question with each city separately, For example, in year 3, ask :"How does the design and implementation of scale up programs in Seattle compare…" then ask "How does the design and implementation of scale up programs in DC compare…"

Contextual factors

7. Sometimes a project works in some settings, but needs adjustments in a new setting. Has Techbridge [city1/city2/city3] made any changes or adjustments to the Techbridge program as a whole, or at particular settings (e.g., in terms of how the program is implemented)? If yes (for each change): What was the change or adjustment? Who made the change? Why was the change made? *(prompts: curriculum, staffing, role models, field trips, training, meeting structure, participation, and support*

8. What should we know about the families of Techbridge girls in city1/city2/city3 in terms of culture, background, assets and barriers to college success? How are they similar to/different from Techbridge families in Oakland? How have these characteristics influenced the Scale Up implementation?

9. What should we know about city1/city2/city3 in terms of industry, school district factors, philanthropy, geography, and "city culture"? How has Techbridge accessed and utilized additional support services for girls and families in each location (e.g., social services, nonprofits with complementary foci, like MESA)? How is city1/city2/city3 similar to/different from Oakland? How have these characteristics influenced the Scale Up implementation?

Career preparation and readiness

10. Please briefly describe the role model program as implemented in city1/city2/city3. How did the scale up site(s) identify role models to participate this year? What kinds of training and support were provided? How did these experiences seem to differ from Techbridge Oakland Role Model efforts?

Curriculum

11. What curriculum units have the scale-up programs used this year? Have any of the units been more challenging to implement than others at a distance? If so, what factors made them more challenging? How did you address the problem(s) you faced with regard to curriculum (e.g., training on content at a distance, materials acquisition, and curricular fidelity)?

Program Fidelity Questions

12. How would you describe the VISION of Techbridge? What is the main issue the program is addressing, and how does the program aim to solve it?

13. Think about the development of Scale Up resources, training, and onboarding practices.

    a. Were there moments or experiences during Scale Up planning that particularly helped you understand or clarify the goals, values, or practices of Techbridge? What were they? What did they help you understand/realize about the organization?

b. Conversely, were there any goals, values, or practices that were more difficult in Scale Up planning, or that took longer to understand or convey? What were they? How did you eventually approach the concept?

14. What features of the management of the project (local and over distance) have been important in keeping the Techbridge stable and effective in city1/city2/city3 (such as face to face communication with Techbridge staff, use of connections with Techbridge Oakland for funding leads)?

    a. Linda has described the values of Techbridge as an organization like this:

- Techbridge is family; everyone helps each other
- Staff are always learning and looking to improve; have that as mindset
- Collaboration; learning to be a good partner
- Remember we are in it for the girls
  In what ways are these values reflected in the culture at (city1/city2/city3)?

15. Techbridge operates in a larger context and other factors could influence the program, such as school/district policies and priorities, the availability of other afterschool activities, etc. Are there any factors we have not already discussed that you think have significantly affected the project this past year? If so, what were these factors and how did they affect the project?

16. Based on your current experience with Techbridge, how do you imagine it can be sustained beyond the years of the grant? *(prompt: school partnerships, funding, curriculum development, human resources)*

17. Other than what you've already shared, what else have you learned about the Scale up project that would influence further expansion in another city?

18. In what ways has Techbridge planned for and used feedback to improve the Scale Up program this year?

19. Is there anything else you would like to add?

Appendix V: Embedded Assessment Protocol and Rubric

Embedded Assessment for Techbridge Scale-Up 7/15/14

The rubric is divided into four sections. The first section comes from the National Science Teacher's Association engineering standards based on Next Generation Science Standards,[41] and refers mainly to the engineering design process and girls' evidence of using reasoned decision making from data to build their projects. The second refers to evidence of quality teamwork, while the third is an attempt to understand the engineering habits of mind fostered in Techbridge. The final section comes from the educational research literature, and refers to types of talk found in expert and novice scientists/engineers. We imagine the first second and third sections would be most relevant to Techbridge at the practical level, the last would be most useful for "pure research" purposes, as it is using theory already evident in the learning engineering literature base as "codes" to analyze discourse on the videos.

The rubric is very broad. Results should be considered over time, over multiple interviews, and not considered as a way to "grade" an individual's performance on a project, but as a way to consider growth in skills and potentially of the development of new ways of thinking. Scoring would occur with multiple coders to assess interrater reliability—typically via "overlap coding" in which two coders rate a subset of the data, then meet to come to consensus on the set of data. Reliability estimates are computed based on results coders come to on their own, before collaboration occurs.

Some possible uses for the embedded assessment rubric: a) near beginning and end of the year with each girl at the site to compare individuals' growth over time; and b)at a few points over the year with a subset of girls to compare different curricula and the way unit implementation can provoke design thinking (or not). We would not expect any interview to score the maximum across all sections.

Girls interviewed one another on video, asking the following questions:

1. What was your design challenge for this project?
2. What roles did members of your group take as you worked on your project (recorder, leader, spokeswoman, artist?) How did you decide what roles to play? Did this change over time?
3. What did you learn from other girls when you worked on your project?
4. If you did this project again, what would you do differently?
5. Did you have a chance to redesign your project?
    [if yes] What did you change to improve your design? Why did you make that change? What happened when you made the change?
    [if no] What would you change to improve your design? Why? What do you think would happen if you made that change?
6. "How would you describe what the "engineering design process" is to a friend who isn't in Techbridge?"

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[41] Standards were modified from the NGSS @NSTA website.

Part 1: NSTA standards for engineering middle school/engineering design process **This section can be considered “stages”- while the girls may only address one of these stages explicitly in her talk, they build on one another. Girls will be given credit for the “highest” level for which there is evidence.**	
Techbridge girls will be able to address the *criteria and/or constraints of a design problem.* Focus is on understanding the task and recognizing how different factors could influence task success [relates to NSTA E1 standard] Scored as 1 for engineering design process	Example of stage 1: (from data) A participant described some of the constraints she experienced with materials she used in a submarine project. *She described the foam as “not sturdy enough” for her purposes, and the electronics she began to use for the project were not always functioning*.
Techbridge girls will be able to *evaluate competing design solutions using a systematic process.* Focus is on engaging in argument and decision-making about designs. [relates to NSTA E2 standard] Scored as 2 for engineering design process	Example of stage 2: (from data) “Our goal was to get water from a lower height to a higher height without using any electricity…we started by trying to use wind power but that didn’t work very well (when we tested it). We scrapped that design and started over to make an Archimedes screw. That worked better-we were able to get water from a lower height to a higher height (when we made that change).”
Techbridge girls will be able *to analyze data from tests to determine similarities and differences among design solutions.* Focus is on data based decisions **and some beginning reasoning about why designs “worked” or “didn’t work.”** [relates to NSTA E3 standard] Scored as 3 for engineering design process	Example of stage 3: (from data) “first when we tried (our design) the **tubes were not tall enough to reach the bucket**- we had a chance to redesign and we changed the height and it was able to put a little bit of water into the higher bucket.”
Techbridge girls will be *able to develop a model to generate data for iterative testing and modifications.* Focus is on development of next iteration, or definitive plan for reiteration **that addresses the previous design’s shortcomings**. It may or may not include a redesign. [relates to NSTA E4 standard] Scored as 4 for engineering design process	Example of stage 4: (from data) “I didn’t get a chance to redesign my toy. I thought I would be able to make the wires stay like this (shows with her hand how she would wind the wires around the headband) but they weren’t as flexible as I thought they were. **If I had the chance to redesign, I would solder the wires over here (indicates how she would connect the wires with her gestures) so that they would be out of the way.** *Ends with a description of what soldering is.*

Part 2: Teamwork		
Use of language that shows group membership and cooperative ownership (we, us, our project)	**Scoring** **(marked as present or absent, 0 or 1)** 0 points = all talk is first person, no indication of group membership, group process, or group engagement **1 point=** some evidence of group process, group effort, or group engagement.	**0 points (hypothetical)=** "I chose to make a fan. I used X Y and Z parts. It didn't move the water at first, but then I redesigned it and it was able to do what it was supposed to do." **1 point= "**We got together and shared all of our ideas then we picked one of them. Then we worked together on that idea."
Teamwork on design projects: Description of different roles within a group and concrete ways individuals could contribute to the project.	**0 points no sense of group work or roles for multiple team members** **1 point= vague responses regarding roles and leadership. No sense that the girls acknowledged leadership, or that girls developed a pattern for working together cohesively.** **2 points= interviewee describes specific ways different members of the team took on leadership roles and contributed to project work.**	0 points (hypothetical response)= "My group didn't like my idea and didn't want to help me so I did it on my own." 1 point: (from data) "Our team worked really well together- we were all the leader at some point." 2 points: (hypothetical response, compilation of responses from multiple videos) "It was hard at first because we really didn't know each other, but we got used to it. We all were leaders in our own way. We got together and shared all of our ideas then we picked one of them. Then we worked together on that idea and made one amazing project. I was best at soldering, so I led that part, but Mona was good at keeping us going when we started to goof off. "

Part 3: Engineering Habits of Mind		
Techbridge girls communicate investment in and connection to their projects, yet do not internalize project setbacks as personal failures. The project's progress does not represent girls' ability/intelligence/skill. [Related to growth mindset] [More implicit, holistic rating over interview with 0---1---2]	**Scoring** 0= No description of external factors that impacted project success, or only evidence that the girl exhibits an internal locus of control regarding project outcomes (e.g., blames her lack of experience, knowledge, intelligence). 1= The responses are mixed; there must be some negative or inconclusive evidence to indicate a 1. 2= Project malfunction is considered as a reason to retest, not as a personal failure. Project elements are assessed objectively. Interviewee may be disappointed in negative outcomes but does not	**Examples** 0 points (hypothetical response) = "I never came up with a good idea for the design. Everything we tried was too weak to work. I'm not very good at civil engineering." 1 point (hypothetical response)= "My group came up with a dumb design at first, but then we reengineered it and it worked a little bit better." 2 points= (response from data) One participant referred to her project's malfunction during the design challenge as "Bad luck for us." She emphasized that the project worked in testing phases. Her response showed a lack of an apologetic stance towards project malfunction.
Techbridge girls exhibit perseverance/resilience with regard to project work. Project life span is ongoing or has the potential to be ongoing (not success or failure as a dichotomous variable). [More implicit, holistic rating over interview with 0---1---2]	**0 points**= Interviewee indicates no redesign, indicates one attempt, or indicates giving up immediately when faced with a challenge in the design. **1 point=** response is mixed, with some negative or inconclusive evidence needed to indicate a 1 **2 points=** Throughout the interview, the girl	0 points (hypothetical response)= "I/We tried to build a tower but it didn't work. It fell over." 1 point= (response from data that shows ambiguity, negative evidence) Participant says her group was "trying to give up but in the end kept working on the design;" "It didn't work, but we tried our best."

Part 3: Engineering Habits of Mind		
	describes her project design as an ongoing process. She refers to its progress in terms of testing, of material or design strength and in terms of current status rather than in dichotomous terms (it worked, it didn't work).	2= (response from data, holistic analysis) Participant describes her project as cyclical, and describes how changes made to the project enhanced the way it performed the described task- moving water from a low height into a bucket at higher height. She had ideas for redesign even following the tech challenge presentations, showing continued interest in the improvement of the project. None of her responses indicate that she was disappointed in the first design.

Part 4: S**BF analysis (Jordan, Hmelo-Silver) research literature base related to engineering design talk This analysis is a beginning code book for research analysis of girls' talk about engineering. Utterances are coded with these labels when appropriate. Coding across projects, individuals, and sites may help us understand engineering expertise as developed in different contexts.**
Engineering language: **Structure** Talk is about materials themselves.
Engineering language: **Behavior** Talk is about how the materials fit or work together.
Engineering language: **Function** Talk is about function of the designed object and how it relates to real-world applicability/ purpose of the design object.