



Techbridge Girls Broad Implementation

Summative Evaluation Findings (2013-2018)

PREPARED FOR
Techbridge Girls

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Ginger Fitzhugh
Carrie Liston
Sarah Armstrong

Education Development Center
43 Foundry Avenue
Waltham, MA 02453

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1 Introduction

and

2 Evaluation Overview



1 Introduction

The mission of Techbridge Girls (TBG) is to help girls discover a passion for science, technology, and math (STEM). 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 Girls was awarded a five-year National Science Foundation (NSF) Advancing Informal STEM Learning (AISL) grant to scale up its afterschool program from Oakland, California to multiple new locations around the United States. The objectives of this broad implementation project were to increase girls' STEM skills and career interests; build communities' STEM capacity and sustainability; enhance STEM career exploration for underrepresented girls and their families; and advance research on the scale-up, sustainability, and impact of the model. Techbridge began operating afterschool programs in the Highline Public Schools, located near Seattle, WA in 2014. In 2015, TBG began operating programs in Washington, DC.

Education Development Center (EDC) conducted the formative and summative evaluation of the project. This summative report presents findings regarding the two expansion sites of Greater Seattle and Washington, DC for the duration of the project (2013-18).¹

2 Evaluation Overview

The following evaluation questions were established regarding TBG's implementation and impact on participating girls and other stakeholders:

Techbridge Girls' Impact on Girls

- 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?
- What is Techbridge Girls' 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?

Techbridge Girls' Impact on Teachers & Schools

- What selection process does Techbridge Girls use to identify schools and teachers within those schools?
- How are teachers trained and supported in the expansion sites?
- To what degree do teachers have a leadership role in their program?
- What is the effect of the program on participating teachers, including their interest, knowledge, and use of strategies to engage girls in STEM; their awareness and promotion of STEM careers; and their awareness and promotion of STEM resources for girls?
- What role do local school districts and/or school administrators have in supporting programs in the expansion sites?

Techbridge Girls' Impact on Girls' Families

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

¹ A few data sources included responses from Oakland as well as from the two expansion sites; these included the role model survey (2016-17 and 2017-18) and student surveys (2017-18).

4. Techbridge Girls' Impact on Role Models

- How are role models recruited, trained, and supported in the expansion sites?
- What is the effect of the program on role models' confidence and effectiveness in conducting outreach with Techbridge Girls participants?

5. Implementation & Fidelity

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

6. Organizational Capacity

- What factors emerged as important during the scale-up effort?
- What unanticipated issues and opportunities emerged that affect Techbridge Girls' expansion? How do they affect the expansion? How does Techbridge Girls address these issues and opportunities?
- What capacity-building activities occurred to enable project sustainability? How does the level of support from Techbridge Girls' central office change over time? How and to what extent do expansion sites develop a plan for sustainability?

The evaluation used mixed methods to investigate the implementation of the TBG expansion and its outcomes. The first year of the project (2013-14) was a planning year. 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 TBG's implementation and impact were collected starting in the second year of the project (2014-15) and each year thereafter from girls, parents or guardians, teachers, school principals, district representatives, role models, and TBG staff. The evaluation team also conducted observations of selected programs, analyzed attendance records, attended planning meetings, and reviewed relevant TBG documents annually. Table 1 (on the following page) shows the data collection instruments and when they were administered. A detailed description of the evaluation methodology and response rates for data instruments can be found in Appendix B.

Table 1. Evaluation Instruments and Administration Timeline

Source	Evaluation Instrument	Administration Date
Girls	Participant Pre/Post Annual Surveys	2014-18 (Years 2-5 of the project) in October (pre) and May-June (post) Year 5: Inspire participants post-survey (December-January and May-June)
	Comparison Student Pre/Post Annual Surveys	2014-18 (Years 2-5) in October-November (pre) and May-June (post)
	Participant Focus Groups	2014-18 (Years 2-5) in April-May
Teachers, Schools, & District	TBG Teacher Survey	2014-18 (Years 2-5) in May-June
	TBG Teacher Interviews	2014-18 (Years 2-5) in April-May
	Principal Interviews	2014-18 (Years 2-5) in April-May
	District Leader Interviews	2014-18 (Years 2-5) in April-May
Parents/Families	Parent Survey	2014-18 (Years 2-5) in March-May
	Parent Interview	2014-15 (Year 2) May 2015
Role Models	Role Model Survey	2014-16 (Years 2-3) May 2016-18, Years 4-5, Ongoing ²
Techbridge Staff	TBG Staff Interview (Central office)	2014-15 (Year 2) August 2015
	TBG Staff Interviews (Expansion Sites)	2014-18 (Years 2-5) in April-July
Other	Dimensions of Success Ratings	2014-17 (Years 2-4) November-December and April-June
	Observed Expansion Site Training	July 2014 and July 2015 (Year 2)
	Observe Teacher Training	August 2014 (Year 2)
	Attend AISL TB Committee Meetings	March-June 2014 (Year 2)
	Attended All Programs Team Meetings	February-June 2016 (Year 3)
	TBG Attendance Records	Annually (Years 2-5)
	Document Review	Annually (Years 1-5)

² Administered by TBG in Years 4-5. Survey also reached Oakland area role models in Years 4 and 5.

This summative report is organized around the guiding evaluation questions. Results from all relevant data sources are presented together for each question. In most cases, data from both Greater Seattle and Washington, DC were aggregated and the results are presented for both sites combined: (1) because the primary purpose of the evaluation was to address the evaluation questions regarding the implementation of the scale-up overall; and/or (2) to preserve the anonymity of respondents.

This summative report is focused on key findings across all four years of implementation at the expansion sites, with a particular focus on data from the past year (2017-18, Year 5). Annual evaluation reports can be referenced for more detailed evaluation findings of each year.

3 Techbridge Girls' Impact on Girls



What recruitment and retention strategies did expansion sites use to reach underrepresented groups?

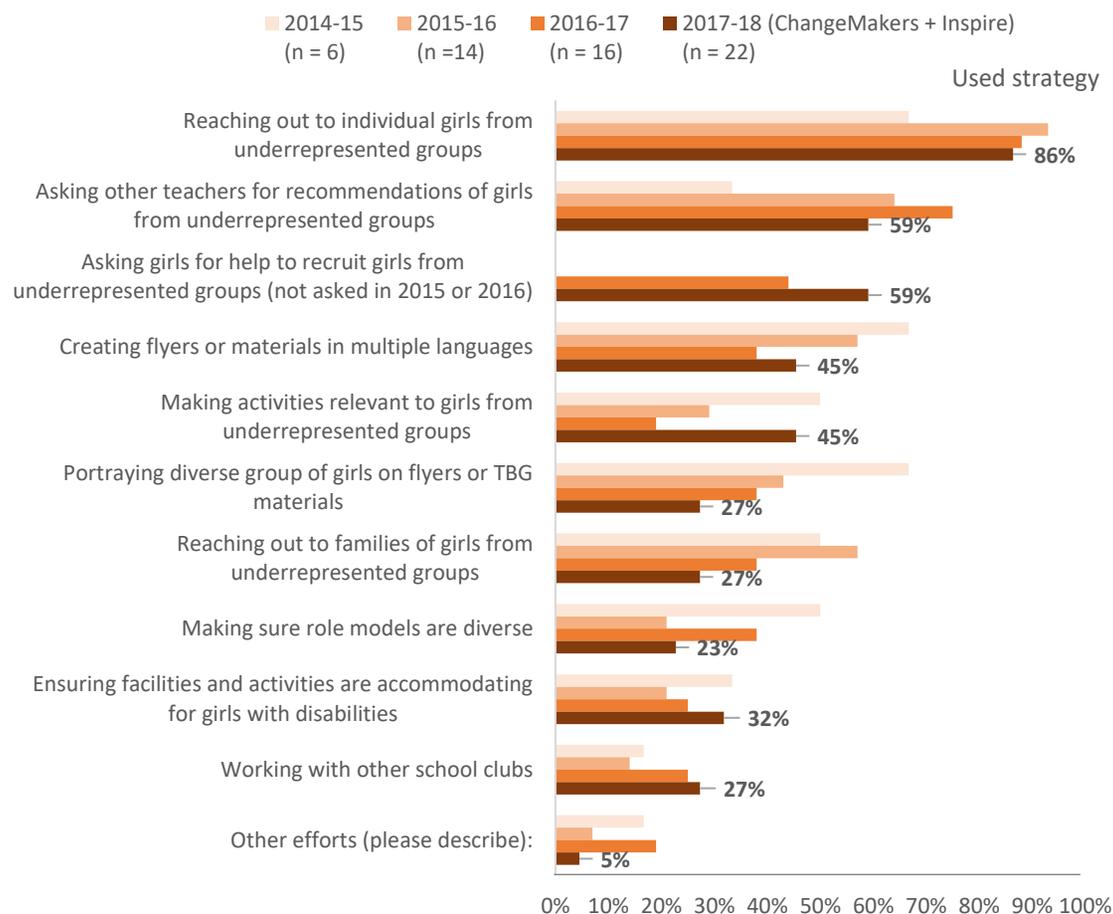


Teachers used a variety of strategies to encourage girls to join Techbridge Girls, with personal invitations (of students or through teachers) being the most popular and effective methods.

TBG teachers used a variety of strategies to recruit and retain girls from underrepresented groups (see Figure 1, which shows how frequently each strategy was used each year, with the values for 2017-18 shown). Although strategies varied somewhat by year, the most frequently used strategy was to reach out to individual girls from underrepresented groups. In most years, the majority of teachers also asked other teachers to recommend girls from underrepresented groups. As TBG became established in specific schools, many teachers asked girls to help recruit their peers by giving presentations or inviting their friends to attend a program. Other TBG teachers said they were most successful in personally recruiting girls from their classes.

Less than one half of the teachers said they used strategies more relevant to retention efforts, such as making activities relevant to girls from underrepresented groups or girls with disabilities, or making sure role models were diverse. This pattern of responses likely reflected the typical role of TBG teachers being highly involved in recruiting participants and not as involved in selecting curriculum or activities, or in recruiting role models.

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



Source: Teacher surveys

Were expansion sites successful in reaching and retaining girls from underrepresented groups?

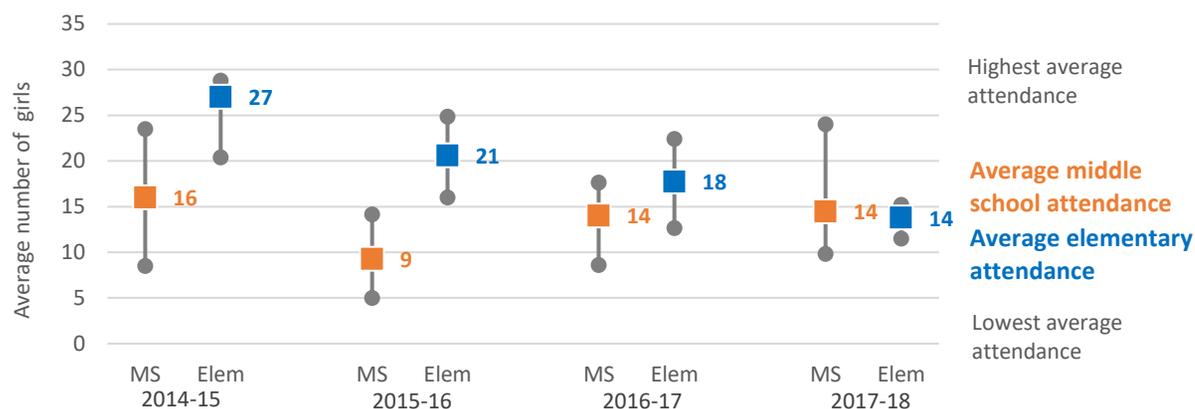


The Techbridge Girls expansion sites successfully enrolled girls from groups who are underrepresented in STEM, including racially diverse students who were from low-income families and would be first generation to college. Attendance at the middle school programs varied from year to year, with programs typically serving an average of 14-16 girls. Elementary school programs often served 20 or more students.

The TBG expansion sites were successful in reaching girls from underrepresented groups, including low-income, racially diverse, and first generation girls. The majority of TBG families in Greater Seattle and Washington, DC qualified for free or reduced lunch (between 56%-79%, depending on the year).³ The expansion programs almost exclusively served girls from racial and ethnic groups who are underrepresented in STEM. Finally, the large majority of TBG participants would be the first in their immediate families to go to college: fewer than 20% of their parents had earned a four-year college degree.

Enrollment at TBG elementary schools tended to be higher and attendance more consistent than at the middle school programs. The typical middle school TBG program served 14-16 girls over the course of a year, while elementary programs often served 20 or more students (especially during the first two years of the project; see Figure 2). Both recruiting and retaining students was particularly a challenge at middle schools. Girls stopped coming to TBG for a variety of reasons, including the start of after-school sports part-way through the year, or parents needing the TBG girls to take care of their younger siblings.

Figure 2. Average attendance varied from year to year. The typical middle school Techbridge Girls program served 14-16 girls over the course of a year, while the typical elementary program served 14-27 girls.



Source: Techbridge Girls attendance records

Table 2. What factors affected student attendance and retention in Techbridge Girls?

Factors that increased attendance/retention	Factors that decreased attendance/retention
Consistent, individual reminders and follow-up	Other after-school activities (including sports)
A positive relationship with the TBG teacher	Being a year-long program (for middle school)
Family support	Other competing responsibilities
Keeping a waitlist to fill spots as they became available	Decreasing student interest

Source: Teacher surveys and interviews

³ The TBG Parent Packet, which parents/guardians complete as part of enrolling their child in TBG, asked parents/guardians to

report their income level. Techbridge Girls provided EDC with parent packet data for 2014-15, 2015-16, and 2016-17.

What did Techbridge Girls participants think of the program?



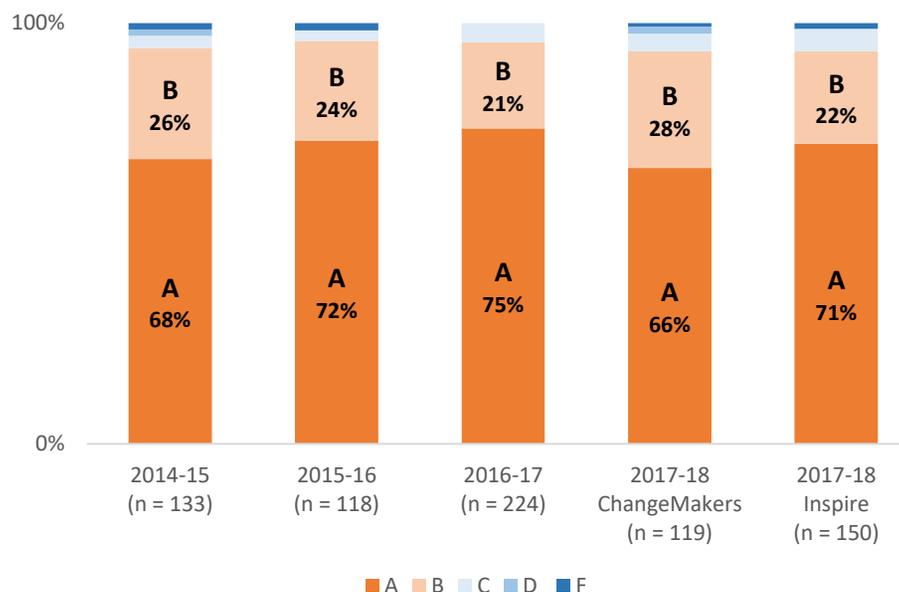
TBG girls consistently gave the program high marks. Techbridge provided a safe space where girls felt comfortable, supported, and appropriately challenged in STEM.

TBG participants were asked to grade the program on a five-point scale from A to F (in 2017-18 the scale was changed to five-point “smiley face” scale). The vast majority of TBG participants gave the program an A or B (93-96%, depending on the year), with at least two thirds of them giving TBG an A (see Figure 3). Respondents explained that they rated the program highly because they found it fun; had the opportunity to learn about STEM and STEM careers; and did hands-on projects. Several students said that the program was specifically empowering to them as girls.

Girls were also asked to explain what they liked most about TBG. The most frequently cited response—given by about half the girls—was 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 were also interested in STEM. Several girls said TBG gave them the opportunity to do what scientists and engineers do, including learning how to use technical equipment like soldering guns.

Girls who gave TBG a grade of “B” or lower most commonly said they found some of the activities boring or repetitive, wanted more time to complete their projects, or wanted to have more choice in the activities.

Figure 3. The majority of girls gave Techbridge a grade of “A.”



Source: Student Post Surveys

“Techbridge is a very useful program for girls, especially around this age when they are discovering new careers and what career they want to pursue. It lets girls explore many different things, going on field trips, and speaking to so many role models. It also teaches girls to work better together with groups. The activities are also very interactive and fun.”

Techbridge Girls Participant

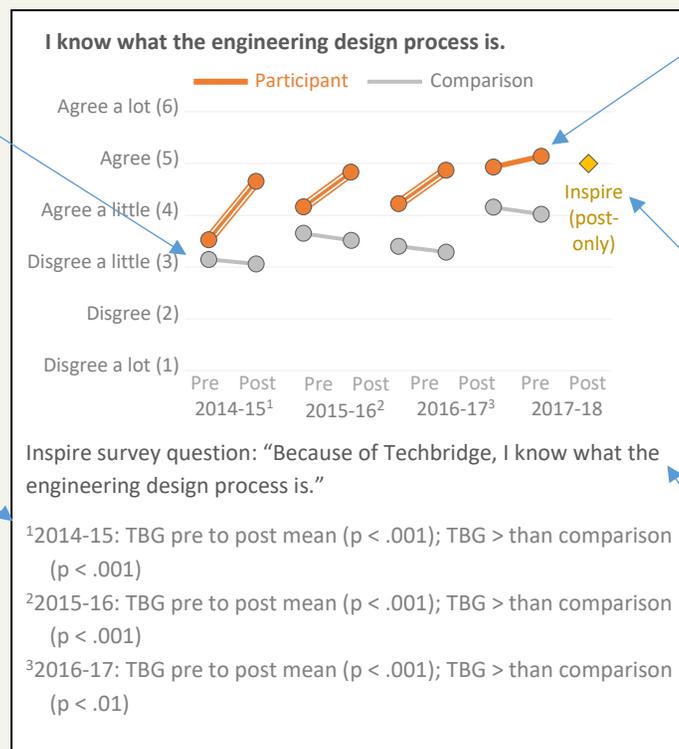
How to Interpret the Figures with Student Survey Results

Students were asked to indicate how much they agreed with each survey statement on a six-point scale from “Disagree a lot (1)” to “Agree a lot (6).” TBG girls’ and comparison students’ mean change scores on each survey question were compared to determine whether TBG girls had better outcomes than comparison students.

The gray dots show the mean pre-survey and post-survey scores for comparison students (who did not participate in the program) for each year data were collected.

Footnotes indicate any statistically significant differences in mean scores. Three types of statistically significant differences are shown: (1) differences between pre to post means for TBG participants and (2) for comparison students, and (3) any differences between TBG vs. comparison students. P values are interpreted as follows:

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



The orange dots show the mean pre-survey and post-survey scores for TBG girls for each year data were collected. Means are on a 6-point scale of agreement. The 2017-18 scores show the pre- and post-survey means for ChangeMaker girls. Double lines indicate the pre and post means were statistically different. Appendix C shows the mean values for each question.

The yellow diamond shows the mean post-only survey score for girls who participated in the twelve-week Inspire program in 2017-18. Unlike the ChangeMakers surveys, the Inspire survey was administered only once at the conclusion of the program.

The Inspire post-only survey questions asked girls to self-assess the impact that TBG had had on them. Not all the ChangeMakers survey questions were asked of Inspire girls.

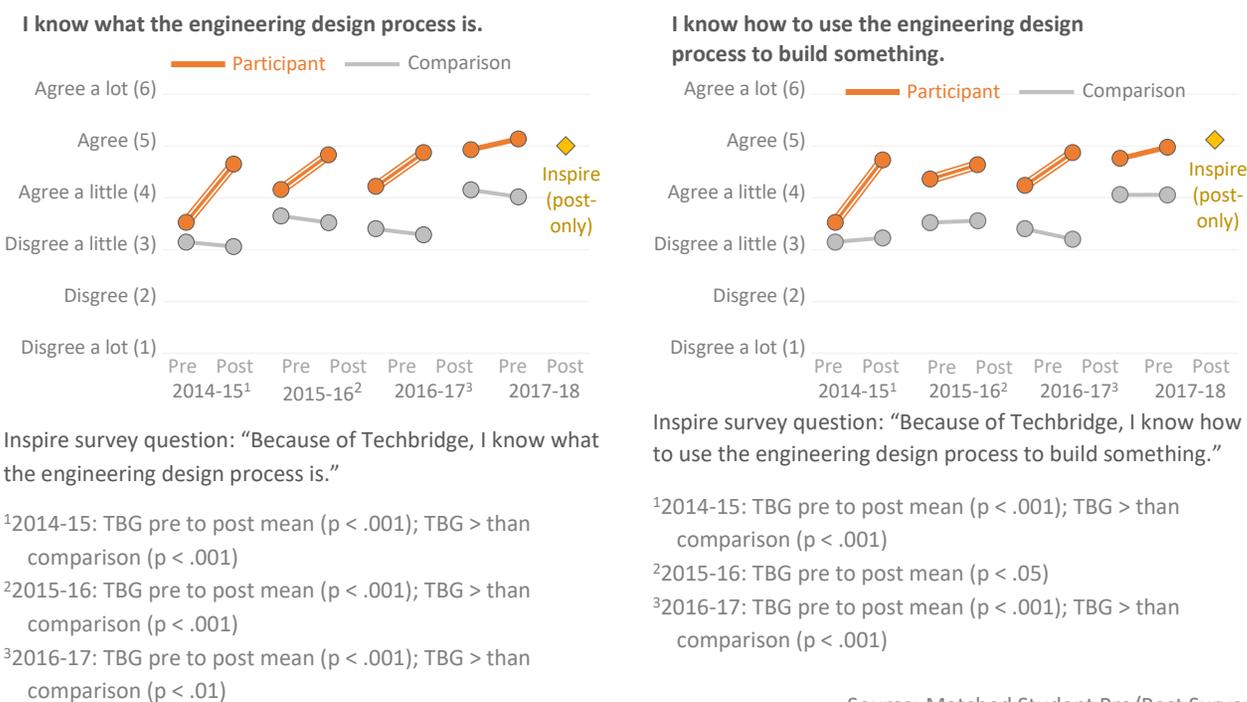
What was Techbridge Girls' impact on participating girls at the expansion sites?



Techbridge Girls helped girls understand processes and practices commonly used in science, engineering and technology and the ability to use these practices (e.g., the engineering design process).

Of the various outcomes addressed by the evaluation, TBG appeared to have the greatest impact on girls' understanding of and ability to use STEM practices. In most years of the program, the percentage of TBG girls who reported understanding what the engineering design process is and how to use it increased significantly from fall to spring (see Figure 4 for the results for each survey question). The greatest increases occurred during the first year of the program when all of the participants were new to TBG, but the increases were statistically significant each of the first three years of the program. Additionally, participants had greater gains in knowledge than comparison students. In 2014-15, for example, the percentage of TBG 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 ($p < .001$). Similarly, the percentage of TBG girls who agreed they know how to use the engineering design process to build something increased in 2014-15, from 50% to 86% ($p < .001$). 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 2014-15. The results from the 2015-16 and 2016-17 were similar.

Figure 4. More TBG participants understood STEM practices after participating in the program. (continued on the following page)





Understanding of STEM practices (continued)

In focus groups, girls were able to describe the steps of the engineering design process consistently and clearly, including that it is an iterative process.

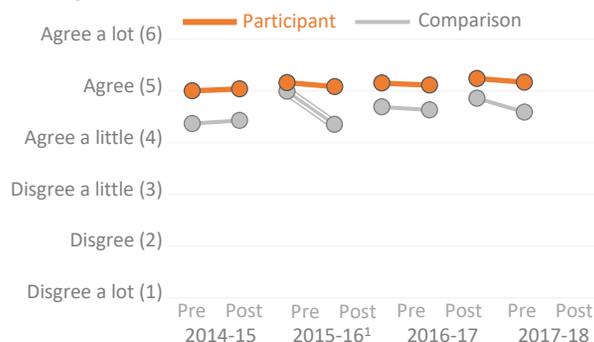
Teachers also said that TBG had a particularly large impact on girls' understanding of the engineering design process. Each year of the project, 80% or more of the teachers said the majority of their girls increased their ability to use the engineering design process to a "large" or a "very large" extent.

"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?' Now 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.'"

Techbridge Girls teacher

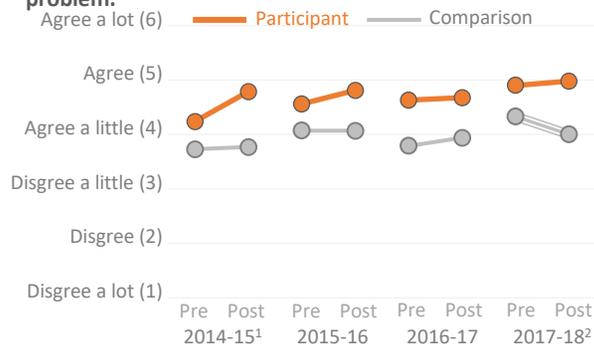
Figure 4 (continued). More TBG participants understood STEM practices after participating in the program.

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



¹2015-16: Comparison pre to post mean ($p < .01$); TBG > than comparison ($p < .05$)

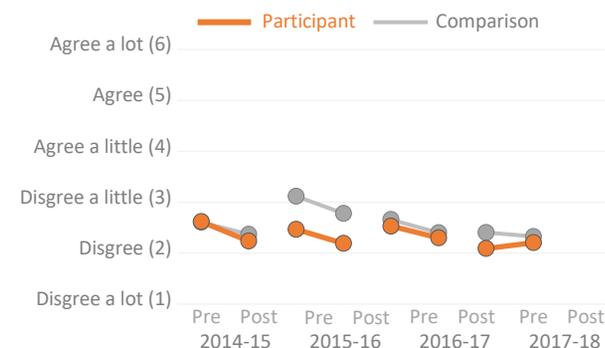
I know how to compare different designs to figure out what is the best way to solve a problem.



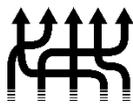
¹2014-15: TBG > than comparison ($p < .05$)

²2017-18: Comparison pre to post mean ($p < .05$); TBG > than comparison ($p < .05$)

Engineers design things perfectly the first time.



Source: Matched Student Pre/Post Surveys



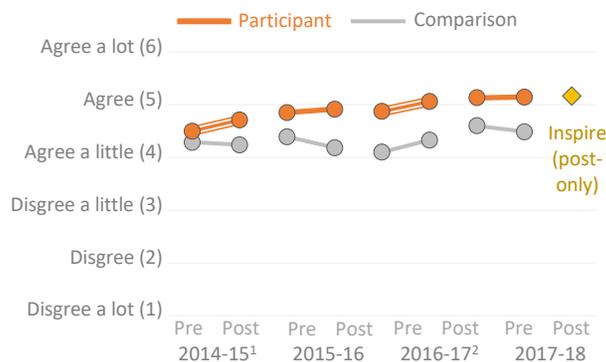
Techbridge Girls helped girls understand various career options in STEM—especially in engineering and technology—and begin to learn about the pathways toward these careers.

Girls broadened their understanding of STEM careers, especially in the fields of engineering and technology (see Figure 5). After participating in TBG, girls were significantly more likely to agree that they know what engineers do in two of the four years data were collected ($p < .05$ in 2014-15 and $p < .05$ in 2016-17). TBG participants were significantly more likely to agree that they know what technology workers do in three of the four years data were collected ($p < .01$ in 2014-15, $p < .05$ in 2015-16, and $p < .05$ in 2016-17). TBG participants' self-reported knowledge of what scientists do increased slightly in some years, but not to a significant degree. Comparison students' self-reported knowledge of what STEM workers did not change significantly in any year.

Students were also asked whether they thought knowing STEM would give them career choices. The vast majority of TBG girls already agreed at the beginning of the year that knowing technology, engineering, and science would give them many career choices. Because TBG participants' attitudes about STEM careers were already so positive at the beginning of the year, there was little room for improvement after participation in the program.

Figure 5. TBG participants increased their understanding of what people who work in STEM do.

I know what engineers do.

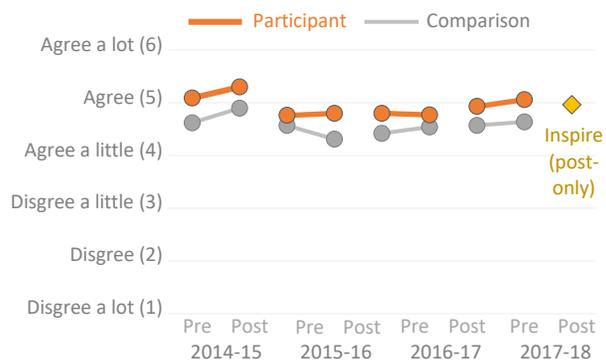


Inspire survey question: “Because of Techbridge, I know more about what engineers do.”

¹2014-15: TBG pre to post mean ($p < .05$)

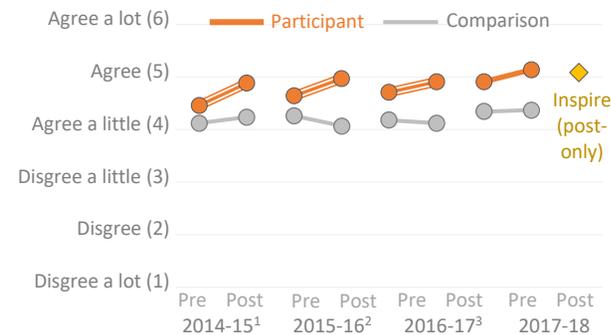
²2016-17: TBG pre to post mean ($p < .05$)

I know what scientists do.



Inspire survey question: “Because of Techbridge, I know more about what scientists do.”

I know what people who work in technology do.



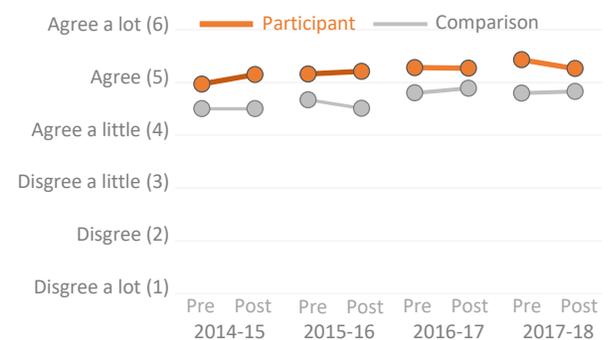
Inspire survey question: “Because of Techbridge, I know more about what people who work in technology do.”

¹2014-15: TBG pre to post mean ($p < .01$)

²2015-16: TBG pre to post mean ($p < .05$)

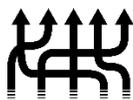
³2016-17: TBG pre to post mean ($p < .05$)

Knowing science, engineering and technology will give me many career choices.*



*The 2014-15 and 2015-16 student surveys asked about each STEM topic individually. Results are shown for “Knowing engineering will give me many career choices.”

Source: Matched Student Pre/Post Surveys



Understand STEM career options (continued)

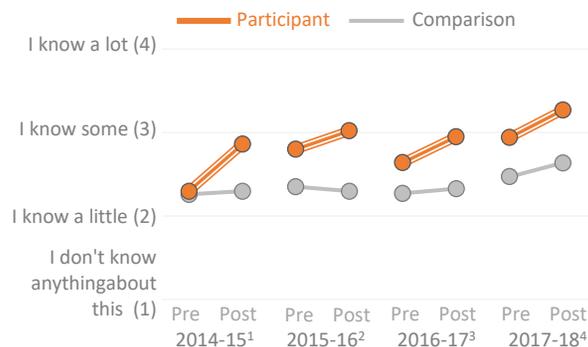
The pre- and post-surveys also asked TBG girls and comparison students three questions about how much they knew about STEM careers and STEM career pathways (see Figure 6). Questions had four possible answer choices: “I don’t know anything about this,” “I know a little,” “I know some,” or “I know a lot.”

Each year of the project, more TBG girls said they knew something about each question topic on the post-survey. TBG participants made particularly strong gains in their knowledge of the types of things that people with STEM careers do, showing statistically significant increases in each of the four years data were collected, as well as greater gains than comparison students in one year (2014-15; $p < .001$). By the end of each year, at least 64% of girls said they knew “some” or “a lot” about the types of things people with STEM careers do in their jobs. In 2017-18, TBG girls made greater gains than comparison students in their self-reported knowledge of classes you need to take to have a career in STEM ($p < .05$). In 2017-18, the percentage of TBG students who said they know “some” or “a lot” about the type of things that people with STEM careers do increased from 72% to 92% ($p < .001$).

The role model visits and field trips were particularly powerful ways for helping girls learn about STEM careers and educational pathways.

Figure 6. TBG participants knew more about STEM careers and career pathways.

The types of things that people with careers in science, engineering, or tech do in their jobs.



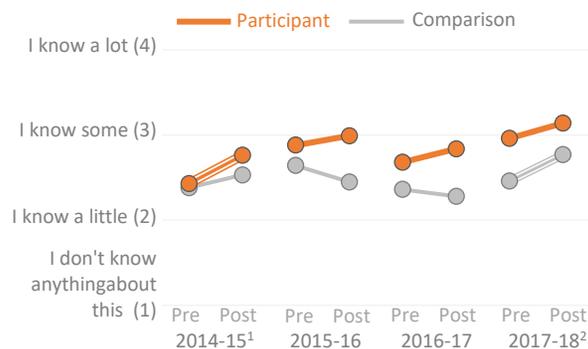
¹2014-15: TBG pre to post mean ($p < .001$); TBG > than comparison ($p < .001$)

²2015-16: TBG pre to post mean ($p < .01$)

³2016-17: TBG pre to post mean ($p < .001$)

⁴2017-18: TBG pre to post mean ($p < .001$)

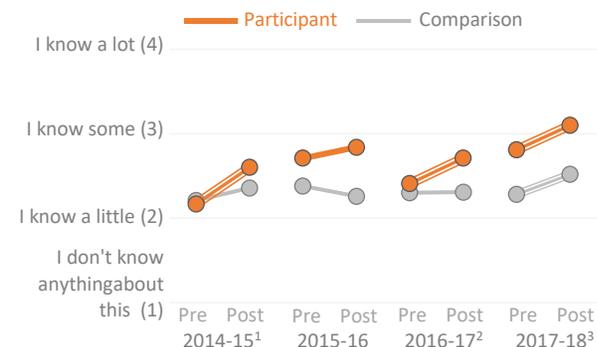
How to find information about careers in science, engineering, or technology.



¹2014-15: TBG pre to post mean ($p < .001$)

²2017-18: Comparison pre to post mean ($p < .05$)

The kind of classes you need to take to have a career in science, engineering, or tech.



¹2014-15: TBG pre to post mean ($p < .001$); TBG > than comparison ($p < .05$)

²2016-17: TBG pre to post mean ($p < .01$)

³2017-18: TBG pre to post mean ($p < .05$); Comparison pre to post mean ($p < .05$)

Source: Matched Student Pre/Post Surveys



Techbridge Girls’ helped participants develop a growth mindset. Following participation in the program, girls more somewhat more likely to understand that intelligence is malleable, and that hard work and perseverance are important behaviors to cultivate.

TBG participants, teachers, and parents reported that the program helped girls become better problem-solvers and to persevere in the face of obstacles. TBG participants were slightly more likely than comparison students to ascribe to statements suggesting they have a growth mindset. In particular, in three of the four years data were collected, participants were significantly less likely to agree with the statement “I can’t change how smart I am” after participating in TBG ($p < .01$ in 2014-15, $p < .05$ in 2015-16, and $p < .001$ in 2016-17; see Figure 7).

TBG’s emphasis on the engineering design cycle provided many opportunities for girls to problem-solve, struggle, and not give up. TBG staff and teachers gently encouraged girls to be patient and persist if they felt frustrated while working on an engineering design challenge.

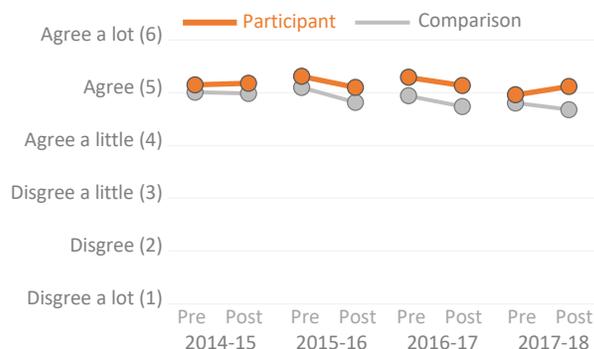
TBG provided a safe space for girls to experiment, fail, and learn from failure. A number of participants said Techbridge helped them learn problem-solving strategies, as well as the value of persistence.

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

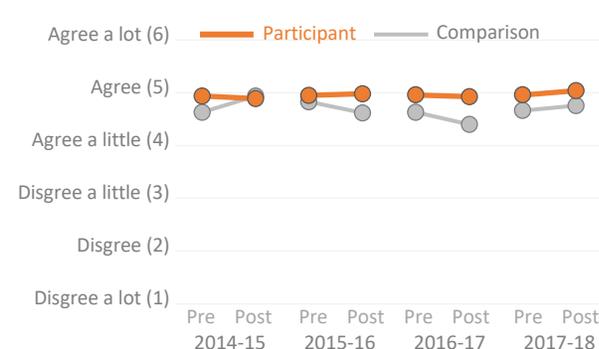
Techbridge Girls participant

Figure 7. Girls were somewhat more likely to have a growth mindset after participating in TBG.

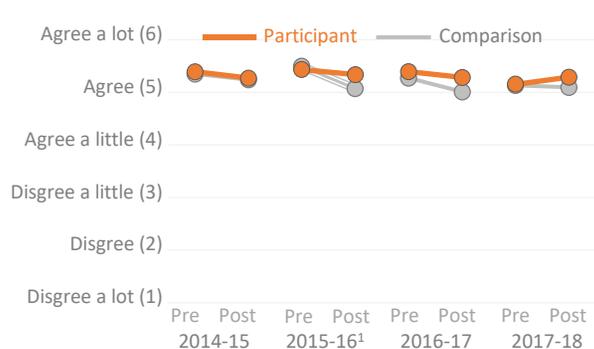
I like doing work that I’ll learn from even if I make a lot of mistakes.



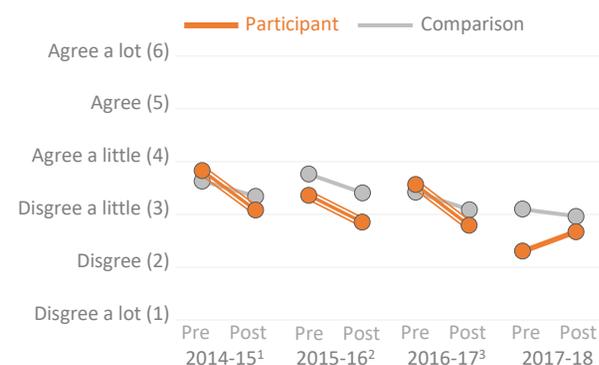
I think I learn more when a task is challenging.



I learn more when I make mistakes.



I can’t change how smart I am.



¹2015-16: TBG pre to post mean ($p < .01$)

¹2014-15: TBG pre to post mean ($p < .01$)

²2015-16: TBG pre to post mean ($p < .05$)

³2016-17: TBG pre to post mean ($p < .001$)

Source: Matched Student Pre/Post Survey



Techbridge Girls nurtured participants' sense of belonging in STEM.

TBG helped some girls feel that they could succeed in a STEM career. Many girls said they felt a sense of belonging in TBG, and that TBG facilitators created an inclusive environment where they felt nurtured and supported. The girls also consistently described TBG as being fun. Being able to engage in STEM in a comfortable and enjoyable environment can contribute to a higher sense of belonging in these fields. As one girl explained, “We are able to thrive.”

Role models and field trips introduced girls to real people who also helped make STEM careers seem more accessible.

Girls were somewhat more likely to say that someone like them could work in engineering or technology after they had participated in TBG, and somewhat more likely to do so than comparison students, although none of these increases was statistically significant (see Figure 8). The percentage of TBG girls who agreed that someone like them could become an engineer increased from 78% to 84% in 2014-15, and from 82% to 88% in 2015-16.⁴ In 2016-17, the percentage of TBG girls who agreed that someone like them could work in STEM increased slightly from 89% to 90%. In 2017-18, although the total percentage of TBG girls who agreed that someone like them could become a scientist, engineer, or work in computing declined from 93% on the pre-survey to 88% post-survey, the percentage

of girls who agreed “a lot” increased from 42% to 53%.

In contrast, comparison students were less likely to say that someone like them could become a scientist, engineer, or work in computing at the end of the year in three of the four years data were collected.

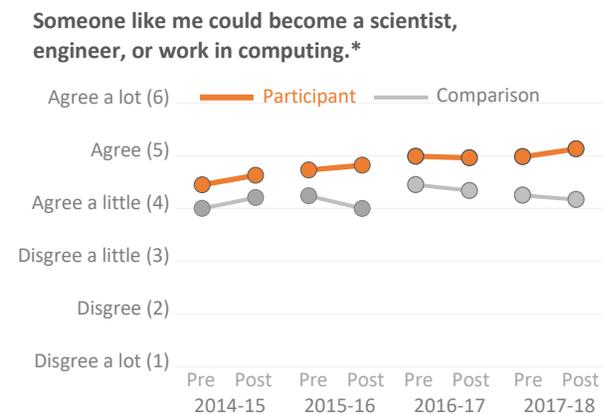
Teachers reported that girls had more confidence in STEM as a result of TBG. Each year of the project, at least 8 out of 10 teachers indicated that the majority of their girls became more confident about their STEM abilities to a “large” or “very large” extent.

“I have been way happier since I have joined Techbridge. I have seen a clearer path in STEM for me in the future. Techbridge has helped me see a little deeper into the world of STEM.”

Techbridge Girls participant

question that asked girls whether they agreed someone like them could become a scientist, engineer or work in computing.

Figure 8. After participating in TBG, participants were somewhat more likely to say they could work in STEM.



*The 2014-15 and 2015-16 student surveys asked about each STEM topic individually. Results are shown for “Someone like me could become an engineer.”

No statistically significant differences in pre- to post-survey means or between participants and comparison students

Source: Matched Student Pre/Post Surveys

⁴ Beginning in 2016-17, three survey questions that asked separately about each STEM field were combined into a single



Techbridge Girls helped girls understand gender inequities in STEM.

The student surveys did not specifically ask students about their understanding of gender inequities in STEM. However, the pre- and post-surveys asked respondents to indicate their agreement with the statement that “engineering is a good career for women” (in the first two years of data collection) or “working in science, engineering, or computing is a good career for women” (in the last two years of data collection; see Figure 9). The vast majority of girls (90% or more) already agreed with this statement at the beginning of the program, leaving little room for growth. In spite of that high bar, TBG girls were slightly more likely to view engineering as a good career option for women at the end of each year. In the final year of data collection, every TBG participant agreed at least “a little” that STEM is a good career for women.

Teachers were relatively less likely to report that their program had explicitly talked about gender inequities in STEM (compared to other TBG program elements). Perhaps as a result, teachers were also less likely to indicate that TBG had an influence on girls’ understanding of gender inequalities within STEM compared to other student outcomes. For example, in 2014-15, only one of six teachers said the majority of their girls had more knowledge of gender inequities in STEM or strategies to overcome these gender inequities to a “large” or “very large” extent. In subsequent program years, a larger percentage of teachers reported that girls had a better understanding

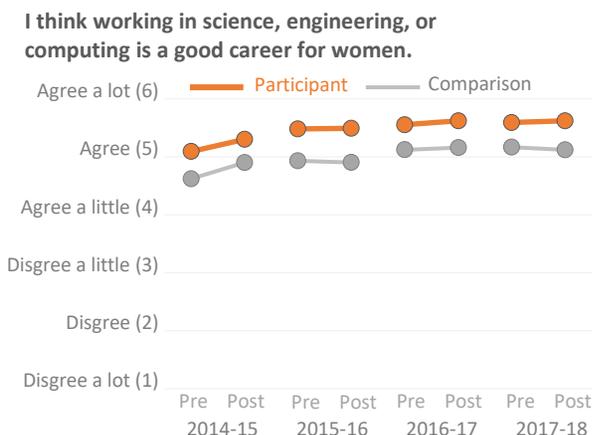
of how to address gender inequities in STEM. In each of the following three years, about two-thirds of teacher respondents agreed said their girls had more knowledge of gender inequities in STEM to a “large” or “very large,” and between half and two thirds of teachers said girls had strategies to overcome them to a “large” or “very large” extent.

Still, many TBG participants said that TBG reinforced the message that “girls can do anything,” including STEM.

“[TBG] inspires girls to do more with their brains and achieve what they want to achieve.”

Techbridge Girls participant

Figure 9. The vast majority of TBG participants (90% or more each year) already agreed that engineering is a good career for women even before participating in TBG.



*The 2014-15 and 2015-16 student surveys asked, “I think engineering is a good career for women.”

No statistically significant differences in pre- to post-survey means or between participants and comparison students

Source: Matched Student Pre/Post Surveys



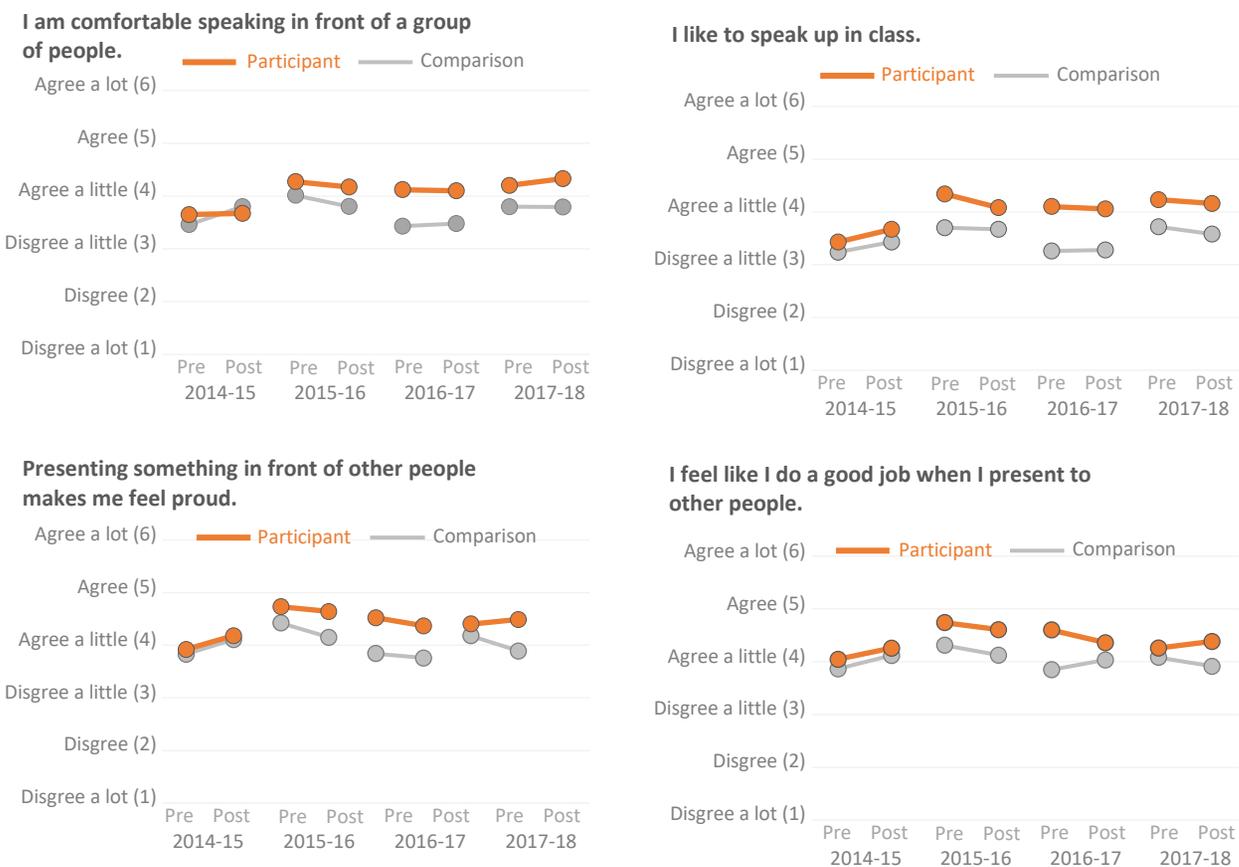
Survey data suggest that Techbridge Girls participants made few to no gains in their public speaking skills and confidence. However, girls, teachers, and parents often noted that TBG girls become more vocal during the program as well as in other settings.

Compared to other program impacts, girls reported that Techbridge had relatively less influence on their speaking skills. While some Techbridge girls reported having more confidence in public speaking situations, others did not make gains in their public speaking skills or confidence.

A retrospective question asked girls whether TBG had helped them become more comfortable speaking in front of a group of people. Of all the outcomes TBG were asked to self-assess the impact TBG had, girls reported the least impact on their confidence in public speaking, though there were still increases. The percentage of TBG participants who agreed that the program helped them become more comfortable with speaking in front of a group increased each year, from a low of 77% in 2014-15 to a high of 87% in 2017-18. However, only about a third of students each year agreed “a lot” that TBG helped them become more comfortable with speaking in front of a group.

Four questions on the pre- and post-surveys asked whether respondents do well in activities involving public speaking (see Figure 10). Results were mixed. For example, the percentage of TBG participants who said they feel comfortable speaking in front of a group increased slightly in two of the four years (although not statistically significantly), but declined slightly in the other two years (although, again, not significantly). Similarly, the percentage of TBG girls who said they feel like they do a good job

Figure 10. Results regarding TBG participants’ confidence in their public speaking skills were mixed.



No statistically significant differences in pre- to post-survey means or between participants and comparison students

Source: Matched Student Pre/Post Surveys



Public speaking skills and confidence (continued)

speaking in front of a group of people increased slightly in two of the four years (although not statistically significantly), but declined in the other two years (not statistically significantly).

Similar to girls, teachers reported lower gains in participants' public speaking confidence and skills compared to other outcomes. Depending on the year, between 44% and 66% of teachers indicated that the majority of their girls were more likely to speak up in a group or to take a leadership role in activities to a "large" or "very large" extent. In interviews, some teachers and principals described examples of specific girls becoming more confident and observing them speak up more in their school classes.

Although students and teachers reported that TBG had a relatively smaller impact on girls speaking abilities compared to other outcomes, the vast majority of parents believed that TBG helped their daughters improve their communication skills. More than 95% of parents agreed their daughter was better able to communicate ideas to other people.

"At the beginning of the year I was kind of shy. I didn't really want to speak up and stuff, and now I'm really loud with my ideas."

Techbridge Girls participant



While pre/post survey results suggest that most Techbridge Girls participants already understood STEM’s relevance prior to participating in the program, other data sources indicate that the field trips and role model visits helped girls gain a greater appreciation of STEM’s importance.

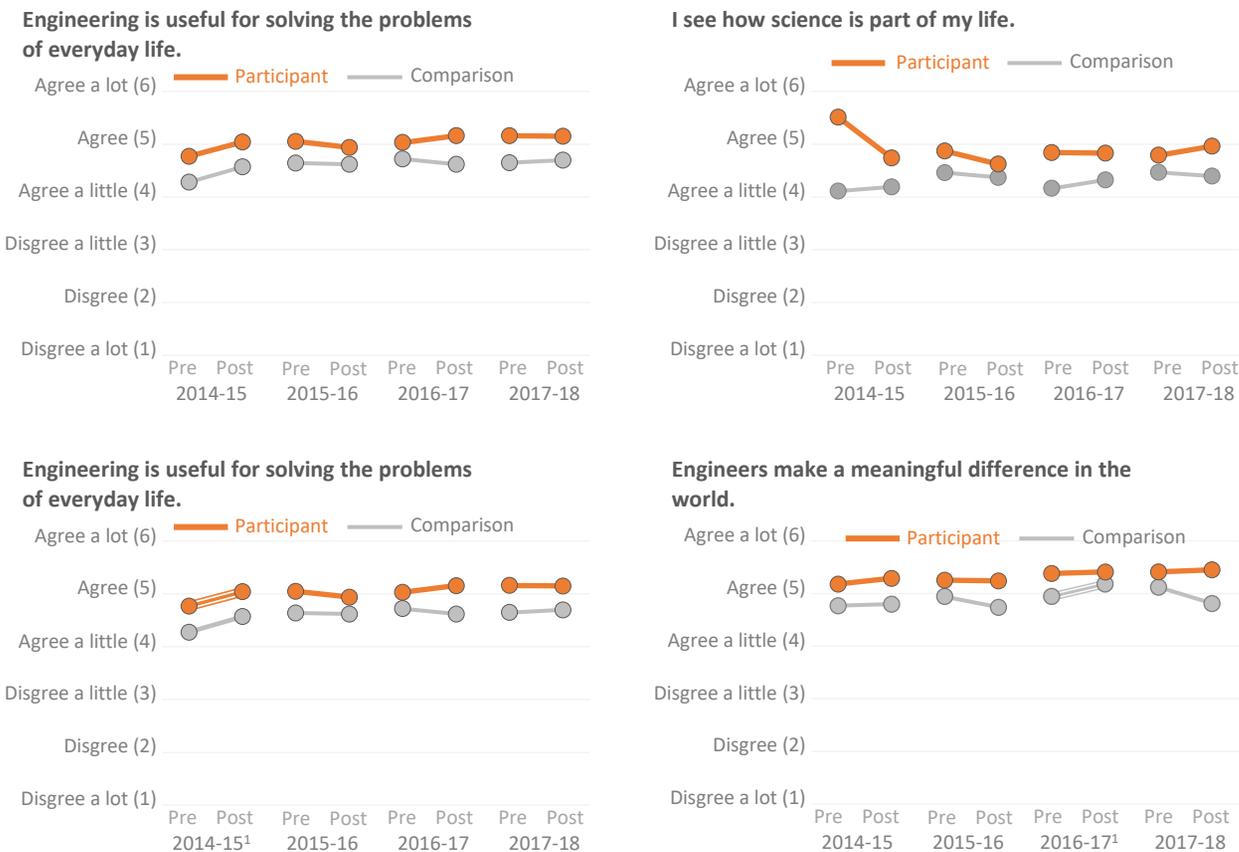
The majority of TBG girls said they already understood STEM’s relevance and importance prior to participating in the program, so there was little room for improvement in ratings (see Figure 11). For example, on the pre-survey, more than 85% of TBG girls each year agreed with the statements “I see how science is part of my life.” Similarly, more than 90% of TBG girls each year agreed that “engineers make a meaningful difference in the world” and “engineering is useful for solving the problems of everyday life.”

Although there was little room for girls’ pre-survey scores regarding STEM’s relevance to improve, other data sources suggest that TBG participants gained a greater appreciation of STEM’s importance through the field trips and role model visits. On a retrospective question on the post-survey, almost all the TBG girls agreed that the field trips and role models helped them understand the importance of STEM (92% in 2014-15, 94% in 2015-16, 96% in 2016-17, and 99% in 2017-18).

“Techbridge showed me how science, engineering, and math are part of our daily life.”

Techbridge Girls participant

Figure 11. Most TBG participants already saw engineering as relevant and useful in everyday life prior to participating in the program, and so there will little room for improvement.



¹2014-15: TBG pre to post mean (p < .05)

²2016-17: Comparison pre to post mean (p < .05)

Source: Matched Student Pre/Post Surveys

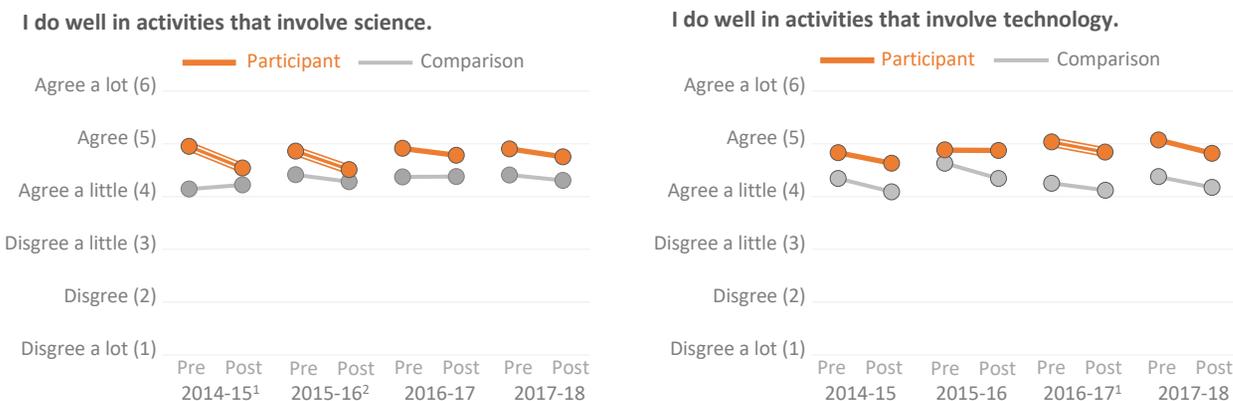


Girls reported on the post survey and in focus groups that Techbridge Girls’ supportive, collaborative environment helped increase their confidence to try new things, including in STEM. However, pre/post survey findings suggest that some girls’ confidence in their STEM abilities did not increase after their participation.

TBG pre- to post-survey ratings showed small declines in girls’ perceived abilities to do well in science and technology activities (see Figure 12). However, girls reported on the post-survey and in focus groups that TBG’s supportive, collaborative environment helped increase their confidence to try new things, including in STEM.

Three retrospective questions on the post-surveys asked TBG girls whether Techbridge impacted their confidence. The majority of girls agreed that Techbridge Girls helped them see they were good at science (88% in 2014-15, 85% in 2015-16, 93% in 2016-17, and 94% in 2017-18) and at engineering (83% in 2014-15, 89% in 2015-16, 92% in 2016-17, and 95% in 2017-18). The vast majority of Techbridge students (92% in 2014-15, 94% in 2015-16, 92% in 2016-17, and 97% in 2017-18) agreed that they were more confident trying new things because of Techbridge.

Figure 12. Both TBG participants’ and comparison students’ self-reported confidence in science and technology declined somewhat from the beginning to the end of the year, with TBG participants’ confidence declining to smaller degree.



¹2014-15: TBG pre to post mean (p < .01); TBG < than comparison (p < .01)
²2015-16: TBG pre to post mean (p < .05)

¹2016-17: TBG pre to post mean (p < .05)

Source: Matched Student Pre/Post Surveys

“I have been in Techbridge for two years and it is cool and fun. It made me realize that science is better, and it makes me proud of who I am.”

Techbridge Girls participant

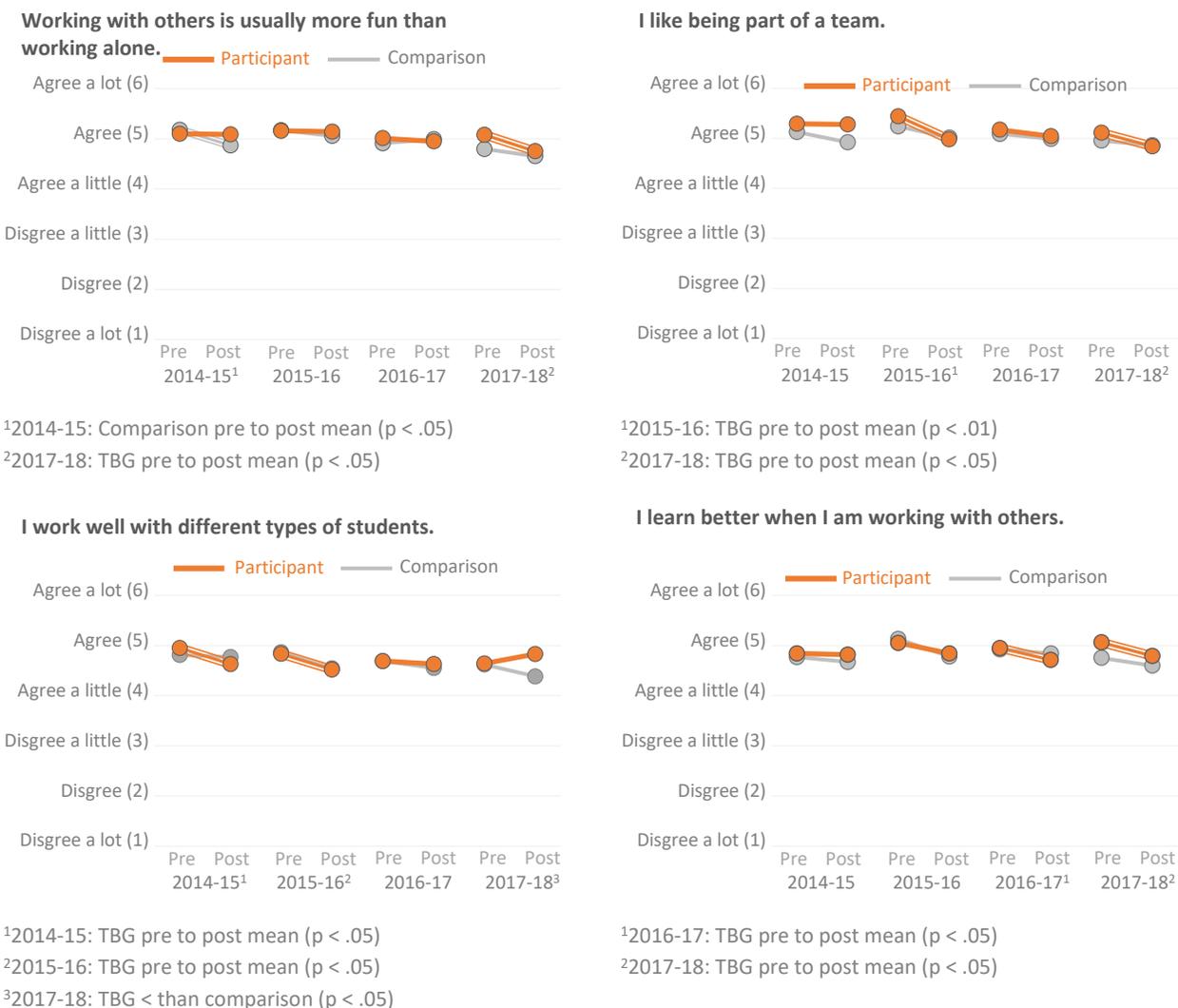


Although pre/post-survey results suggest little change in girls' collaboration skills, many participants said Techbridge Girls helped them become better at working in teams and with partners they did not know.

Pre- and post-survey responses suggest that TBG girls' self-reported attitudes toward teamwork and their teamwork skills were very positive prior to their involvement in TBG and generally remained high at the end of the year. For example, on the pre-survey, the vast majority of TBG girls agreed working with others is usually more fun than working alone (86% or more each year), including approximately half the girls who agreed with this statement "a lot." Furthermore, TBG participants' ratings were very similar to comparison group ratings.

While the pre/post-survey results suggest little change in girls' collaboration skills, many girls said TBG made them better at working in teams and with partners they did not know. When girls were asked about the impact TBG had on their teamwork skills, each year approximately 90% or more said that they had become better at working on a team and that they had learned to work well with girls, whether they liked them or not. In focus groups and in response to open-ended survey questions, many girls said they appreciated that TBG emphasized group work, and for some girls, the collaborative nature of TBG was one of their favorite aspects of the program.

Figure 13. Girls' collaboration skills were already high and changed relatively little following TBG.

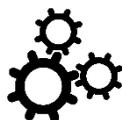


Source: Matched Student Pre/Post Surveys

Teachers were also asked to indicate whether TBG had an impact on participants' teamwork skills. Teachers' assessment of TBG's impact varied by year. While 84% of teachers in 2015-16 said participants had developed teamwork skills to a "large" or "very large" extent because of TBG, only 67% of ChangeMaker teachers in 2017-18 said the majority of their girls had developed teamwork skills to a "large" or "very large" extent because of TBG.

"I've become more social in Techbridge. I always look forward to coming to Techbridge every week, and I've learned how to work in groups with girls who I didn't really know."

Techbridge Girls participant



Techbridge Girls may have had a somewhat protective effect on participants' interest in STEM. While many students lose interest in STEM in middle school, TBG participants were less likely to lose interest in STEM than comparison students.

The majority of TBG participants from the Greater Seattle and Washington, DC programs already had a strong interest in STEM at the beginning of each project year, so there was little room for improvement in their survey scores. While some TBG girls were less interested in STEM at the end of the year, an even larger percentage of non-participating students became less interested in STEM (i.e., comparison students were even more likely to lose interest in STEM). Although the differences between participant and comparison students' survey responses were not statistically significant in most cases, TBG may have had a somewhat protective effect and helped reduce girls' loss of interest in STEM that research shows to be common among students in the age groups served by TBG.⁵

The student pre- and post-surveys had five questions asking participants and comparison students about their interest in STEM-related activities (see Figure 14, which continues onto the following page). At the end of each year, TBG girls were less likely to agree with each of these statements regarding their interest in STEM. In several years, these declines were statistically significant; TBG participants were significantly less likely to agree "a lot" that they like creating things with technology ($p < .05$ in 2015-16), computer programming ($p < .05$ in 2014-15, $p < .05$ in 2016-17), science ($p < .001$ in 2014-15, $p < .001$ in

2015-16), and figuring out how things work ($p < .05$ in 2015-16).

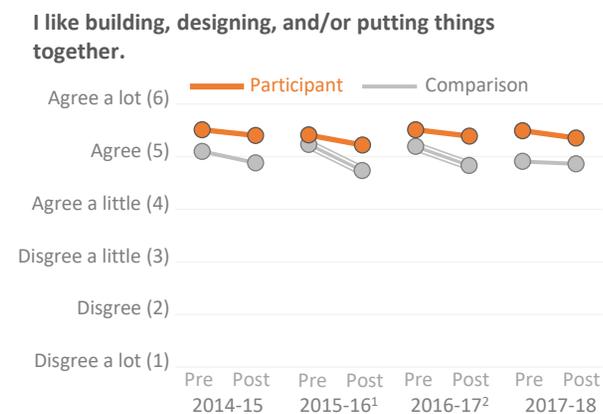
While the strength of some girls' interest in STEM may have waned slightly, the vast majority of TBG girls said they continued to enjoy those activities at the end of the school year. For example, 90% or more TBG participants said they like creating things with technology and building or designing things at least "a little" at the end of each year.

Furthermore, comparison students' interest in each STEM topic also declined from the beginning to the end of the year, and, in most cases, declined more steeply than TBG girls'. For example, in 2016-17, the percentage of comparison students who agreed at least "a little" that they like computer programming declined from 84% at the beginning of the year to 67% at the end of the year. In contrast, 90% of TBG girls agreed at least a little both before and after participating in the program that they liked computer programming.

"[Techbridge Girls] helps me know how fun science and engineering is."

Techbridge Girls participant

Figure 14. TBG participants were less likely to lose interest in engineering and technology than girls who did not participate in the program. (Continued on the following page)



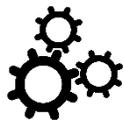
¹2015-16: Comparison pre to post mean ($p < .01$)

²2016-17: Comparison pre to post mean ($p < .05$)

Source: Matched Student Pre/Post Surveys

⁵Archer, L., Dewitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2010). "Doing" science versus "being" a scientist: Examining

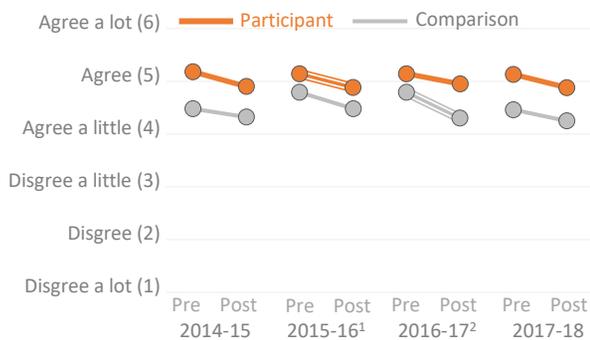
10/11-year-old schoolchildren's constructions of science through the lens of identity. *Science Education*, 94(4), 617-639.



Interest in STEM (continued)

Figure 14 (continued). TBG participants were less likely to lose interest in engineering and technology than girls who did not participate in the program.

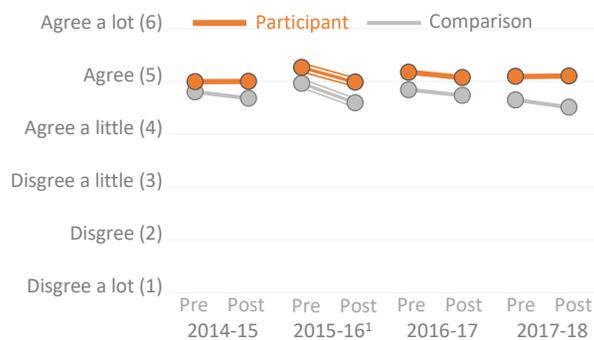
I like creating things with technology (like games or websites).



¹2015-16: TBG pre to post mean ($p < .05$)

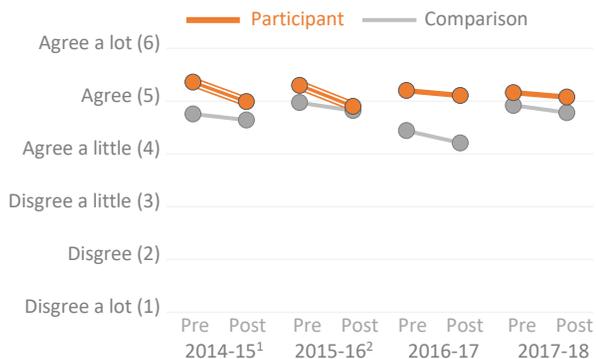
²2016-17: Comparison pre to post mean ($p < .01$)

I like figuring out how things work.



¹2015-16: TBG pre to post mean ($p < .05$); Comparison pre to post mean ($p < .05$)

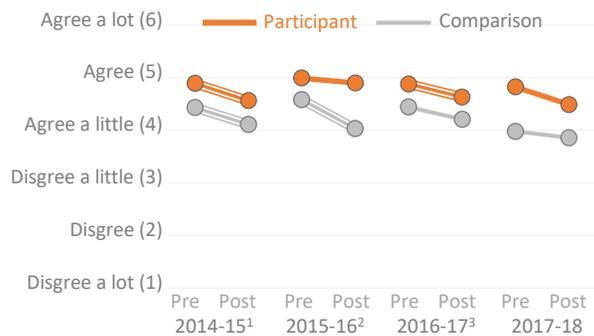
I like science.



¹2014-15: TBG pre to post mean ($p < .001$)

²2015-16: TBG pre to post mean ($p < .001$)

I like computer programming.

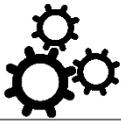


¹2014-15: TBG pre to post mean ($p < .05$); Comparison pre to post mean ($p < .05$)

²2015-16: Comparison pre to post mean ($p < .01$)

³2016-17: TBG pre to post mean ($p < .05$)

Source: Matched Student Pre/Post Surveys



Interest in STEM (continued)

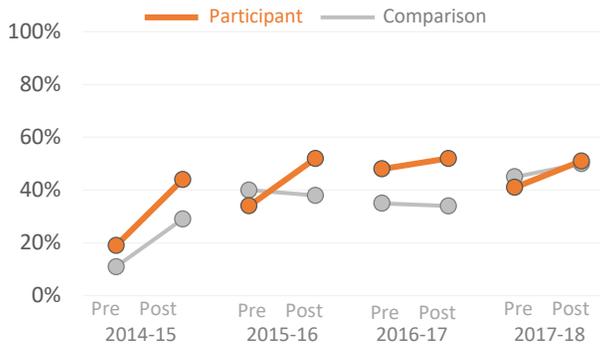
TBG participants were doing more STEM activities at home by the end of each school year than in the fall, and they generally were more likely to engage in STEM activities than comparison students.

Girls were asked to indicate at both the beginning and end of the year whether they had participated in various STEM activities outside of school during the previous school year (see Figure 15). More TBG participants engaged in each STEM activity during the year they participated in TBG than during the previous school year.

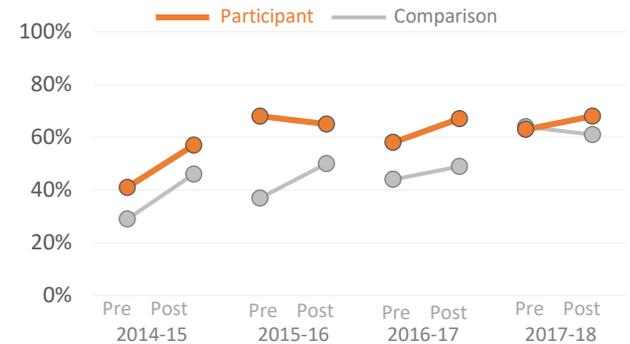
For example, the percentage for girls who said they did engineering activities outside of school following participation in the program increased each year (from 19% to 44% in 2014-15, from 34% to 52% in 2015-16, from 48% to 52% in 2016-17, and from 41% to 51% in 2017-18). In contrast, the percentage of comparison students who reported they did engineering activities either increased to a lesser degree or declined slightly.

Figure 15. More TBG participants reported engaging in various STEM activities by the end of each year.

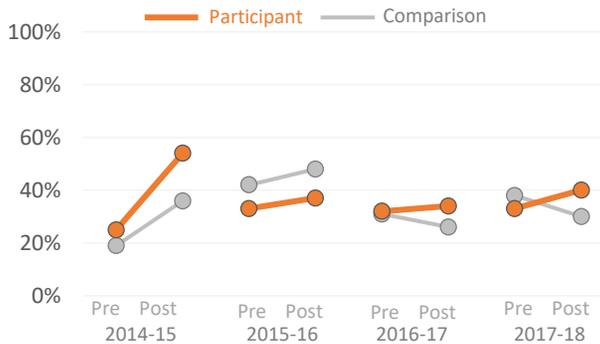
Did engineering activities at home, not for school



Did science experiments at home, not for school



Created something with technology at home, not for school



Source: Matched Student Pre/Post Surveys



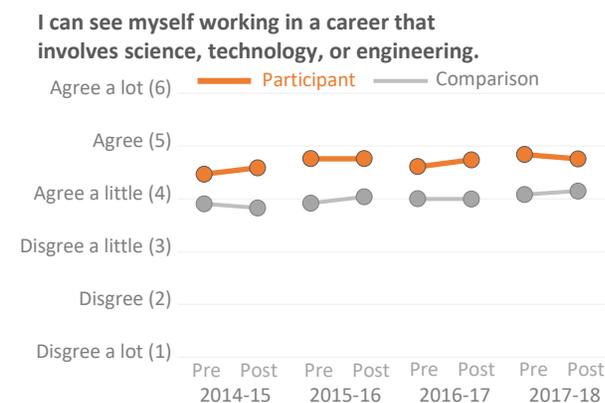
The Techbridge Girls field trips and role model visits piqued many girls’ interest in STEM careers, exposing them to careers they did not know existed and helping them envision themselves doing that work.

One of TBG’s goals is to encourage girls to consider pursuing a career in science, engineering, or technology. In three of the four years of the project, girls were more slightly more likely to agree after participating in TBG that they would like to have a STEM career (increasing from 81% to 84% in 2014-15, from 87% to 89% in 2015-16, and from 82% to 86% in 2016-17; see Figure 16). The exception was in 2017-18, when slightly fewer girls indicated they would like to have a STEM career (decreasing from 88% to 84%). However, none of these increases or the decrease was statistically different.

Another survey question asked respondents to select their top three career choices at the beginning and end of the school year (see Figure 17). In three of four years data were collected, girls who had not previously listed a STEM career in their top three choices were more likely to list a STEM career after participating in TBG than comparison students. In 2014-15, 46% of TBG girls who did not identify STEM among their top three career choices on the pre-survey listed at least one STEM career on the

post-survey. In 2015-16, 70% of the TBG girls who had not listed a STEM career category on the pre-survey listed at least one STEM career on the post-survey. In 2017-18, 40% of TBG girls who did not identify STEM among their top three career choices on the pre-survey listed at least one STEM career on the post-survey. (Many fewer comparison students became interested in STEM careers. Less than one-third of comparison students who did not list a STEM career on the pre-survey listed one on the post-survey each year.)

Figure 16. More TBG participants said they were interested in STEM careers after participating in the program.



No statistically significant differences in pre- to post-survey means or between participants and comparison students

Source: Matched Student Pre/Post Surveys

“Techbridge Girls made me more interested in working in a STEM career.”

Techbridge Girls participant



Interest in STEM careers (continued)

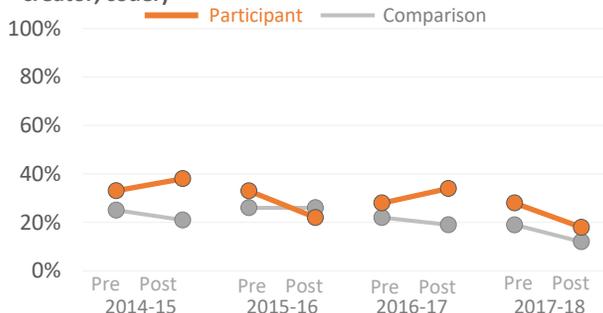
On the surveys and in focus groups, some girls said TBG increased their interest in STEM careers, many of which they had not previously known to exist. The field trips and role model visits piqued many girls' interest in STEM careers, exposing them to careers they did not know existed and helping them envision themselves doing that work. Two retrospective questions on the post-survey asked girls about TBG's impact on their interest in working in STEM. Each year, 90% or more of participants said that TBG helped them think about their career goals, and more than 90% said that the field trips and role models made them more interested in working in STEM.

Many parents reported that their daughters began talking about having a career in STEM after attending TBG. When asked on the parent survey if their daughters talked about STEM careers *before* attending TBG, just over half of the parents each year said "yes." When asked if their daughters talked about a job in STEM *since joining* TBG, 58-79% of parents (depending on the year) reported that the girls now spoke about having a job in STEM.

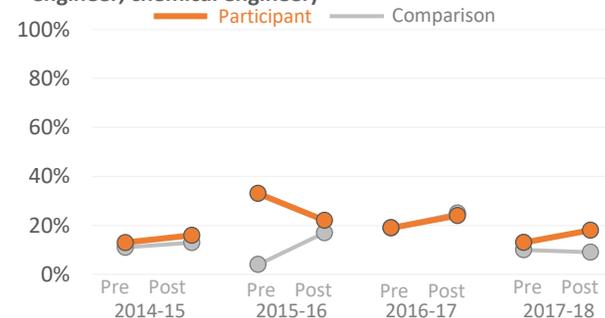
Figure 17. In most years, TBG participants were to indicate that engineering or computer science were amongst their top three career choices after they participated in TBG.

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

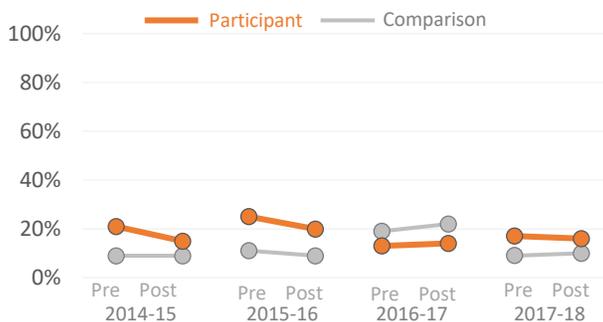
Computer Science (video game designer, app creator, coder)



Engineering (mechanical engineer, civil engineer, chemical engineer)



Science (biologist, scientist, physicist)



Source: Matched Student Pre/Post Surveys

90%

or more of TBG girls each year indicated that TBG helped them think about their career goals and that the field trips and role models made them more interested in working in STEM.



While the majority of Techbridge Girls participants entered the program already with the expectation that they would study STEM in college, some girls who did not already have STEM education aspirations were more likely after participating in the program to say they planned to study science, engineering and/or computer science in college.

TBG appeared to have a small but positive impact on girls' interest in studying STEM in college. Several questions on the pre- and post-surveys assessed students' interest in going to college and in studying STEM. Pre-survey responses show that three-quarters or more of participants were already interested in studying STEM in college. Although many girls entered the program with an inclination to study STEM, in three of the four years data were collected, girls were more likely to say they planned to study engineering after participating in TBG (increasing from 79% to 80% in 2014-15, from 75% to 84% in 2015-16, and from 79% to 84% in 2016-17; see Figure 18). (In 2017-18, 85% of TBG participants said they planned to study science, engineering and/or computer science both before and after participating in TBG.) In contrast, comparison students' reported intentions to study engineering remained essentially unchanged or declined.

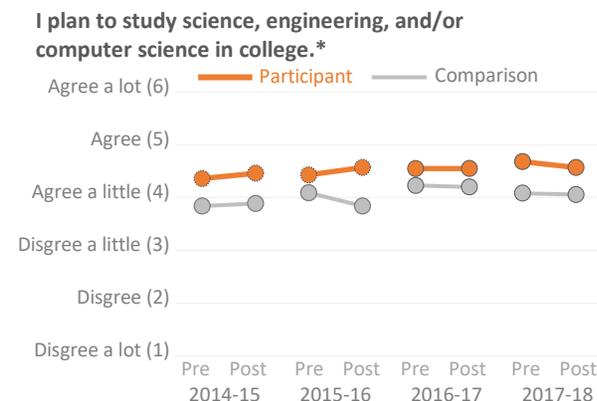
Retrospective questions on the post-survey suggest that TBG had a positive influence on girls' interest in studying STEM in college. The majority of TBG girls said that TBG had specifically increased their interest in studying engineering in college (87% in 2014-15, 92% in 2015-16, 86% in 2016-17, and 93% in 2017-18).

Parents were asked whether TBG had had an impact on their child's STEM aspirations. The vast majority of parents (95% or more each year) said their daughter became more interested in studying STEM in high school and more interested in studying STEM in college after participating in TBG.

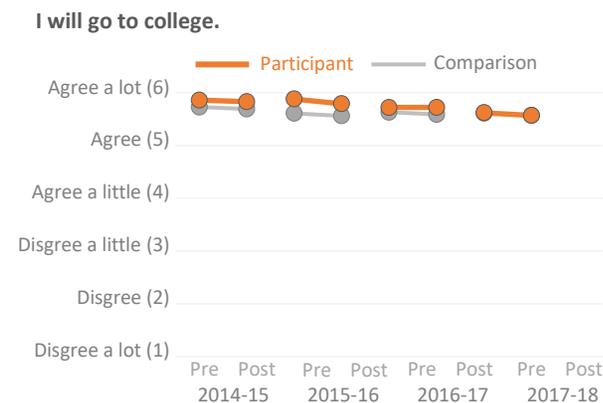
“[Techbridge Girls] showed me that I like chemical engineering so much that I would want to be a chemist when I grow up.”

Techbridge Girls participant

Figure 18. After participating in TBG, a slightly higher percentage of participants intended to study STEM.



*The 2014-15 and 2015-16 student surveys asked about each STEM topic individually. Results are shown for “I plan to study engineering in college.”



No statistically significant differences in pre- to post-survey means or between participants and comparison students

Source: Matched Student Pre/Post Surveys

The new TBG Inspire program for elementary students had positive impacts on participants and most girls enjoyed the program.

Beginning in 2017-18, TBG began implementing a new program model for elementary school students. Called “Inspire,” the elementary program lasted 12 weeks instead of a full program year. Teachers facilitated the program by themselves using materials and curriculum provided by TBG, with coaching from a TBG staff member. Role model visits and field trips were not included.

Because most of the survey questions were different for Inspire participants than they were from either previous years or for middle school ChangeMaker participants in 2017-18, it was not possible to directly compare the results for Inspire with other TBG implementations.

Results from 2017-18 suggest that Inspire had positive impacts on participating girls and that most girls enjoyed the program. A total of 71% of participants gave Inspire the highest possible rating (in the fall/winter version of the survey, the scale used letter grades with “A” being at the top and in the spring, the scale used “smiley faces”). Almost every Inspire participant agreed that their teacher made sure they had fun during the program. In response to an open-ended question asking participants what they liked most about TBG, Inspire participants most frequently mentioned doing hands-on projects and working with other girls (see Table 3). When asked what they would change about the program, about one-quarter of girls said they wouldn’t change anything. Girls’ most common suggestion was the length, with one out of five respondents mentioning they would like longer sessions or more sessions.

Table 3. Selected responses from Inspire participants to the open-ended question, “What did you like MOST about Techbridge? Why?”

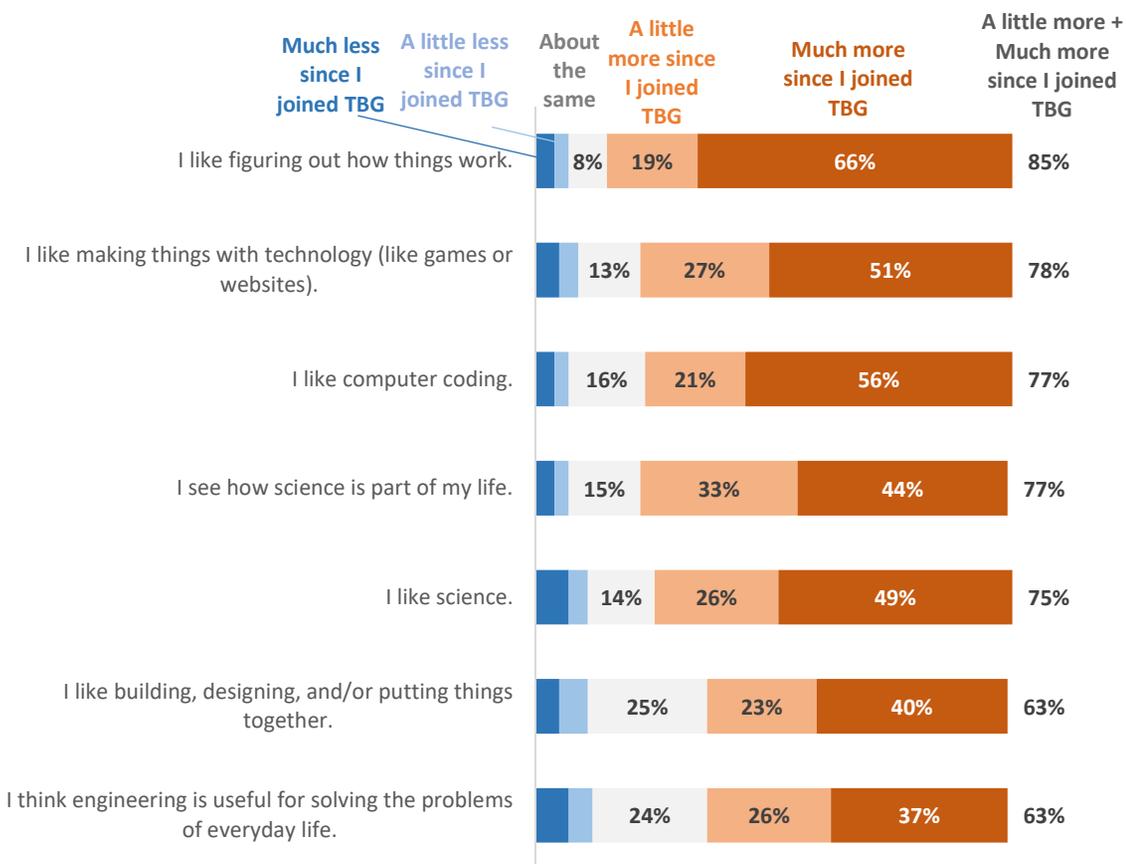
Theme (coded)	Percent (Number) of Respondents	Examples of Responses
 <small>Created by Stephen Borengasser from Noun Project</small> Hands-on projects	36% (56)	“The projects and the learning about new things.” “That we do a lot of interesting stuff during this program and that it shows that girls can do anything if they try and that not everything is for boys.” “The science and experiments.”
 Social aspects of the program	31% (48)	“What I liked most about Techbridge is that you get the choice of who you get to work with and that you get a chance to meet new people.” “How I can interact with the people I don’t know a lot about. But in the end of the day I get to know them and I get to see their point of view in some things.” “I like Techbridge because...it also helps you be with a group with girls where you have fun and work at the same time.”
 Learning new things, including STEM	14% (22)	“Learn about more different things in science and engineering and enjoy what I do. I also enjoy how I can contribute with other girls.” “I like that you can get to know people more, and that you have the chance to do engineering.”

Source: Inspire Student Post Surveys

Inspire also had an impact on girls' knowledge of and interest in STEM. About three-quarters of Inspire participants indicated that they liked figuring out how things work, making things with technology, and computer coding "much more" since joining TBG (see Figure 19).

Inspire participants were also asked several questions about whether TBG had an impact on their STEM knowledge, skills, and dispositions. Inspire girls reported that the program increased their knowledge of engineering. For example, 94% of Inspire participants agreed at least "a little" that they know how to use the engineering design process to build something, including 48% who agreed "a lot." Over 90% of participants agreed at least "a little" that, because of TBG, they knew more about what scientists, engineers, and people who work in technology do.

Figure 19. The majority of Inspire participants said they liked STEM more since joining TBG.



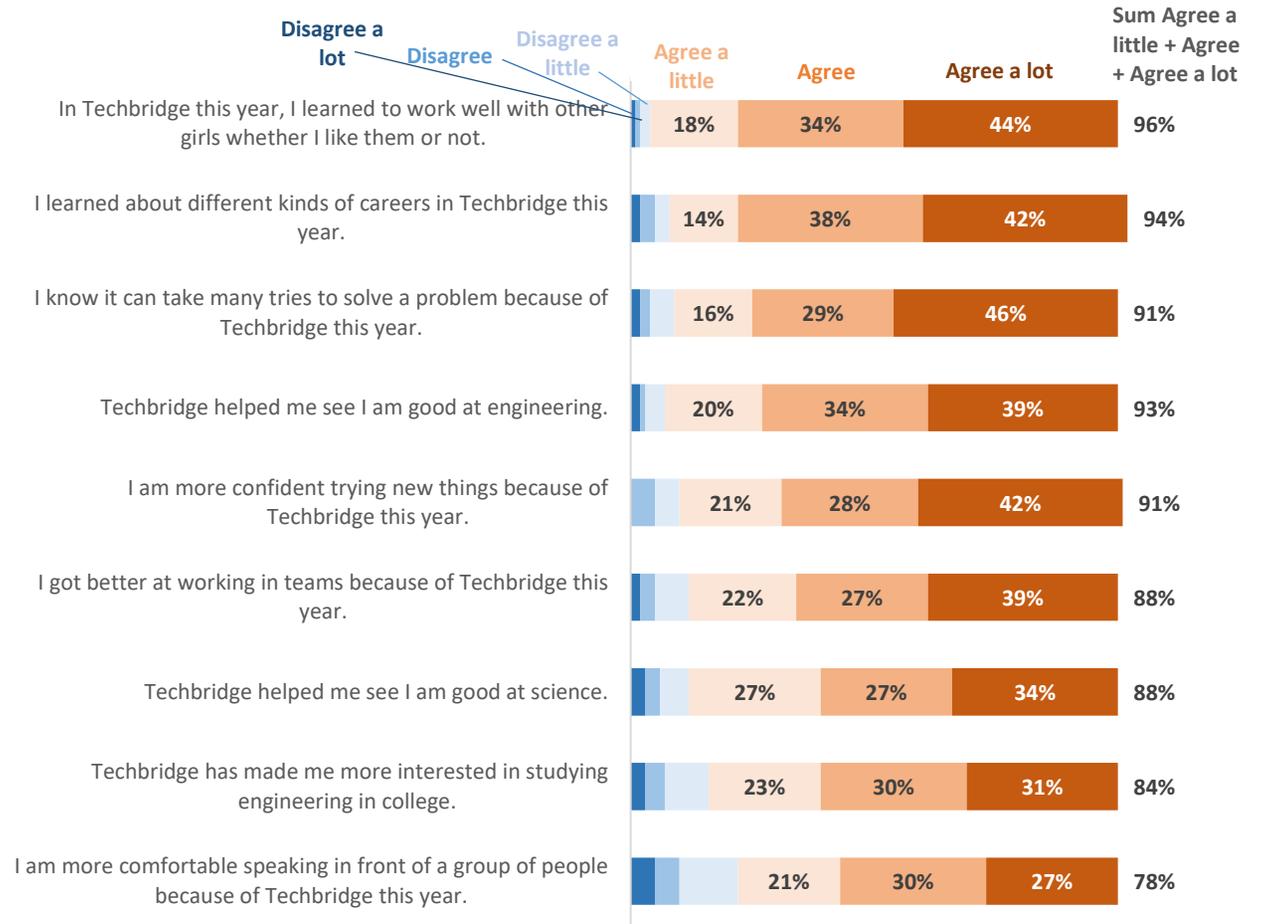
Source: Inspire Student Post Surveys

The majority of Inspire participants reported that TBG had a positive impact on their teamwork skills, knowledge of STEM careers, problem-solving skills, and confidence in STEM (see Figure 20).

“What I like most about Techbridge is that the teachers give us chances to create new things. Also I like that Techbridge teachers always help the student.”

Inspire participant

Figure 20. The majority of Inspire participants said TBG increased their interest, confidence, and skills in STEM.



Source: Inspire Student Post Survey

4 Techbridge Girls' Impact on Teachers & Schools



What selection process did Techbridge Girls use to identify schools and teachers within those schools?



TBG looked to select schools with high ethnic diversity, supportive administration, and a commitment to STEM. In Greater Seattle, the district helped choose schools to host the program and advocated to develop a feeder path so that girls could participate in TBG throughout their educational experience. Principals typically helped identify teachers to help facilitate TBG, and looked for teachers with interest in equity, classroom management skills, good relationships with students, and/or STEM content knowledge or interest.

The school selection process was different at each expansion site, but both sites prioritized diverse schools with a supportive principal, and a commitment to STEM education.

The district partner in Greater Seattle had more input on which schools offered TBG. Highline Public Schools suggested that TBG partner with its STEM Academy schools and then suggested one other school that it thought would benefit from the program. Highline was also interested in creating a pathway for students to become involved in TBG at their elementary schools and then continue into middle school and high school; the district’s desire to create a STEM pathway also influenced the school selection.

In Washington, DC, programs were offered in DC Public Schools (DPCS) and multiple few charter schools that TBG identified as a good fit.

Principals appreciated having TBG at their school because it provided additional STEM opportunities for their students.

Table 4. Techbridge staff and district representatives considered various factors when selecting schools to participate.

TBG Schools have...	Quotes from TBG Teachers and School Administrators
Diversity of population 	<p>“ I think for a little over a third of our students, Spanish is their first language at home. Then our second most common language is Somalian. Then I think we have 30+ languages...We range somewhere from 82 to 86% free and reduced lunch.” (TBG principal)</p>
A supportive principal 	<p>“ Admin is definitely on board. I’ve asked our administrator, ‘Can we go on these field trips?’ And she’s like, ‘Go crazy.’ She’s very pro-Techbridge. So is our assistant principal. One of science coaches supports me all the time...and the computer and technical educator guy at the district has been coming in and supporting. Both of them came to the Family Night. Overall people are like, ‘Yay, Techbridge.’ Which is nice.” (TBG teacher)</p>
STEM as priority 	<p>“ We should really be preparing our kids here for those tech jobs. There’s Boeing here and Microsoft. We’re really doing a disservice to our kids if we’re not preparing them for that and especially in a high poverty school that’s so diverse. I think often our kids don’t have access to learning about those types of careers or even think that that’s possible for them. Our core value here is around equity and closing opportunity gaps and this is a huge gap. Especially for girls of color, to really see themselves represented in the science and tech industry and then think, ‘Oh I can do that,’ is so important and powerful.” (TBG principal)</p>
Commitment to gender equity in STEM 	<p>“ In terms of the Techbridge mission of engaging girls and empowering girls, there is a need for that. Most of our students are low-income in communities where opportunities are not rich. Having program like Techbridge is a great fit as we need to give girls more opportunities. There is a new emphasis [in our district] to ensure girls are getting equitable access to programming.” (District representative)</p>

Identifying TBG Teachers

Principals were typically involved in recommending a teacher to be the co-teacher in the TBG program. They described efforts to select teachers who had positive relationships with students, appropriate pedagogical skills, strong classroom management skills, and knowledge and/or interest in STEM. Once a school was selected, there was not always a large number of teachers available with the capacity to fill the role, so sometimes a teacher was urged to participate who might not otherwise opt in. One teacher said:

“An administrator emailed me and another teacher during summer and said, ‘Anybody?’ The other teacher had had a baby. At first, it was a process of elimination, but then I met [the TBG Program Coordinator] and it actually sounded really cool. Then we started doing it and I was like, ‘This is awesome, so now I want it forever. Now I want it and nobody can take it.’”

Table 5. What are important characteristics of a Techbridge teacher?

TBG Teachers Have...	Quotes from TBG Teachers and School Administrators
Commitment to equity 	<p>“ 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.”</p>
Personality/Relationship with students 	<p>“ 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.”</p>
Classroom management skills 	<p>“ 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.”</p>
STEM expertise nice, but not necessary 	<p>“ 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.”</p>

“I think she’s very committed to making sure that there’s equity in STEM-like subjects. She develops really strong relationships with the students, which is helpful to encourage them to attend and to be productive. I think that she is a good choice, and she’s very interested in it and very enthusiastic about it, so that helps.”

Techbridge Girls Principal

How were teachers trained and supported in the expansion sites?



Teachers attended a multi-day training during the summer before the programs, participated in follow-up trainings during the year, and communicated with their Program Coordinator or Program Manager. Teachers generally highly rated Techbridge Girls’ training and support.

All TBG teachers attended an initial multi-day training during the summer before the programs began, participated in follow-up trainings during the year, and communicated with their TBG Program Coordinator (PC) or Program Manager (PM).

The Inspire program for elementary schools in 2017-18 had a different model for teachers. Inspire teachers facilitated the program by themselves, using materials and curriculum provided by TBG and receiving coaching from a TBG staff member.

For all non-Inspire teachers, the two-day training during the summer was typically the most highly rated component of the teacher preparation, followed by meetings with the PC or PM (see Table 6 on the following page).

Teachers wrote that the most valuable aspect of the training and the support was the opportunity to “tinker,” where they got hands-on time to do the activities that the girls would be doing. For example, one teacher 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.”

Teachers reported that the ongoing support they received from their PC or PM was also very helpful, including seeing the slides, reviewing the content and key terms, and talking through the activities coming up that week.

Some teachers felt it was valuable to connect with the other Techbridge teachers to share ideas. Others noted that the program and curriculum were so organized and straightforward that it diminishes the importance of an effective training.

Suggestions to improve the training from TBG included:

- More time on the activities in the curriculum
- Sharing presentation slides and vocabulary with teachers prior to the session
- Provide a broad timeline for the year to show how long each project will be
- More ongoing training sessions during the school year.

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

Techbridge Girls Teacher

In 2017-18, Inspire teachers received slightly different training and support from TBG. Ratings showed Inspire teachers felt the written materials/lesson plans and the pre-kitted materials for hands-on activities were the most valuable aspects (with means of 4.69 on a scale from “Not at all helpful” (1) to “Extremely helpful” (5); see Table 6). The teacher meetings during the school year and opportunities to interact with other Techbridge teachers were the lowest rated aspects of support by Inspire teachers (3.20 and 3.33, respectively).

Inspire teachers appreciated the training they received, including time to tinker:

“The two-day training was an excellent intro to the program. I was glad to try the activities ahead of time. It was great to do it with others to see differing interpretations. It was also good to know that any questions I had would be promptly addressed and answered.”

When asked how TBG could better prepare and support them, Inspire teachers suggested offering another training to try out the activities and a visit to an Inspire program. Inspire teachers also requested additional support in some areas, including more information about STEM opportunities to share with the girls, more extensive Scratch training, and earlier communication to coordinate campus visitors.

Overall, Inspire teachers felt they had what they needed to lead the program. One Inspire teacher commented, “I was surprised how I could do it myself. Thanks for all the front loading! Those boxes and bags were so well organized!”

Table 6. The initial training was the mostly highly rated aspect of support to TBG teachers.

Means on the scale: Not at all helpful (1) to Extremely helpful (5)

	2014-15 (Year 2)	2015-16 (Year 3)	2016-17 (Year 4)	2017-18 (Year 5) ChangeMakers	2017-18 (Year 5) Inspire
Pre-kitted materials for hands-on activities	Not Asked			Not Asked	4.69
Written materials/lesson plans developed to assist in my facilitation of activities	Not Asked			4.00	4.69
Initial teacher training ¹	4.67	4.56	4.20	4.11	4.36
Debriefing meetings with your Techbridge program coordinator	3.83	4.36	4.10	Not Asked	
Input/coaching from the Techbridge director/manager	3.20	4.10	3.70	4.00	4.15
Spring teacher training	Not Asked			4.00	Not Asked
Opportunities to interact with other Techbridge teachers, in a group or individually	4.00	3.30	3.80	3.71	3.33
Teacher meetings during the school year ²	4.60	3.86	4.20	Not Asked	3.20

¹ In Year 5, for Inspire teachers, this question was asked as “Two-day Inspire teacher training during summer 2017.” For ChangeMakers teachers in Year 5, the item was asked as “Fall teacher training.”

² In Year 4, this question was asked as “Teacher trainings/workshops during the school year.” In Year 5, this question was asked to Inspire Teachers as “Virtual meetings with other Inspire teachers.”

“I feel like I was really fortunate to get this training. Techbridge is the best professional development in terms of teaching STEM that I’ve had—undergrad, grad, or with the district. It’s the best. For me, it’s one-on-one teaching how to teach STEM. [My TBG staff member] is modeling, coaching... There’s no replacement for that.”

Techbridge Girls Teacher

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



Teachers were mostly very satisfied with the level of leadership and decision making they had in their Techbridge Girls program, though the role of teacher varied widely from program to program (or even day to day).

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

Techbridge Girls Teacher

Overall, teachers were satisfied with the amount of control they had over different aspects of the program. There were no patterns in teachers’ responses regarding what they wanted more or less control over, suggesting that the teacher’s role in the program was an individual preference.

The role of teachers in TBG and the coordination of the PC/PM and teacher varied somewhat by school. The PC/PM usually brought the activity and often led the introduction of the activity (unless otherwise planned, and an Inspire program). Teachers were frequently responsible for classroom management and used their relationships with and knowledge of students to improve the program. Teachers could also offer insight into the appropriate level of complexity

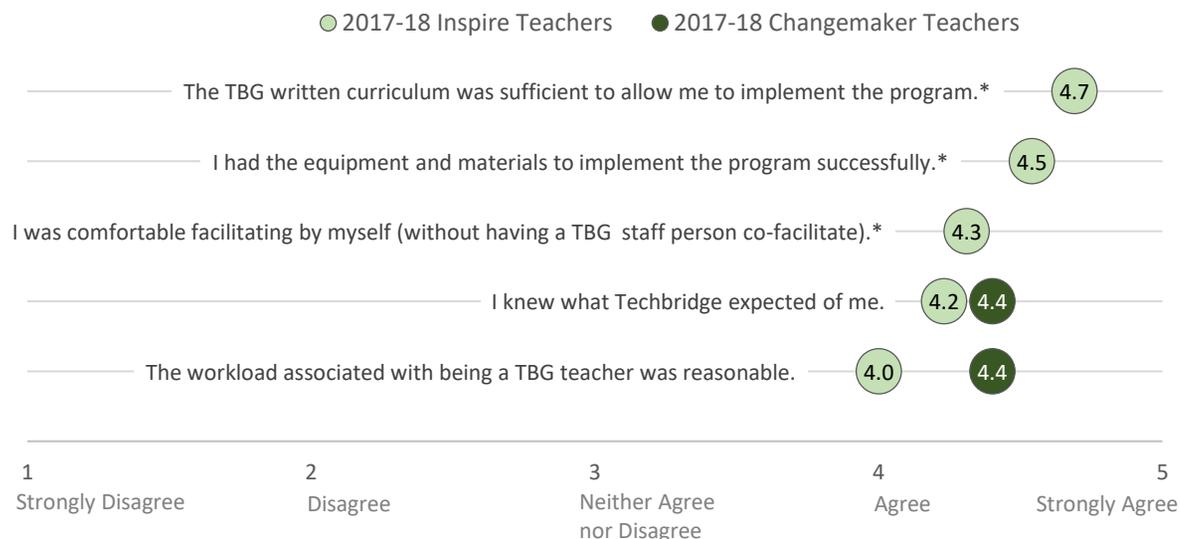
of activities and how TBG content related to what students were learning in class. As one teacher said, “I know the students very well because these are my kids. If I know what I’m doing, I can prep them linguistically or tie it into what is happening in the school day.”

Teachers admitted they appreciated not having to do any prep of lessons and materials or make decisions about field trips. Most teachers said they worked well with their PC/PM and had a collaborative

relationship, though at least one wondered if the PC/PM wanted them to be doing more.

Inspire teachers felt comfortable facilitating curriculum and well prepared with materials and equipment. Compared with ChangeMakers teachers (in 2017-18), teachers in the Inspire program were slightly less likely to agree that the workload was reasonable and that they understood TBG expectations, though the majority of Inspire teachers still agreed with each statement (see Figure 21).

Figure 21. Teachers generally agreed the workload was manageable and they had what they needed to implement TBG.



*Not asked of ChangeMakers teachers

Source: ChangeMakers and Inspire Teacher Surveys

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



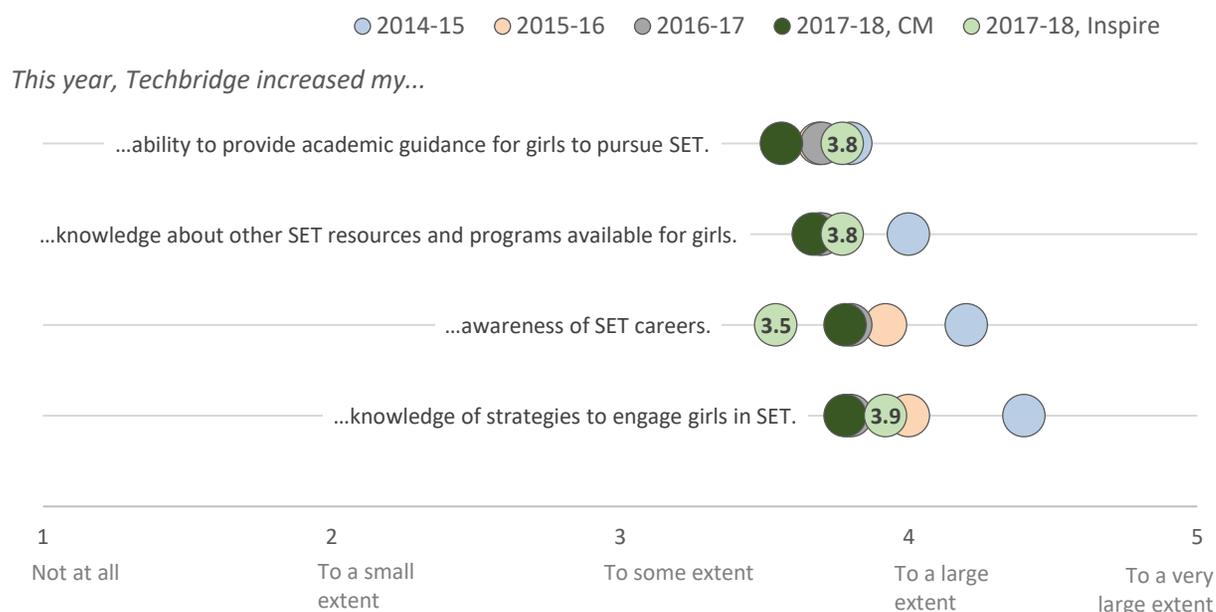
TBG teachers also benefitted by being involved in the program. Teachers especially increased their knowledge of strategies to engage girls in STEM and awareness of STEM careers.

Teachers indicated TBG had at least a small impact on them in each of the five areas measured in the teacher survey. In most years, teachers reported that TBG had the greatest impact on their knowledge of strategies to engage girls in STEM and awareness of STEM careers.

In all four years, teachers indicated they experienced the least growth in their ability to provide academic guidance for girls to pursue STEM.

Inspire teachers indicated slightly higher growth than the 2017-18 ChangeMakers teachers on three out of four items: knowledge of strategies to engage girls in STEM, knowledge of other STEM resources, and ability to provide academic guidance for girls to pursue STEM.

Figure 22. TBG teachers reported the greatest gains in their knowledge of strategies to engage girls in STEM.



Source: ChangeMakers and Inspire Teacher Surveys

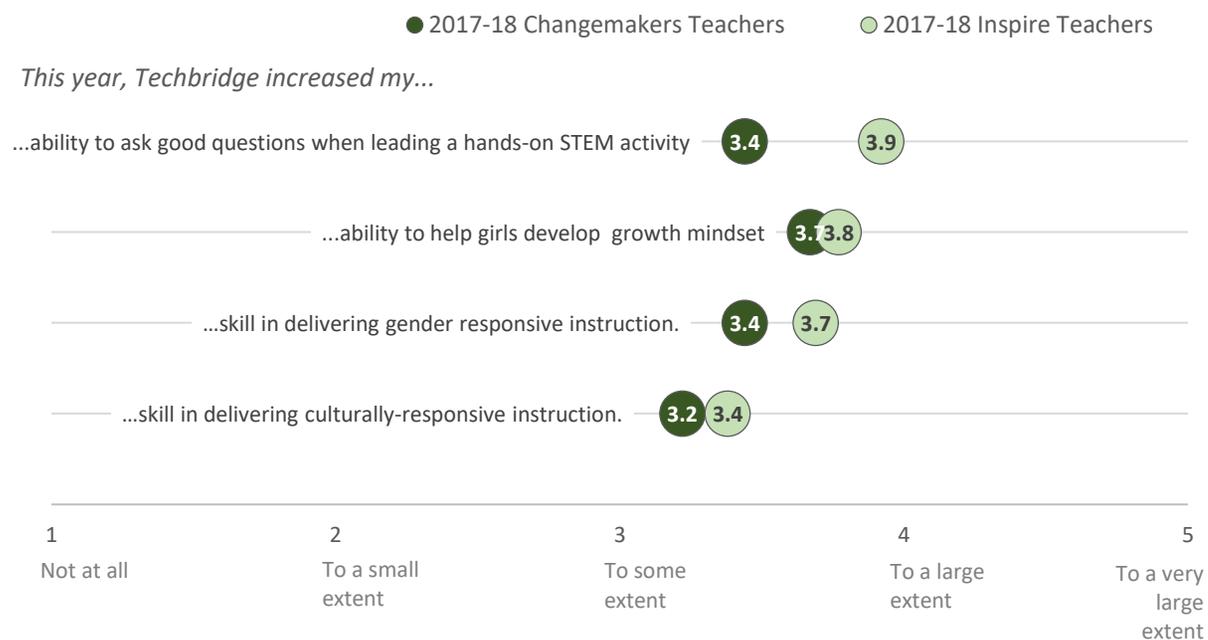
In 2017-18, teachers were asked additional questions about how TBG had impacted them professionally. Inspire teachers' ratings were a little higher than ChangeMakers teachers' in all four areas, especially in their ability to ask good questions when leading a STEM activity (see Figure 23). ChangeMakers teachers indicated the most growth in helping girls develop a growth mindset.

Both ChangeMakers and Inspire teachers were least likely to report large improvements in their skills delivering culturally responsive instruction.

TBG teachers elaborated further on TBG's impact during interviews. They described getting to know their students better, using growth mindset strategies with their students during the regular school day, and learning STEM content along with the girls.

One teacher said, "It's been a great experience for me, helped me in other parts of teaching. It allows me to further connect with students, building those relationships so I can talk with them in class more and they can approach me more."

Figure 23. Inspire teachers indicated slightly higher impact than ChangeMakers teachers in pedagogical areas.



Source: ChangeMakers and Inspire Teacher Surveys

"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 Girls Teacher

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



In Greater Seattle, all programs were located within Highline Public Schools, and the district had an active role in shaping and supporting the program. In DC, programs were held at charter schools as well as in DC Public Schools (DCPS). TBG coordinated with DCPS and sought support as needed, but generally DC school district staff were less involved. Principals from most schools in both expansion sites were supportive of TBG, though their level of involvement varied. Principals most often helped identify and support the TBG teacher, promoted the program, and attended Family Nights.

Role of the Districts

In Greater Seattle, Highline Public Schools had an active role in TBG through most of the four years of programming. The district was highly involved in selecting the schools, and pushed for setting up “pathways” that would allow girls to participate in TBG from elementary grades through high school. Highline district representatives saw TBG’s mission as aligned with the district’s mission of preparing students to be college and career ready, and to be exposed to opportunities that they might not otherwise have. The district also helped arrange transportation for student participants, distributed payment to teachers, invoiced TBG for buses, stipends, and other costs, and worked on contract-related addendums. During the first few years of the expansion, a representative from Highline met with Seattle staff about every six weeks in person or by phone, attended several programs over the course of the year, and came to a few of the Family Nights.

The Highline district also partnered with TBG on grant proposals, including a Race to the Top proposal. District representatives felt they had a

positive relationship with TBG and were appreciative of the responsiveness of the Greater Seattle TBG staff.

DCPS was less involved in selecting participating schools in Washington, DC compared to Highline. (About half the programs were located in public charter schools not managed by DC Public Schools.) A district representative received monthly reports on the program at the schools they were supporting, and discussed grant possibilities with TBG. DCPS also worked with the DC Executive Director to address low enrollment at one school and implemented strategies such as rescheduling the program to start during “enrichment” time during the school day. DCPS praised the TBG DC office for their responsiveness and collaborative nature. They felt that one challenge working with TBG was the higher cost compared to other afterschool programs.

“[Our school district has] benefited from partnering with Techbridge. Our approach is as a district versus a school. [We’re] really trying to leverage a strategy to be supported throughout the careers.”

District Representative

Role of the Principals

The role of principals varied by site. Principals often supported the teacher, promoted the program to girls and families, helped remove barriers such as making sure other afterschool programs were not offered the same day as TBG, provided transportation support for field trips, and communicated with the district. Many principals attended a Family Night.

At both expansion sites, principals mentioned they served as a spokesperson for TBG, spreading the word about the program and advocating for its importance and value.

Not all principals were actively involved, especially after the first year of the program at their school. One principal said, “I go see what they’re doing. I met with people to get ball rolling. I put good people in charge of it.”

Teachers generally felt supported by their school administrators. Teachers mentioned that principals helped secure space for the program, supplemental materials, and funding for transportation. Most teachers described their principal as responsive to their requests and “checking in” on the program every so often.

“My stance is, this is good for our girls, for our families, I believe in it, and I want it to be a partnership that is long-term. I want to make sure that the school is providing Techbridge with all the necessary items that we need to be taking care of to make the partnership work, and to make it be smooth.

“I’m the face of the school. I have to promote it. I have to talk to families about what we’re doing. How we’re doing it. Why we’re doing it. I have to have these conversations with the parents about what are the opportunities that are available to their children.”

Techbridge Girls Principal

5 Techbridge Girls' Impact on Role Models



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



Program Coordinators or Program Managers were primarily responsible for recruiting role models to visit programs. Role models participated most commonly in an online preparation for their role and almost all felt prepared to interact effectively with TBG participants.

The Program Coordinators or Program Managers were primarily responsible for recruiting role models to visit programs, typically by reaching out to STEM-related companies and higher education institutions. TBG aimed to involve role models who were female and who reflected the ethnic diversity of the TBG 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 TBG (at least in terms of gender and ethnicity) was important to establish that people “like them” work in STEM and help enable girls envision themselves having a similar career.

Ninety-seven percent of role models in 2017-18 indicated that their area of expertise was at least

slightly related to the content covered during their visit, including 48% who indicated it was “Very related.”

Many women returned to serve as a TBG role model after their first year of experience. During the 2017-18 school year, two-thirds of role models completing the role model survey had been a role model in a previous year. Having a pool of returning role models reflects positively on TBG and is an indicator of how many role models find the experience to be positive.

Training and support provided to role models featured background about TBG, and information about how to talk to and mentor youth. TBG staff also talked with role models in person or over the phone prior to the model visiting the program, provided details on the day’s activity and agenda, and shared tips for the role models.

67%

of Year 5 role models had been a Techbridge Girls role model in a previous year

“[The TBG staff member] was AMAZING. She was so supportive and responsive to all of our questions and really made the process of volunteering and coordinating super easy.”

Techbridge Girls Role Model

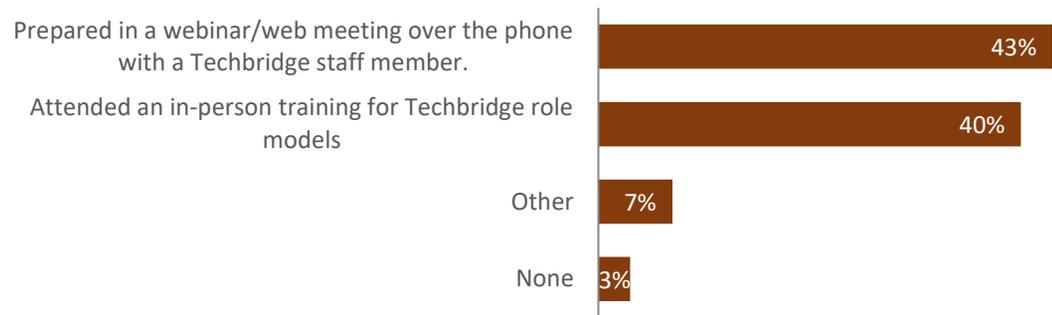
Almost all 2016-17 and 2017-18 role models received some type of preparation. In 2017-18, role models most commonly participated in a webinar or web meeting with a TBG staff member (43%) or in an in-person training for TBG role models (40%) (see Figure 24). The number of role models not participating in any type of TBG preparation was higher in previous years of the project, with 17% of Year 2 (2014-15) respondents and 21% of Year 3 (2015-16) respondents indicating “None.”

During 2016-17 and 2017-18, all role models indicated the training offered by TBG was “Somewhat helpful” or “Very helpful.” (In contrast, 11% respondents in Years 2 and 4% in Year 3 indicated the training was “Only a little helpful.” See Figure 25.)

Additionally, at least 90% of role models each year agreed that they understood TBG’s expectations of role models and TBG’s mission.

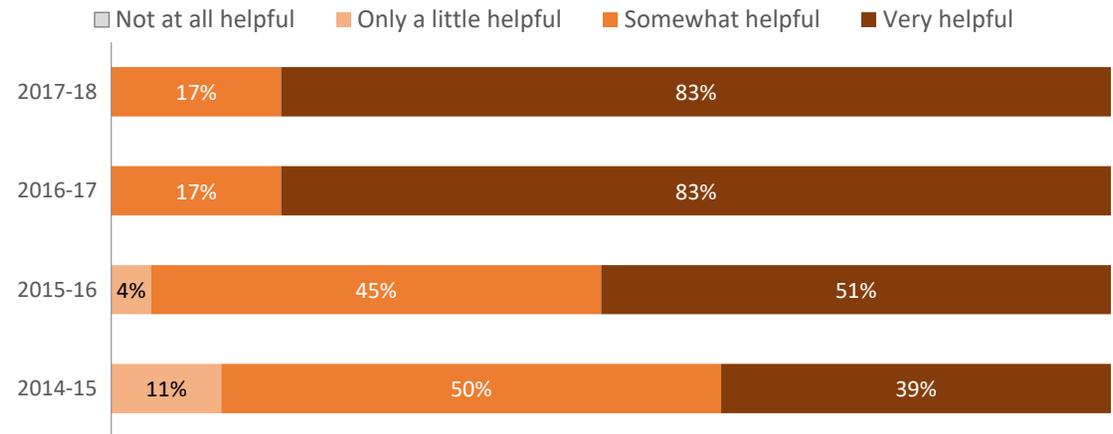
Role models did offer some suggestions. They requested more information about the activity that was going to be underway on the day they were visiting, a one-page tip sheet, more strategies on how to engage girls, and information on what the girls were interested in. Other role model requests indicated they were unfamiliar with resources that were already available, such as the materials on the TBG website, including a video of a role model visit.

Figure 24. TBG role models were most commonly prepared for their role in a web meeting or in-person training.



Source: 2017-18 Role Model Survey

Figure 25. The large majority of role models indicated the TBG training was at least “Somewhat helpful.”



Source: 2017-18 Role Model Survey

The majority of role models indicated they used TBG strategies for engaging with the girls during their visits (see Figure 26), especially encouraging girls to ask questions (97% indicated they did so in at least some of their visits in Year 5) and sharing their educational pathway or how they decided to work in STEM (89% in Year 5). Role models were somewhat less likely to facilitate hands-on activities or ice-breaker activities during their visit.

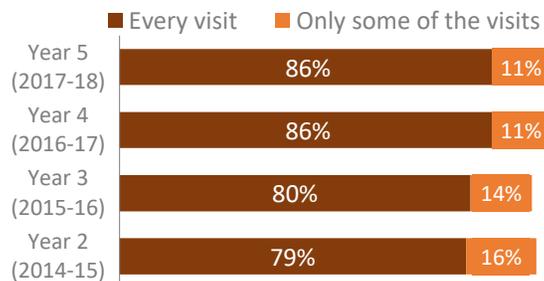
“I really enjoyed my experience and thought the training was great for teaching me how to frame my talk and communicate about my experiences that lead to me becoming an engineer. I hadn’t thought about how important it is to be relatable and just a normal person! That makes sense to show girls they can do this too. The info about growth mindset, open ended questions and keeping hands of projects to let the girls explore was also very helpful.”

Techbridge Girls Role Model

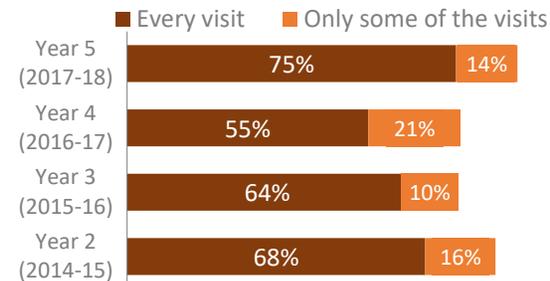
Figure 26. Role models reported implementing most TBG strategies during visits to a TBG program or field trip they hosted.

Note: Response options were: “Yes, in every role model visit/field trip”; “Yes, but only in some of my role model visits/field trips”; “No, in none of my visits/field trips”; “Not sure.” The figure below only shows responses for “in every visit” and “only some of the visits.”

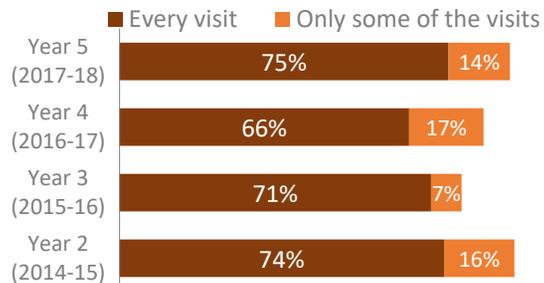
I encouraged the girls to ask me questions.



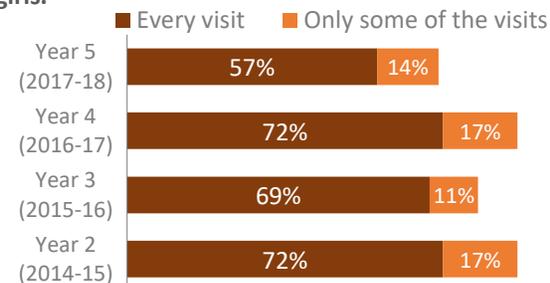
I shared my educational pathway with the girls.



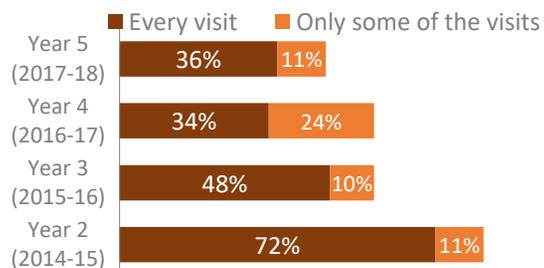
I shared about how I decided to work in science, engineering, or technology.



I facilitated a hands-on activity with the girls.



I conducted an icebreaker activity (a warm-up or get-to-know you activity).



Source: Role Model Surveys

The role models and field trips were a very important component of the career education aspect of TBG.

According to one teacher:

“The field trips are beneficial because the students get excited around SET [science, engineering and technology] careers and the benefits of a SET career. While we spark that excitement during program and with role model visits, going to the place where the work happens makes it more accessible for girls.”

Teachers identified a number of benefits from role model visits and field trips, including increasing girls’ interest in and awareness of STEM education and career pathways, helping girls become inspired, and helping girls make connections between STEM and the “real-world.” A teacher commented: “These visits and trips were very inspiring for them and helped to make the idea of a STEM career real.”

Teachers frequently asked for more role model visits and field trips.

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



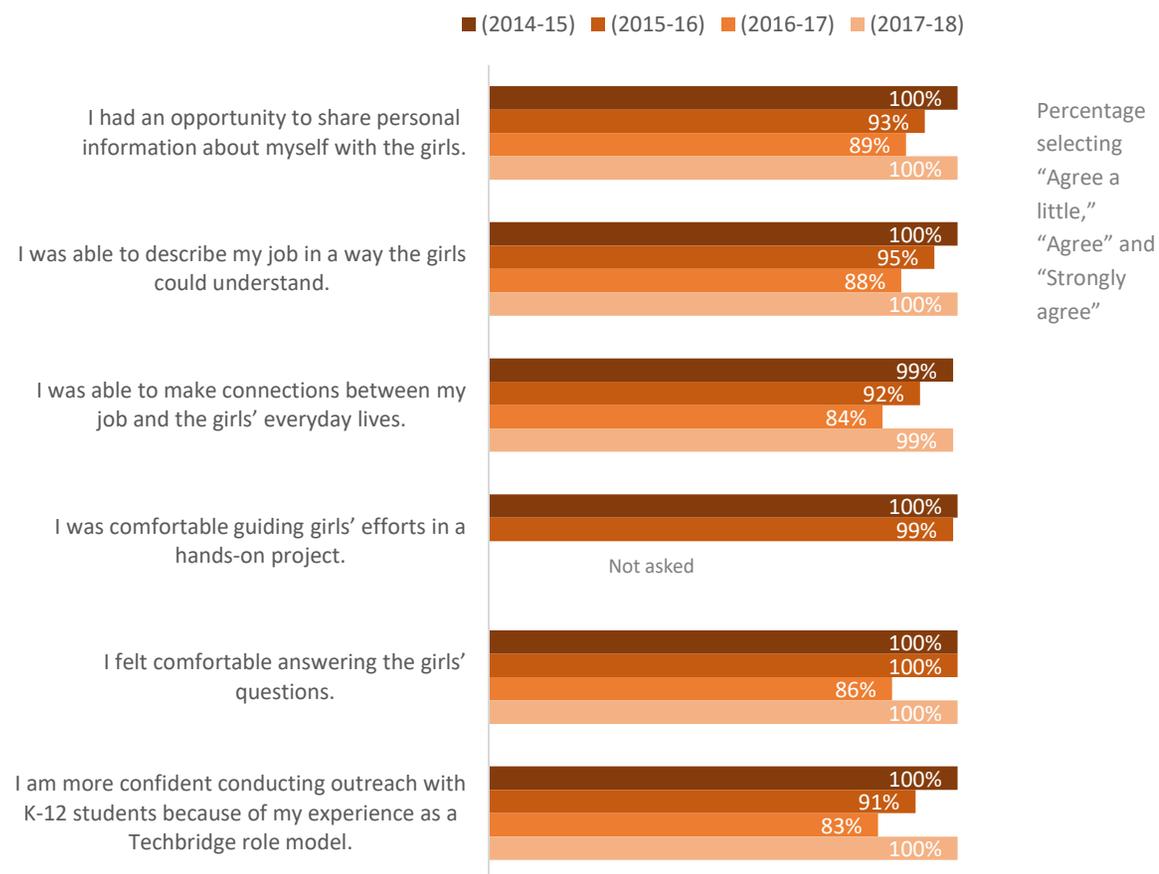
Almost all role models agreed that serving as a TBG role model was worthwhile and that they were more confident in conducting outreach due to the experience. Role models were comfortable using effective strategies from the TBG training during their visits, such as sharing personal information about themselves, describing their careers in ways that girls could understand, and making connections between their jobs and the girls' everyday lives.

Role models experienced a variety of benefits from volunteering with TBG, including increased knowledge about effective role model practices and confidence in serving as a role model (see Figure 27).

Role models were very likely to agree that they were more confident conducting K-12 outreach as a result of their experience with TBG (the mean response was on a scale from Disagree a lot (1) to Strongly Agree (6) was more than 5.00 in three out of four years). They also felt very comfortable answering girls' questions and found opportunities to share personal information about themselves.

Role models indicated 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 TBG encouraged role models to employ.

Figure 27. Role models increased their confidence in conducting outreach due to their experiences with TBG.



Source: Role Model Surveys

Role models mentioned tangible gains, including increased leadership and presentation skills. Other responses were very positive, but more general. For example, some role models described enjoying serving in that capacity: “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.”

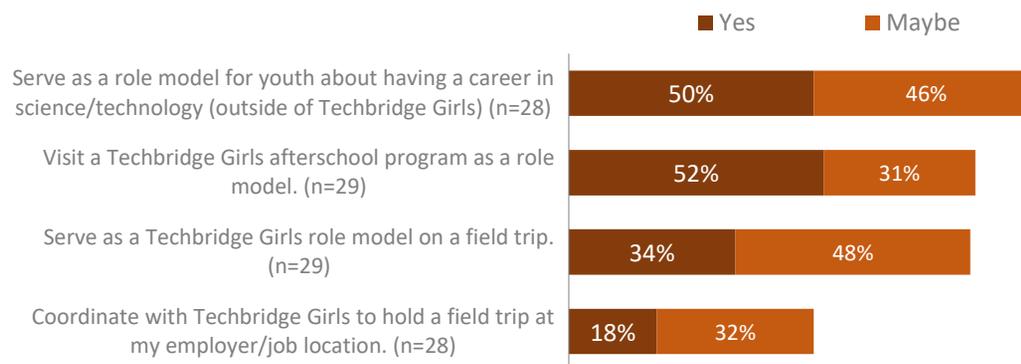
Role models described feeling good about volunteering and encouraging more females to work in STEM: “I am passionate about women in tech and this gives me a chance to show young girls what a career in tech might look like for them.”

One teacher commented on how role models who made personal connections with the girls, such as by sharing personal details and challenges that girls could relate to, were particularly effective.

Many role models were open to continuing as a TBG role model in subsequent years, either hosting a field trip or visiting a program (82% of 2017-18 role models said “yes” or “maybe,” which was fairly consistent with responses in previous years). In addition, 96% of 2017-18 respondents indicated that they “probably will” or “definitely will” serve as STEM career role models outside of Techbridge.

Overall, role models offered very positive reviews of the program and their experience. One said, “I think it’s a great program; happy for the opportunity to be involved.” And another role model noted, “This was AMAZING!!! Completely boosted my day, week, month. Thank you for all the work that you are doing.”

Figure 28. Most role models planned to serve as a role model outside of STEM and host a field trip next year. *Note: Response options were “Yes,” “Maybe,” and “No” The figure below only shows responses for “Yes” and “Maybe.”*



Source: 2017-18 Role Model Survey

“I’ve thoroughly enjoyed being a role model each time that Techbridge has come to my work. The interactions are just as helpful for the role models as it is for the girls!

“I’m amazed at how inspired the girls get and how they light up while they hear our stories. You can literally feel their futures changing while you talk to and encourage them!”

Techbridge Girls Role Model

6 Techbridge Girls' Impact on Families



How did expansion sites engage girls' families?



Techbridge Girls programs invited families to Family Nights, typically with food, presentations, and activities. TBG staff also provided resources on other STEM programs and activities, and often kept parents updated on activities and events by texting. Challenges to engaging families included language barriers and scheduling difficulties. Girls were encouraged to communicate with their parents about TBG and teachers often helped with efforts reach families, including sharing best practices from their experiences at their school.

TBG staff, teachers, and girls all played a role in engaging families in the program. TBG sent families resources such as Techbridge newsletters, a Summer Programs Guide, and a Holiday Activity List, and kept them updated on the project activities. Some Program Coordinators/Program Managers used text messaging to inform families of the activities girls were doing in the program as well as more logistical information on schedules, Family Nights, and field trips. Other TBG staff shared photos taken of the girls during the program with their families.

The percentage of parents indicating they had received written materials from Techbridge with updates about the program ranged from 64% in 2017-18 to 82% in 2014-15.

Teachers reported that they shared information on TBG activities and created opportunities for girls to show their families what they have learned. They also took advantage of opportunities to connect with TBG families, such as at pick-up or drop-off or other school functions.



FAMILY NIGHTS

“[Family Night is] a chance for girls to share with their families some of the cool things they are doing. It’s a simple and genuine experience for our families. The families get to do a project together, eat together, then the kids are proud and families are proud.”

Techbridge Girls School Principal

Keys to success, according to TBG teachers:

- ✓ **Food**
- ✓ **Personal invitations from girls (and/or from teachers or TBG staff)**
- ✓ **Advance warning**
- ✓ **Invitations translated into native languages, as necessary**
- ✓ **Including the whole family (especially siblings)**

Highs and Lows of Attendance:



“For the first Family Night, I would say of the 30 girls, probably at least 20 of their families were here, which is amazing, considering attendance at most of other functions isn’t usually that high.” TBG Teacher



“It wasn’t overly successful with the number that attended, but I don’t think that that’s the program, I think 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.” TBG Teacher

Girls were encouraged to share about what they were doing and learning in TBG with their families. Almost all parents (over 90% each year) reported that their daughters talked to them about what they did in TBG.

Family Nights were largely considered a successful strategy at engaging many parents. At a Family Night, girls talked about what they had done during the program, led families in hands-on activities, and answered parents' questions. Principals were also able to attend to learn more about TBG. Attendance at Family Nights varied by year and by school. Successful strategies for increasing attendance included offering food (or holding a potluck), phone calls to parents, giving parents more advanced warning, encouraging them to bring the entire family, and reaching out during the year to engage parents and siblings in TBG.

The girls led many of the Family Nights. As one teacher explained, "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."

Family members said the communications from TBG kept them up-to-date with what their daughter was doing in the Techbridge, and gave them ideas or suggestions for talking to their daughter. One family member said, "The teacher calls and texts for updates. It has been very helpful to keep up with what she does in Techbridge." Families could also be engaged in the program by chaperoning TBG field trips.

The resources also helped families learn about STEM activities to do at home and other STEM learning opportunities near them (see box below, right).

About a quarter of families each year indicated they had not received resources from TBG. TBG staff and teachers commonly noted the challenges of engaging parents, including limitations of the family's time, language barriers, responsibilities such as caring for other children, being difficult to reach via phone or email, and lack of transportation. Parents of middle school girls were considered to be more difficult to engage. TBG has addressed language barriers by using multiple strategies, including translating materials that are sent home, using a translator at the school to call parents to welcome them to TBG and invite them to Family Night, as well as asking girls to serve as translators (such as during Family Night). As one expansion site Techbridge staff member noted, reaching families is a predictable challenge based on the population they target to participate in the program:

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

Difficulties engaging parents was not universally true for TBG programs, though. In Washington, DC, at least one charter school was described as having high family engagement: "I would say, because I have worked in other schools, our families are definitely

very engaged and very much participants and stakeholders."

Additionally, principals and teachers commented how parents were usually very supportive of the Techbridge Girls 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."

Responses to an open-ended question on how families used TBG resources included:

- "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."
- "Use them for ideas on things for making learning science, math, engineering more interesting."
- "We have some potential summer camps for our daughter and have done 'daughter-led' science projects at home. We love it."
- "Discussed programs with my daughter, let her know if she is interested she could participate/sign up."

Techbridge Girls Family Members

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



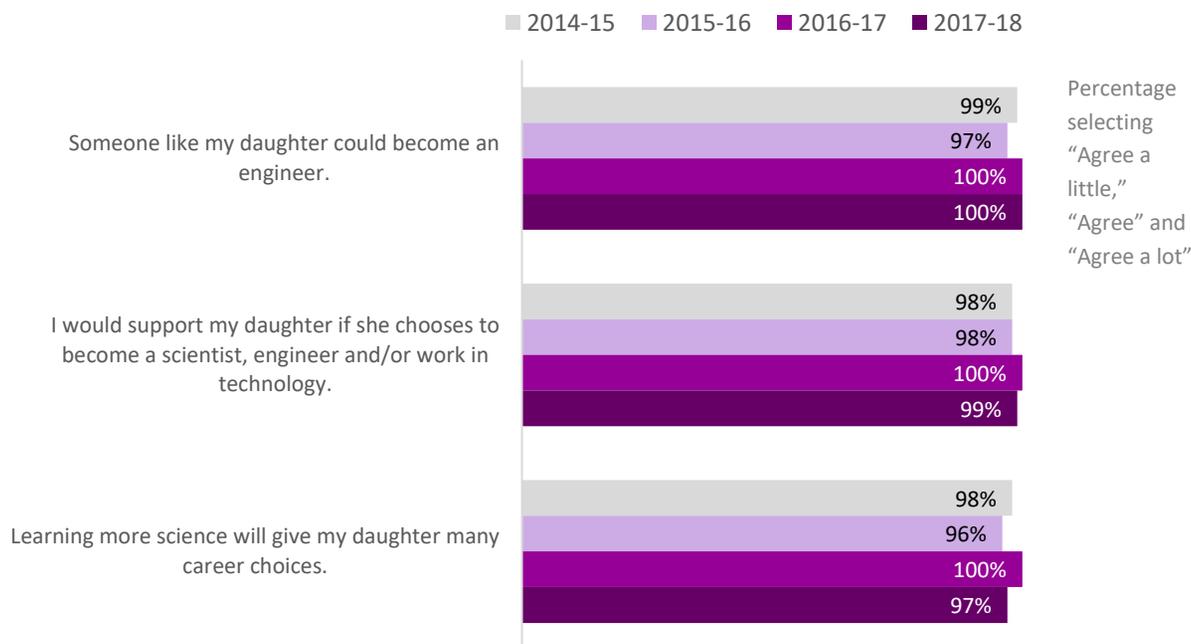
Parents reported that TBG helped them become more aware of STEM resources, encourage their daughters to use those resources, and encourage their daughters to pursue careers in STEM. According to TBG participants, their parents had very positive views of STEM careers and would support them if they chose to work in STEM, even before their participation in TBG.

Parents of TBG girls had very positive attitudes about their daughters' potential interest in STEM, as reflected in the survey administered near the end of the program each year (see Figure 29). Parents were very likely to agree that someone like their daughter could become an engineer, that they would support their daughter if she chose to pursue a STEM career, and that learning science would give their daughter career choices.

"They [families] love it. They feel energized and excited about career paths. I don't think they realize that girls can do the activities we are teaching them. I know some families are starting to push the girls. When we do activities, they (the families) are in it, they are engaged, laughing. And I think that's important for them to see, the learning and the careers that the girls could have."

Techbridge Girls Teacher

Figure 29. Parents had positive attitudes about their daughters' interest in STEM.



Source: Parent Survey

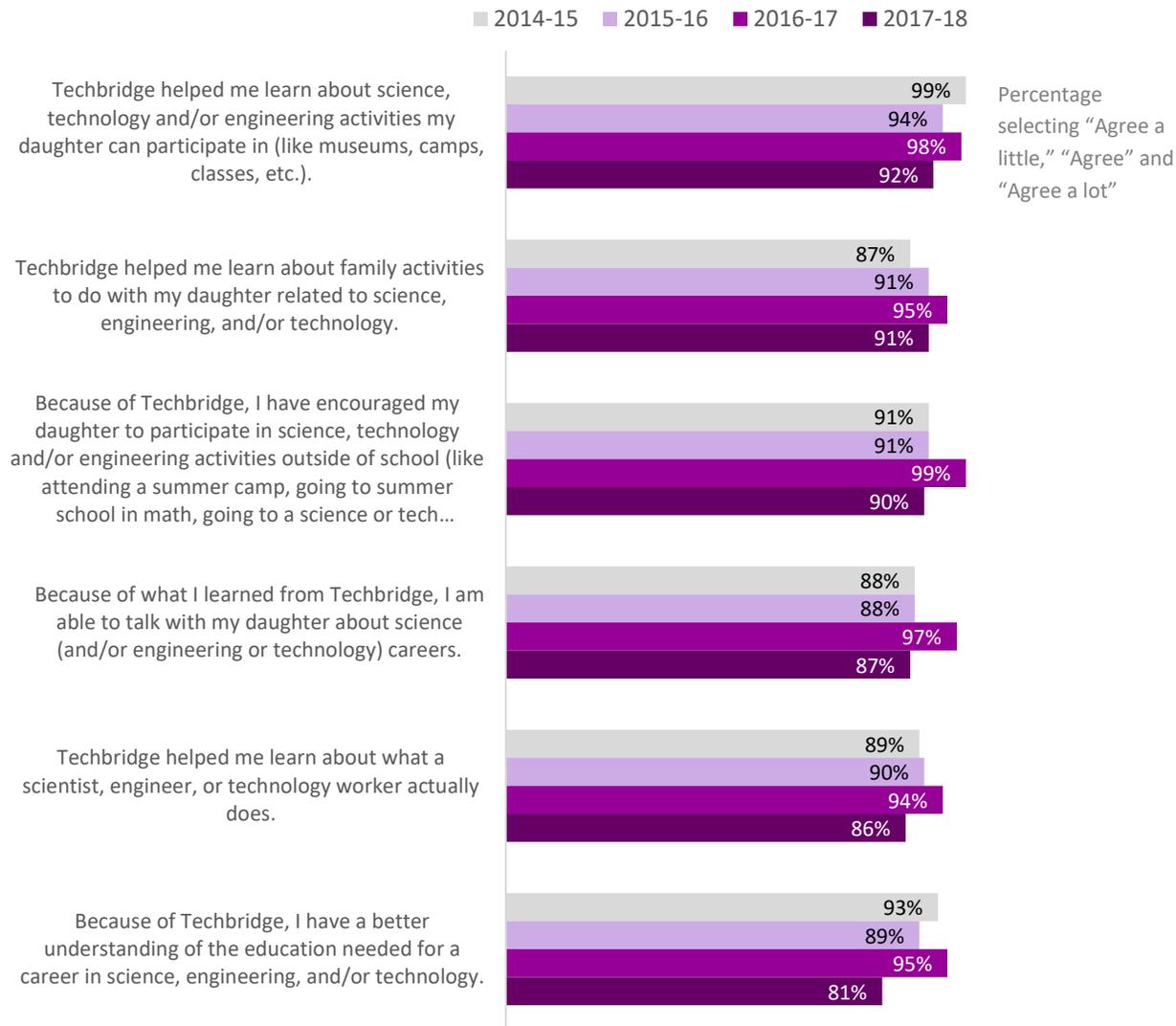
Parents were also likely to indicate that, because of TBG, they learned of STEM activities their daughter could participate in and they encouraged their daughter to participate in more STEM activities (see Figure 30). Many parents also said TBG helped them learn family STEM activities to do at home.

Most parents agreed that, due to TBG, they were better able to talk with their daughter about STEM careers. Because of TBG, parents had a better understanding of what STEM workers actually do and the education needed to obtain those careers.

On a 6-point scale from “Disagree a lot” (1) to “Agree a lot” (6), mean responses to each of these items was more than 4.50 every year (between “Agree” and “Agree a lot”).

Parents were excited for their daughter to be more engaged in STEM. A parent said, “We are eager to help our daughter get more exposure to science programs.” TBG girls corroborated that their parents supported their interest in STEM. For example, one participant said, “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.’”

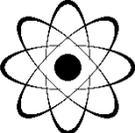
Figure 30. Parents indicated that TBG helped them learn about how to support their daughter in STEM.



Source: Parent Survey

Parents were impacted by their daughter’s involvement in TBG. TBG inspired families to talk about STEM and do more STEM at home, including asking their girls what they were learning in TBG and trying activities from the resources TBG sent home. Parents noted that they were more aware of STEM and the opportunities in STEM, including other STEM learning opportunities and STEM careers. TBG prompted families to consider future plans, including having conversations about education and career options. Some parents could not point to impacts of TBG, especially if they had not received the TBG resources.

Table 7. Techbridge Girls’ Impact on Families

Type of Impact	Example Quotes from Parents
	<p>Facilitated family interactions about STEM; doing more STEM at home</p> <p>“Techbridge has changed our family’s attitude/interest in STEM because our daughter’s learning helped us thinking about the world differently.”</p>
	<p>Increased awareness of STEM and STEM opportunities</p> <p>“Attending Techbridge events made us aware of the unlimited science, technology and engineering programs available to girls and how much they can achieve.”</p>
	<p>Prompted planning for the future, including STEM education</p> <p>“We are looking for a high school related [to] science, technology and engineering for our daughter.”</p>
	<p>None/Not much</p> <p>“My daughter talks more about it, but it hasn’t really changed the family attitude. Great work!”</p>

Source: Parent Survey and Interviews

“Now I think that 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.”

Techbridge Girls Family Member

Teachers had positive views of how families were affected by TBG:

- “We got a lot of positive feedback—they really like the program and what it was teaching girls and exposing them to.”
- “[Parents] are learning things. Their daughters are teaching them things that they don’t know... 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.”
- “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.”

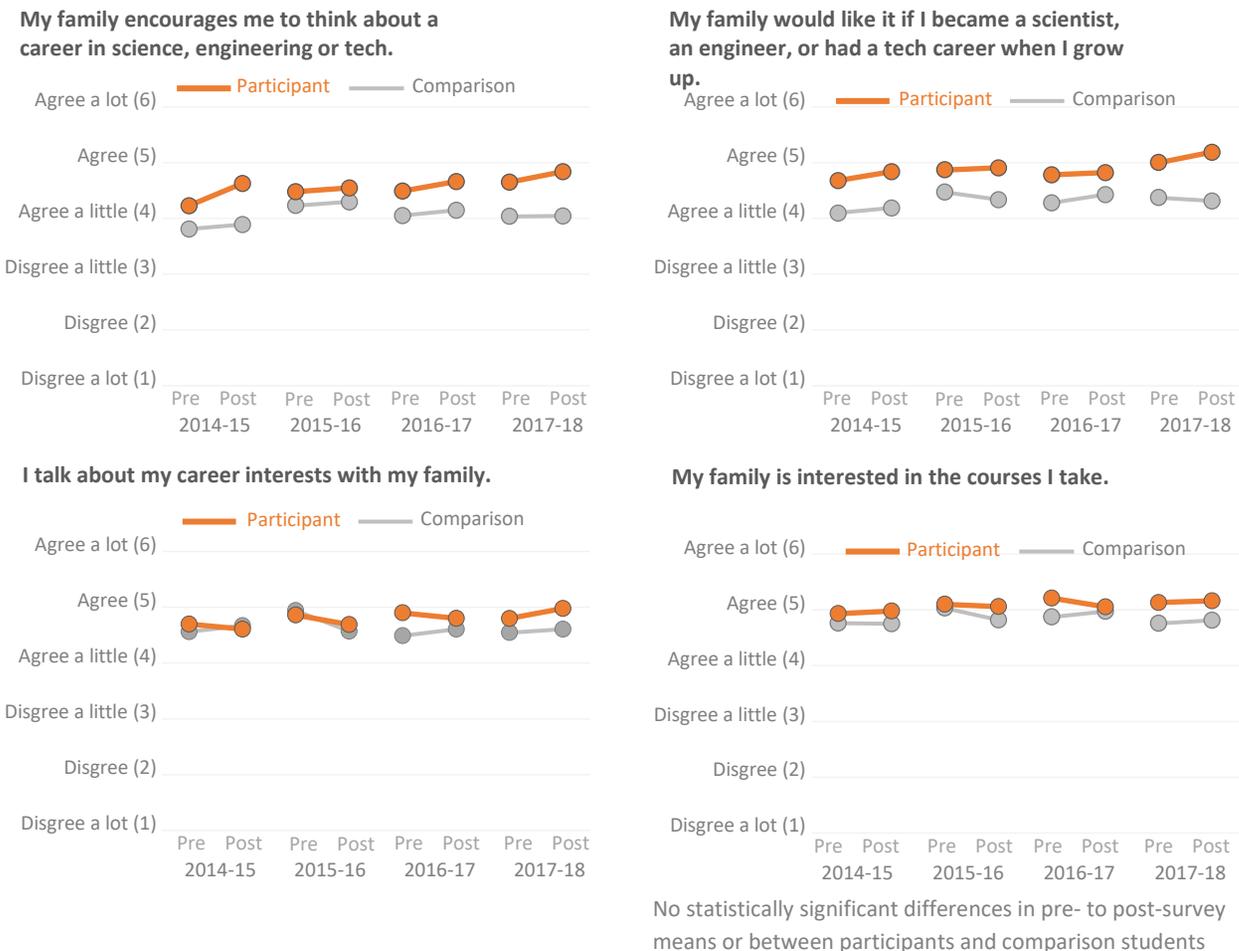
According to girls, the majority of their parents already supported their interest in STEM prior to their involvement in TBG. However, the levels of parental support still increased after TBG (especially in their encouragement of STEM careers).

At the end of three out of the four years that data were collected, TBG participants were slightly (although not statistically significantly) more likely to report that their families would like it if they had a STEM career (increasing from 81% to 87% in 2014-15, from 75% to 84% in 2015-16, from 74% to 80% in 2016-17). (In 2017-18, 81% of girls said on both the pre- and the post-survey that their families would like it if they have a STEM career.)

A few parents mentioned that it would helpful if TBG provided more detailed information about careers and the steps to lead her daughter toward a STEM 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 [my daughter could] get into it.”

Figure 31. Some Techbridge girls reported that their families became more supportive of their interests in STEM.



Source: Matched Student Pre/Post Survey

7 Implementation and Fidelity

Windmill Blade Designs

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

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

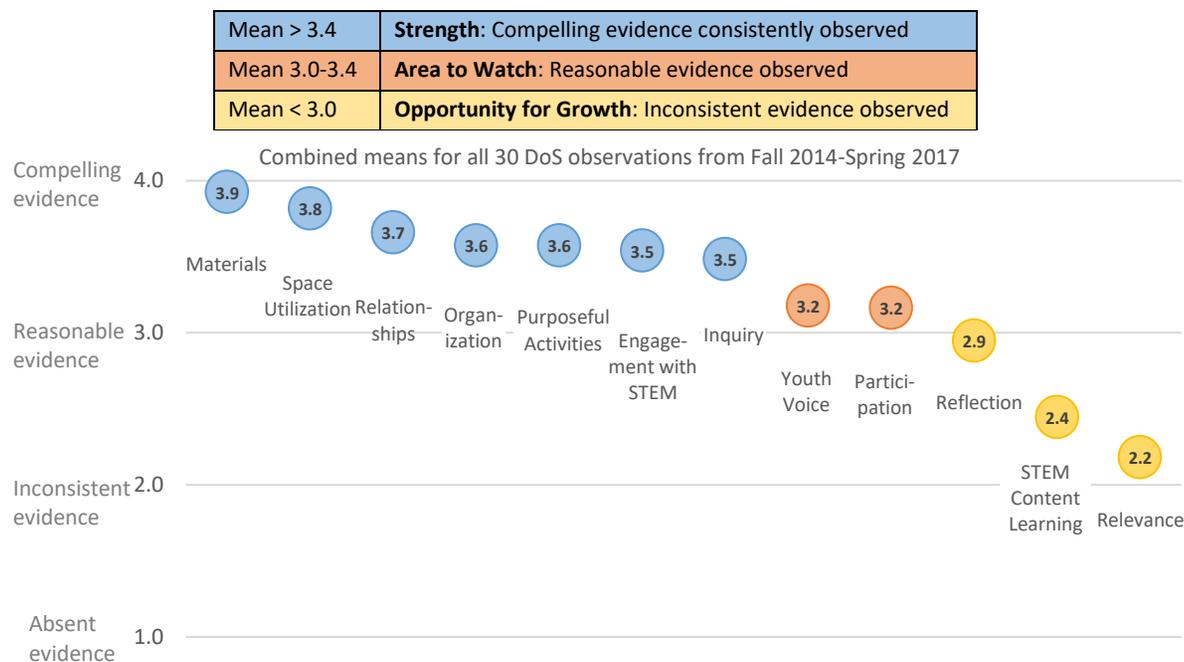
To what extent did each new program site implement the Techbridge Girls curriculum?



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

Observers from the evaluation and research teams used the Dimensions of Success (DoS) observation tool to conduct a total of 30 observations of Greater Seattle and Washington, DC programs, 10 each in 2014-15, 2015-16, and 2016-17.⁶ Figure 32 shows the average mean ratings on each of the 12 DoS dimensions. Each element was rated on a scale of 1 (“Absent evidence”) to 4 (“Compelling evidence”); DoS guidelines are that ratings of “3” or “4” indicate high quality.⁷

Figure 32. Dimensions of Success (DoS) observations indicate that TBG programs were strong in most areas.



Source: DoS Observations of 30 expansion site programs in 2014-2017 (10 each school year)

⁶ The observed programs were as follows: Fall 2014 (n = 5; Seattle only); Spring 2015 (n = 5; Seattle only); Fall 2015 (n = 3; DC only); Spring 2016 (n = 7; Seattle & DC); Fall 2016 (n = 2; Seattle only); Spring 2017 (n = 8; Seattle & DC).

⁷ A July 2017 internal memo by EDC and CERC, “Dimensions of Success Observations in Greater Seattle, WA and Washington, DC,” summarized results from all DoS observations the evaluation and research teams conducted.

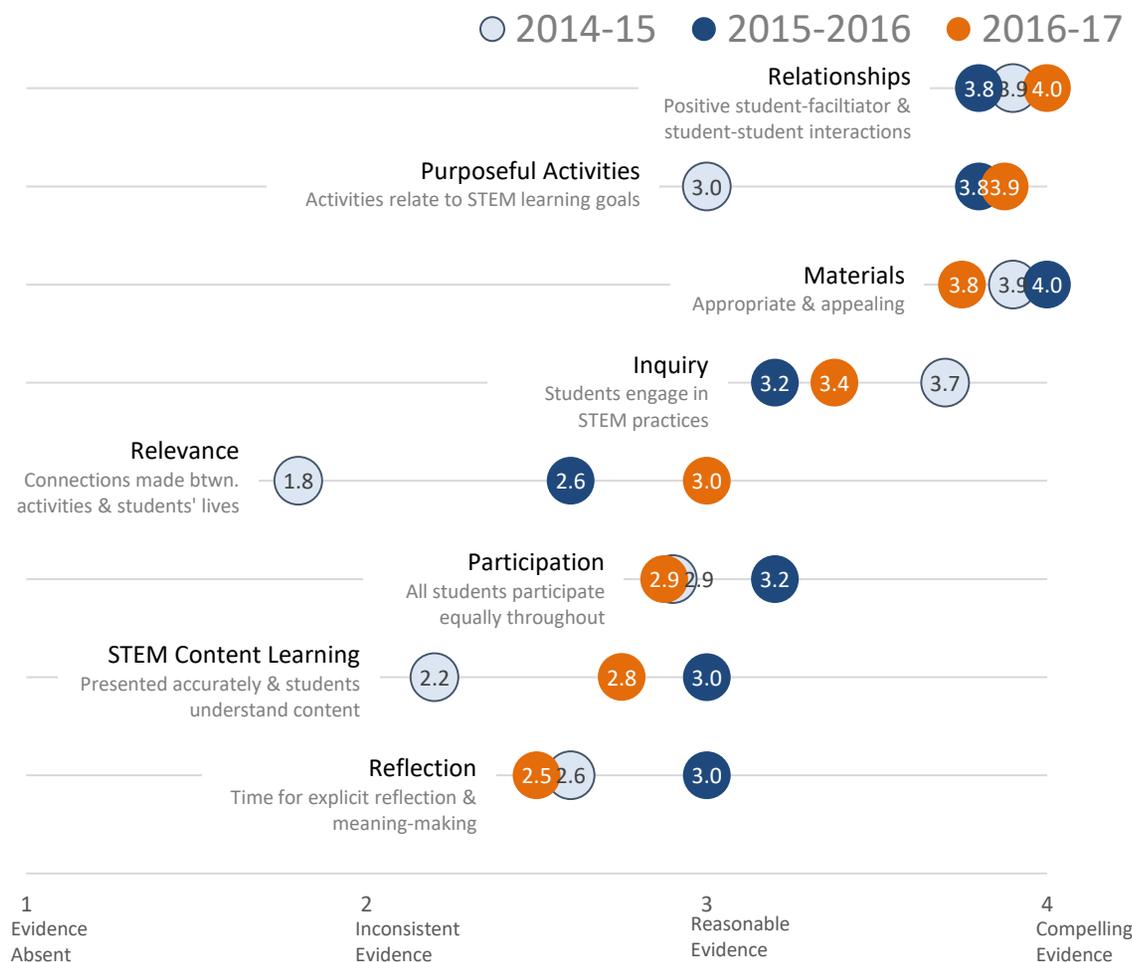
On average, the 30 observed programs showed **compelling evidence** (an average rating of ~4 on the DoS) of the following seven dimensions:

- using **materials** that were appropriate and engaging to the students
- **utilizing space** in a way that is conducive to out-of-school-time (OST) learning
- having positive **relationships** between the facilitators and students and amongst the students
- delivering activities in an **organized** manner (ensuring all materials are available and transitions flow)
- offering **purposeful** activities (where the activities clearly relate to STEM learning goals)
- having students **engage with STEM** in meaningful ways (where students do the cognitive work and do hands-on activities that help them explore STEM content)
- using **inquiry** approaches (where students had the opportunity to engage in STEM practices like observing, testing, and building explanations)

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

- **youth voice** (where youth are encouraged to voice their ideas and make important and meaningful choices that shape their learning experience)
- having consistent and equal **participation** of all the students throughout the activities.

Figure 33. The figure below shows the average Dimensions of Success ratings for each year for only the eight dimensions that were identified as important elements of the TBG model. Observed programs were consistently strong in offering STEM activities with clear learning goals, good materials, and that fostered positive relationships. Observed programs made an increasing number of connections between the activities and students’ lives (relevance) each successive year. However, ratings regarding participation, STEM content learning, and reflection were somewhat lower in 2016-17 than in the previous two years.



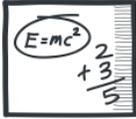
Source: DoS Observations of 30 expansion site programs in 2014-2017 (10 each school year)

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

- fostering explicit time for **reflection** and meaning-making during the activities
- **STEM content learning** (indicating STEM content was presented accurately and that students’ comments, questions and performance during activities indicated they accurately understood the STEM content)
- **STEM content learning** (showing evidence that the facilitators and students were making connections between the STEM content and activities and students’ everyday lives and experiences).

It is noteworthy that DoS ratings of most dimensions improved from fall to spring each year, suggesting an upward trend in the quality of implementation over the course of the year. In particular, observed programs received higher ratings for relevance in 2016-17 than in either 2015-16 or 2014-15, reflecting TBG’s efforts to ensure facilitators made connections between TBG activities and students’ everyday lives and experiences.

Table 8. While some observed sessions received relatively lower DoS ratings for reflection, STEM content learning, and relevance, other sessions received higher ratings. The table below shows effective examples of these dimensions.

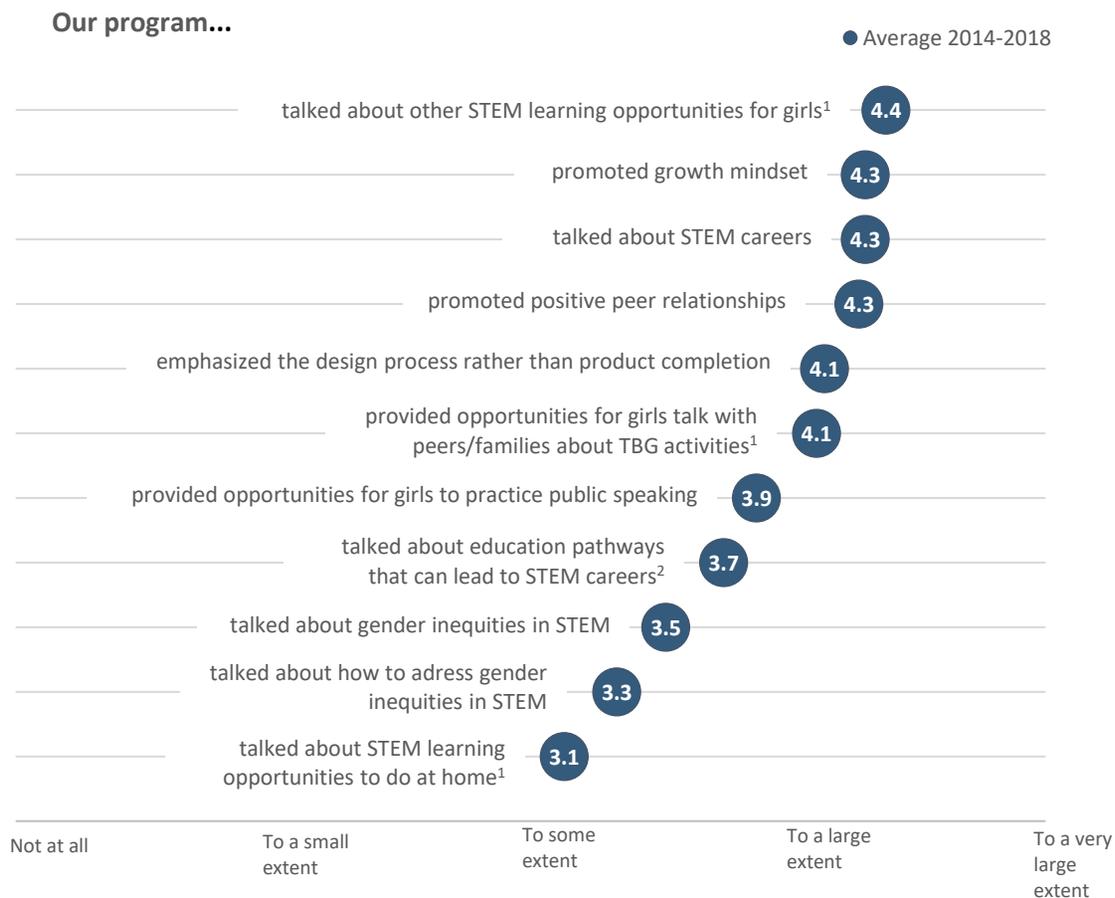
<p>Reflection</p> 	<p>In a session that received a DoS rating of “3” (reasonable evidence), the facilitators checked in with pairs of girls throughout the activity and encouraged many of them to consider their designs and refine them.</p> <p>One facilitator said to a pair, “How could you make it better?” Another facilitator 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 incorporate them.” The facilitators encouraged girls to reflect during the activity.</p>
<p>STEM content learning</p> 	<p>In one session that received a DoS rating of “3” (reasonable evidence), facilitators reviewed various concepts the girls had learned in earlier sessions, including what coding blocks and conditional statements are, and how they are use.</p> <p>Facilitators reminded girls to use what they knew about geometry to program in Scratch. One facilitator moved and danced to demonstrate how girls’ sprites would move given their program. The facilitator said, “Remember, you want to think of Scratch like coordinates.” Another facilitator said, “You want her to glide in the negative.” Students’ comments and questions indicated that students understand some of the STEM content well.</p>
<p>Relevance</p> 	<p>In one session that received a rating of “4” (compelling evidence), the facilitators made connections with how what they were doing was related to computer science careers, things they do in their everyday lives (like shopping), things the girls had seen and done during previous TBG programs or on TBG field trips, and how they might create games that were of interest to them.</p> <p>The two facilitators asked questions like, “You guys have done a lot of computer science. What are some types of problems that computer scientist might solve?” and “What problems do computer scientists make codes to solve?”</p>

TBG teachers were asked to describe the extent to which various TBG-specific elements that were not addressed in the DoS were implemented in their program (see Figure 34), including discussing STEM educational and career pathways, the engineering design process, growth mindset, peer relationships, public speaking, and gender inequities in STEM. With the exception of discussing STEM education pathways, gender inequities in STEM (and how to address them) and STEM learning opportunities to do at home, the majority of the teachers said they implemented each of the Techbridge program elements either to a “Large” or “Very large” extent.

Although teachers were less likely to report that their program talked about gender inequities in STEM or how to address them, a greater number of teachers said their program had addressed gender inequities each year. While in 2014-15, the majority of teachers said they had only talked about gender inequities to “Some extent” (and even fewer said they had talked about how to address them), by 2017-18, the majority of teachers said they had talked about gender inequities and how to address them to a “Large extent.”

One teacher explained, “I think one of those first weeks, [we spent] 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.”

Figure 34. Of the various Techbridge Girls program elements, TBG teachers were most likely to report that their program talked about other STEM learning opportunities for girls, promoted a growth mindset, emphasized the design process, talked about STEM careers, and promoted positive peer relationships.



Source: Average of 2015, 2016, and 2017 Teacher Surveys and 2018 ChangeMaker Teacher Surveys

¹ Only the 2018 ChangeMaker teacher survey asked teachers to indicate the extent to which they did the following three activities: *talked about other STEM learning/education opportunities*, *provided girls the opportunity to talk with peers/families about their activities in TBG*, and *talked about STEM learning/education opportunities to do at home*.

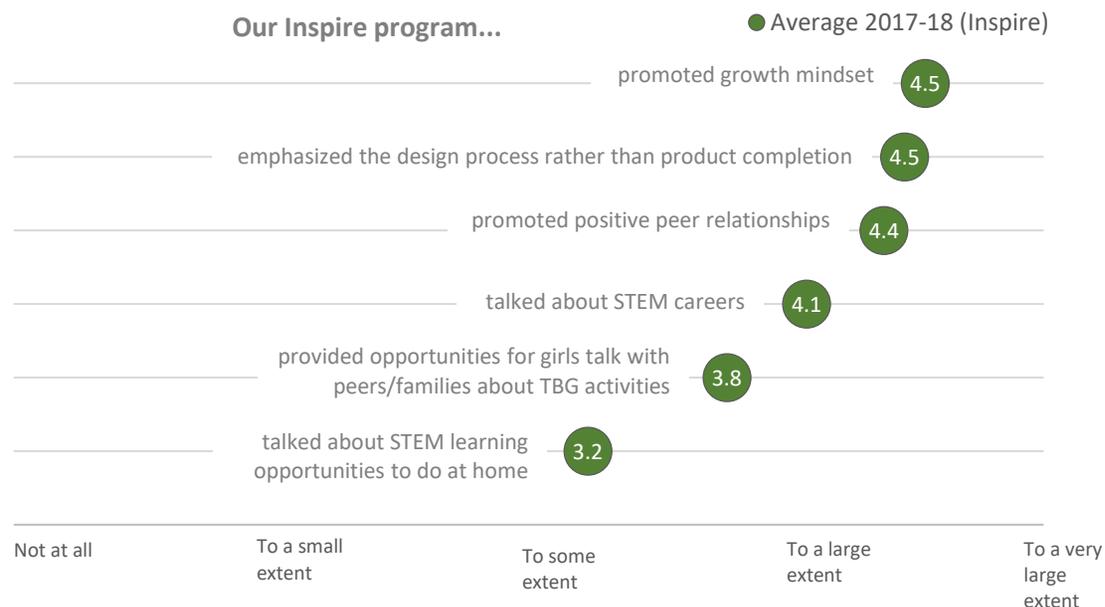
² The 2018 ChangeMaker teacher survey did not ask teachers to indicate the extent to which they *talked about education pathways that can lead to STEM careers*.

However, one teacher thought TBG could do even more to prepare girls for gender inequities in STEM:

“Rather than being embedded in a program schedule, there were some discussions of the issues facing girls in STEM that were not very engaging and made inaccurate assumptions about my students. For example, many of my students believe that it is girls, not boys, who ‘naturally’ excel in math and science. They also do not think of themselves or identify as ‘low-income,’ even if they do qualify for FRPL [Free and Reduced Price Lunch]. This is not to say that they are unaware of the realities outside of our school, but to suggest their experience so far in school will mirror one particular experience of women feels inauthentic. Role models that can speak to this different experiences clearly were better. For example, noting that they excelled in science and math in school, but then got to college and found that there were fewer people from communities like their own OR went to an HBC intentionally so that they could continue to learn in a community that felt inclusive to them.”

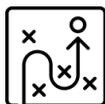
The 2017-18 Inspire teachers were asked to describe the extent to which they implemented various TBG-specific elements in their program (see Figure 35). The majority of Inspire teachers implemented four of the six TBG elements that were asked about to at least a “Large extent,” including promoting growth mindset, emphasizing the design process, promoting positive peer relationships, and talking about STEM careers. Similar to the ChangeMaker teachers, Inspire teachers were least likely to report talking about STEM learning opportunities to do at home.

Figure 35. Inspire teachers reported that they implemented four of the six TBG elements that were asked about to at least a “Large extent,” including promoting growth mindset, emphasizing the design process, promoting positive peer relationships, and talking about STEM careers.



Source: 2017-18 Inspire Teacher Surveys (n = 13)

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



During the first three years of expansion, the expansion sites and Bay Area programs differed somewhat in staff structure and responsibilities, program implementation, and school district involvement. Beginning in 2017-18, Techbridge Girls made significant changes to its program model for elementary school students and changed the responsibilities of Program Coordinators, in part to create greater consistency across sites.

The Year 2 and Year 3 evaluation reports (covering data from the 2014-15 and 2015-16 school years, respectively) described the differences between the expansion sites and Bay Area programs in some detail. These differences included the number of staff in each location and the greater role that the Highline Public Schools have had in working with TBG to select schools.

As part of an effort to increase the reach and sustainability of its afterschool programming, TBG made significant changes to its afterschool program model in 2017-18. The changes were implemented in all three geographic regions. The elementary model changed most significantly. Rather than a co-teaching model (where a TBG staff member and a teacher implement the program together), teachers implemented the program by themselves. Called “Inspire,” the elementary program was 12 weeks instead of a full school year. TBG provided a new model of training and support to Inspire teachers along with curriculum and kits with all of the materials. Inspire teachers were encouraged to host a Family Night and plan field trips to local STEM

companies or higher education institutions, but TBG did not organize these activities.

The middle school model—now called ChangeMakers—continued essentially unchanged. A TBG staff member co-facilitated each program with one teacher, field trips and role model visit remained integral program components, and the program met weekly throughout the school year. TBG introduced a new community-based project to the middle school curriculum in 2016-17, and made it a larger focus of the program in 2017-18.

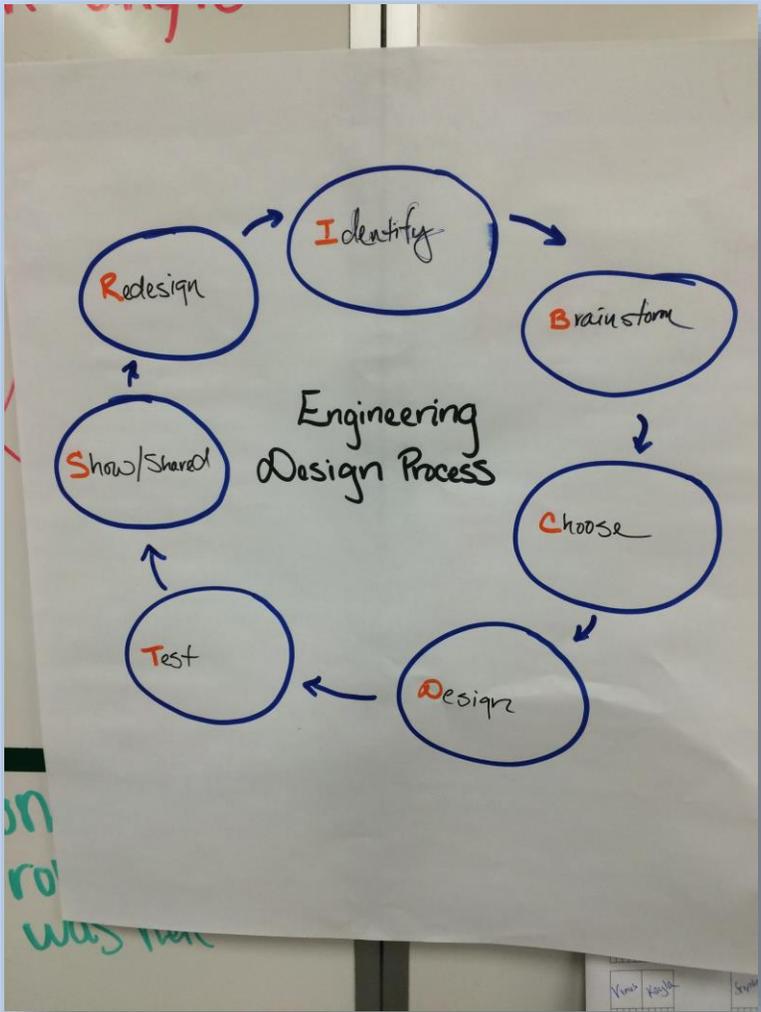
The role of the Program Coordinator at the middle school level shifted somewhat (and became known as a Program Manager in 2017-18), and included more responsibility for serving as the liaison with school leaders.

TBG temporarily suspended its high school program as it rolled out the new Inspire model and the revamped ChangeMakers middle school program.

Table 9. There were some differences in implementation between regions during the first two years of expansion.

	<p>The Greater Seattle and DC expansion sites had fewer staff (3-4 staff at each location versus more than 10 in Oakland). The small office size meant fewer people to interact with and from whom to receive informal support. On the other hand, the expansion sites were more insulated from the staffing transitions and associated stress that occurred in the TBG Oakland office during Years 3 and 4 (2015-17), including changes in the professional development and the development and communications staff.</p>
	<p>The expansion site Executive Directors (and PCs) were responsible for cultivating relationships with local STEM partners, including businesses, educational institutions, funders, and donors.</p>
	<p>Many of the Greater Seattle and DC expansion site programs were 90 minutes long, while the Bay Area programs were 120 minutes.</p>
	<p>Greater Seattle site a tighter connection to the school district than the Bay Area or DC. Highline Public Schools decided which schools should have TBG programs, helped identify partner teachers, met with TBG staff regularly, and visited programs and attended Family Nights.</p>

8 Organizational Capacity



What factors emerged as important during the scale-up effort?



The expansion stretched Techbridge Girls’ infrastructure. Staff at headquarters and expansion sites identified and responded to gaps in communication and systems. Overall, flexibility, adaptability, and resilience were all key to TBG’s continued success.

A number of factors emerged as important during the scale-up effort.



Fostering connections between and among the expansion sites and the central office.

During the early years of the expansion, TBG staff from Greater Seattle and Washington, DC reported sometimes feeling disconnected from the Oakland central office and excluded from important decisions. Senior leadership heard these concerns and responded. Senior leaders—including the new TBG CEO, the Vice President of Programs and Strategic Partnerships, and the Director of Curriculum—visited the expansion offices and/or programs on multiple occasions. Staff in both the Greater Seattle and DC offices commented how they appreciated these visits.

In 2017, for the first time in the history of TBG, the majority of TBG staff were based outside of Oakland. Multiple staff also said that the fact that the VP of Programs and Strategic Partnerships was based in DC rather than Oakland—a position change that happened in 2017 and the first time that TBG had a senior leader based outside of the central office—helped facilitate cross-site communication and sensitivity to issues specific to expansion sites. In general, staff from TBG expansion sites reported feeling more connected to other parts of the organization by the end of the five-year grant period.



The need to develop new organizational systems.

Several TBG staff said that scaling up the afterschool program to new geographic regions created more strain on the organization as a whole than they had anticipated. As one TBG staff member said, “We didn’t account for what the effect would be on TBG as an organization.” Systems that had worked in Oakland were not efficient or possible to implement in other regions. The timing of the expansion sites coincided with an uncharacteristic amount of staff turnover at the central office—with positions left vacant for a period of time—which added to the strain of incorporating expansion sites. The growth put a strain on central operational systems, contributing to confusion and frustration. “Headquarters was cracking,” said one leader. TBG responded in a variety of ways, including creating new staff positions, developing written manuals, and creating more robust electronic systems. TBG leadership also decided not to expand to a third city.



The role of the “mother ship” (i.e., the central office in Oakland, CA) in relation to the expansion sites.

One TBG leader said, “We haven’t figured out a balance yet of how much decision-making power to distribute to the field.” Staff at expansion sites felt as though organizational decisions were sometimes made based on what was going on in Oakland, without equal consideration for what might be most appropriate for expansion sites. In addition, TBG staff commented that they were hoping for more support from the central

office on tasks such as marketing, communications, and grant writing. Staff noted that this disparity was likely in part due to staff turnover and lack of capacity in Oakland.



The need to identify new staffing models and support staff in these new roles.

As the scale-up project progressed, Techbridge Girls created, eliminated, and morphed multiple staffing positions at all levels of the organization.

A key ingredient to the success of the afterschool model was TBG’s ability to hire highly qualified staff who formed strong relationships with girls, teachers, and school leaders. As one TBG staff member said, “There’s something really special about people we hire. They are unique and powerful. They’re unicorns.”

In late spring 2017, TBG announced changes to the Program Coordinator positions, renaming them “Program Managers” (with the Inspire Program Managers having new responsibilities for providing professional development support to elementary teachers rather than implementing the program themselves; Program Managers for ChangeMakers would be at middle schools, still sharing responsibilities with teachers for facilitating the programs), and requiring current staff to apply for the new positions. While staff generally understood the reasons for the changes, the transition to new staffing model was somewhat bumpy and occurred during a busy time wrapping up the program at schools. Staff did not perceive that their worth and abilities were known to the organization and did not feel they were able to decide what position would be the best fit.

TBG is still figuring out the appropriate mix of responsibilities for PMs. For example, PMs spent more time putting together kits for Inspire than anticipated.

The Executive Director positions in the expansion sites were newly created as part of this project. The success of the regional ED model—together with staffing departures in Oakland—created an opportunity to replicate the ED model in Oakland.

Staff at multiple levels said it is important to provide appropriate professional development and supports to develop and retain TBG’s talent. For example, expansion Executive Directors said it would be helpful to receive more professional development to help them in their roles, including on fundraising, hiring, and HR.



The need to develop a more diverse funding base (including large government and/or private multi-year grants, individual donors, partnerships with school districts and other nonprofits).

TBG as a whole has faced financial challenges, in part because two large private foundations that provided significant funding to the organization for many years “sunsetting” their operations about mid-way through the NSF AISL-funded scale-up project. As one staff member explained, “We realized in 2016 we didn’t have diversity of funders. We’re just climbing out of it.” Turnover in the central office’s development staff also slowed fundraising efforts. TBG leadership recognizes the need to develop a more diversified and robust funding base, with a mixture of long- and short-term funding, grants from public and private sources, fee-based revenue, and donations. The expansion sites have stepped up their fundraising efforts and developed partnerships with nonprofits and companies in their regions, while the central office is leading organization-wide development efforts.



There is no roadmap for scale up; expect detours.

Although TBG had already existed for more than decade when it began the expansion project, some staff described that the recent scale-up period as “feeling like a start-up.” As one staff member said, “We’re on the precipice of being a large organization, even though we [already] act like one sometimes.” Organizational change can be painful. During start-ups and transition periods, motivating and valuing staff are especially critical. TBG staff (and even teachers and school partners) needed to be flexible.

What unanticipated issues and opportunities emerged that affect TBG’s expansion? How do they affect the expansion? How does TBG address these issues and opportunities?



TBG experienced staffing changes throughout the length of the project, which both gave rise to new opportunities, and also strained remaining staff and systems. TBG leaders estimated they on- or off-boarded more than 60 staff from 2014-2018. Staffing changes can create opportunities to introduce fresh ideas, but can also lead to confusion, distraction from ongoing work, additional work covering for vacant positions (plus the time to hire and train new staff members), and the loss of important institutional knowledge.

With the addition of the Greater Seattle programs in 2014 and the Washington, DC programs in 2015, the total number of TBG after-school programs 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 fast growth strained the operations side of the organization, including development, communications, and accounting.

A number of senior staff from the central office who played a key role in leading the expansion effort and supporting the TBG expansion sites departed during the five years of the expansion grant, including TBG’s founding Executive Director, the Chief Operating Officer, the Chief Growth and Strategy Officer, the Research and Evaluation Manager, and the Director of Development. (See Table 10 on the following pages for a timeline of the personnel and organizational changes.) These departures resulted in a cascade of effects. A larger portion of grant-writing responsibilities fell to the expansion EDs, who, in turn, delegated more responsibilities to their PCs. The TBG staff member responsible for interfacing with the evaluation and research teams changed four times over the course of the project.

Changes in senior leadership also meant that TBG’s strategic planning process—originally begun about the same time the NSF AISL-funded project began—was temporarily suspended. During that time, the expansion site Executive Directors needed to make decisions regarding the scope and structure of their programs (such as whether to begin high school programing in Greater Seattle) without the guidance of an overall plan.

In spite of these changes, TBG has continued to attract talented individuals to replace those who have left. As one TBG staff member explained:

“Techbridge is really resilient. It’s kind of strange that they loosely held together, but it’s holding... I think that the organization has a strong enough foundation to be able to drop in a [Program Manager] and she can run with it, run with her tasks without having a lot of experience or even historical knowledge to run Inspire. But I also learned that there’s a lot else we could improve.”

“I think the people who work for Techbridge are amazing. Whether they’re here for three months, six months, or five/six years, everybody’s extremely talented, extremely committed to the mission. Techbridge anchors everybody to the mission very well... When you have a strong mission like Techbridge does, you tend to attract people that want to work with, and for, a strong mission.”

Techbridge Girls Staff Member

Table 10. Techbridge Girls experienced numerous staffing transitions and other organizational changes over the five years of the expansion grant.

	Year 1: 2013-14	Year 2: 2014-15	Year 3: 2015-16	Year 4: 2016-17	Year 5: 2017-18
 Techbridge Girls Overall	<p>Planning year for expansion</p> <p>TBG begins organization-wide strategic planning process</p>	<p>In spring 2015, TBG decides not to expand to a third city and to delay adding high school programs in Greater Seattle until 2016-17</p>	<p>With senior leadership changes, TBG puts strategic planning process on hold</p>	<p>Under new CEO's leadership, TBG restarts strategic planning process</p>	<p>Inspire program for elementary students launched</p> <p>New Program Manager (PM) positions created (staff re-applied for positions)</p>
 Greater Seattle, WA	<p>First Greater Seattle Executive Director (ED) hired in January 2014</p> <p>Two Greater Seattle Program Coordinators (PCs) hired in summer 2014</p> <p>3 of 7 principals from schools that agreed to host TBG leave their schools in summer 2014; all replacement principals supportive of TBG</p>	<p>1st year in Greater Seattle</p> <p>First Greater Seattle ED resigns in February 2015</p>	<p>New Greater Seattle ED begins in July 2015</p> <p>One of two Greater Seattle PCs departs in early fall 2015</p> <p>Replacement Greater Seattle PC starts in fall 2015</p>	<p>First high school program launches at one school</p> <p>Part-time PC and intern hired</p>	<p>High school program suspended pending strategic plan</p> <p>PM hired in summer 2017</p> <p>Office relocates from Renton, WA to Burien, WA</p> <p>PM resigns fall 2018</p>
 Washington, DC	<p>Did not exist</p>	<p>First Washington, DC ED begins in March 2015</p> <p>2 DC PCs hired in summer 2015</p>	<p>1st year in Washington, DC</p> <p>Washington, DC ED became Interim Head of Programs while continuing to manage DC expansion site (summer 2016)</p>	<p>Former DC ED becomes Vice President, Programs & Strategic Partnerships</p> <p>New Washington, DC ED hired in February 2017</p> <p>Part-time PC hired</p> <p>Both full-time DC PCs depart in summer 2017</p>	<p>PM and additional PC hired in summer 2017</p> <p>1 PC departs mid-year</p>
 Oakland, CA	<p>No known changes</p>	<p>Bay Area Senior PM departs in fall 2014</p> <p>Two Oakland-based staff who support the project (Chief Growth & Strategy Officer and</p>	<p>Research and Evaluation Manager position is created in July 2015</p>	<p>Chief Operating Officer (COO) departs at the end of April 2017</p>	<p>New California ED begins in October 2017</p> <p>New COO begins in winter 2017</p>

Year 1: 2013-14	Year 2: 2014-15	Year 3: 2015-16	Year 4: 2016-17	Year 5: 2017-18
	<p>Director of Curriculum) are on leave</p> <p>Director of Development and Communications position is vacant</p> <p>Turnover in PCs</p>	<p>TBG's founding ED retires in December 2015</p> <p>Interim ED/CEO serves part-time from December 2015 – June 2016</p> <p>Chief Growth & Strategy Officer, who oversaw implementation of the expansion grant, resigns in June 2016</p> <p>Research and Evaluation Manager position eliminated in June 2016</p> <p>New CEO begins in July 2016</p> <p>Multiple staff in Development and Communications department leave over course of the year</p> <p>Turnover in PCs</p>	<p>Continued turnover and vacancies in the development staff</p> <p>Headquarters relocates to new office in Oakland, CA</p> <p>Turnover in PCs</p>	<p>Turnover in PMs/PCs</p>

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



Issues of sustainability were a consideration in planning the expansion, with a design to steadily build capacity of the regions to be self-sustaining. Sustainability became a key concern of TBG as a whole and was part of the reason for changing the program model in 2017. The loss of two major funders created financial pressures, and changes in the Oakland-based development staff meant that fundraising for the expansion sites took more time to develop than originally anticipated. However, both Greater Seattle and Washington, DC applied for and received local grant funding. Both expansion sites have established regional advisory councils that will have a role in helping to secure additional local sources of support.

TBG originally planned for the expansion sites to become self-sustaining within three years. The original expectation was that the local Executive Directors 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 TBG’s national Director of Development. Schools and/or districts hosting programs would also be expected to contribute more funding to have TBG continue at their schools.

Changes in TBG staff have meant that more complex fundraising and development activities have been delayed or taken more time. As one TBG leader said, “I don’t know how you would have implemented this better, but in terms of both programs and fundraising, they both rely so much on relationships. Relationships take a really long time.” Some staff suggested that it would be helpful for expansion site

leaders to receive additional training in fundraising and development.

The Executive Directors of Greater Seattle and Washington, DC have recruited and formed advisory councils whose primary role is to help them recruit local supporters (e.g., role models and field trip sites) and develop a local funding base. One member of each council also serves on TBG’s national board. One TBG leader said, “My advisory council is the reason I’m able to do this work.” One advisory council member helped create a marketing video of her interviewing an Inspire teacher.

Both advisory councils have experienced some turnover, and the regional EDs have recruited (or plan to recruit) additional members. TBG would like to have advisory board members who can contribute more financially to the organization: “You need people for whom [giving] \$10,000 is no big deal. We don’t have anyone like that.” “Another plan is just to get them from giving at four digits to five digits—so from \$1,200 dollars to \$15,000. That’s the goal.”

“[Techbridge Girls has] turned out to be one of our stronger partners in terms of what they’re bringing to the table...I appreciate that they’ve gone out and looked for additional funds to sustain programming because that doesn’t always happen with our partners. For me, that exceeded [my] expectations because most partners are, ‘Either you give me the money or I can’t provide programming.’ I appreciate [the ED’s] willingness to work in collaborating and continuing to find opportunities to fund the programming.”

Techbridge Girls District Partner

Although TBG faces financial challenges, both expansion sites secured additional funding during the last two years. Washington, DC received funding from Boeing to add a half-year program at an additional elementary school, and from *STEM for Her* to fund field trips. Greater Seattle received a three-year grant from Samsung. The Greater Seattle staff and Advisory Board has organized publicity and fundraising events. The Greater Seattle Area Executive Director collaborated with the Highline Public Schools on their Race to the Top renewal application which allowed them to implement a pilot family engagement program with the Somali Youth and Family Club in 2016-17. The Highline school district funded a one-week summer program in August 2016. However, TBG leaders report that school funds remained “tenuous” in the current funding climate. Both Washington, DC and Greater Seattle may explore the possibility of expanding into one or more neighboring school districts to expand their reach and diversify their base.

The amount TBG asks schools to contribute to their program was considered high by a few school administrators and may be prohibitive to schools with budget issues. One administrator said, “The challenge with Techbridge is that the cost is too much. It’s unaffordable for what it is—only one hour, or an hour and a half once a week... Compared with other afterschool programs, it’s very expensive.”

In an effort partly to make TBG’s elementary afterschool model more cost effective, the organization rolled out Inspire, a more streamlined program for elementary school girls. With Inspire,

TBG can reach more girls at less cost by having teachers as the only program facilitator and shortening the program length. As one TBG staff member explained:

“Inspire has the potential to serve a lot more girls. ChangeMakers, at best, the manager has four programs; each one has at most 20 girls, and probably more have 15 girls. You’re just looking at numbers of girls, which is a ridiculous measure, but funders care about it. Inspire really has the potential for that.”

TBG is also exploring expanding its professional development into a more substantial fee-for-service

“We can’t be the Black Girls Code and we can’t be the Girls Who Code with the 25 million dollar budgets, right? But can we be the Intel chip that everybody depends on to make their programs work in the best way possible? Which means we also have the best programs possible. So the Intel chip is [that] we help other programs, other organizations run their work and at the same time, we also do quality work every day.”

Techbridge Girls Staff Member

model, and adding afterschool programs in community based organizations.

Participating girls, parents, teachers, principals, and district staff were almost universally very positive about TBG and eager to see the program continue. Teachers felt TBG was a valuable and high-quality program leading to positive outcomes. One teacher said:

“I am impressed with the program and with the people that work for TBG and how easy it has been to work with [my TBG staff member], 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.”

Principals were universally appreciative of TBG. One principal said, “It’s been great. It’s gone beyond my original expectations.” 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 findings from throughout TBG’s summative evaluation.

Teachers/Schools

 **Continue effective aspects of the teacher training, such as tinkering at the in-person trainings and coaching or debriefing with a TBG staff member.** Teachers especially valued the chance to learn the curriculum and activities and think about how to help students do the activities.

 **Inspire teachers, especially those who were new to TBG, might benefit from visiting another TBG program to observe and learn.** While logistically challenging, the opportunity for peer learning is potentially rich.

 **Strengthen teacher training in culturally responsive and gender responsive instruction.** Items on culturally responsive and gender responsive instruction were included in teachers’ surveys in 2017-18 and teachers indicated less growth in these areas compared to others.

 **Provide teachers with more resources about education pathways toward a career a STEM.** For all four years of data collection, this area had the lowest impact.

 **Consider additional creative ways to keep principals and school district leaders informed about the program and ideas for how to support the program.** For example, one Greater Seattle principal

suggested TBG invite principals to visit their school’s TBG program together with the Executive Director.

Role Models

 **Consider adding more field trips and more role model visits, even for Inspire students.** Opportunities to meet people, especially women, working in STEM and/or see professional STEM workplaces, were very impactful for TBG girls. Field trips were valuable and “mind-opening” opportunities that most students did not have outside of TBG.

 **Send role models an overview of the activity that will be conducted during the day of their visit,** including the concept, questions to ask the girls, and other suggestions of how to support the learning.

 **Recruit a diverse pool of role models.** Consider a greater social media presence; recruiting students and faculty from local colleges and universities; and connecting with professional organizations and tech company’s affinity groups.

 **Consider how to offer continuing professional development for returning role models.** As more role models are returning year-after-year with TBG, consider how to provide new information to continue to build their capacity and ensure they are fully engaged.

Families



Share best practices for increasing family engagement and attendance at Family Nights across schools and regions. Teachers, principals, and TBG staff have identified effective strategies for communicating with families and structuring Family Nights to attract the most families.



Continue to inform and engage families in TBG. Families were appreciative of the updates about what their daughters do in TBG. A few parents were eager to know even more or to become involved in TBG activities. Some parents were interested in joining field trips. Involving family members as role models is another possible way to engage some families.



Continue to ensure TBG's written and oral communications are accessible to all girls' families. Teachers and principals said it was valuable to have TBG's written materials (including enrollment paperwork, family guides, and surveys) translated into other languages, and thought materials should be translated into additional languages. A small portion of families said they did not receive information from TBG, such as the Holiday Activity List or the Summer Program Guide, even though they were very interested in these materials.

Program Design, Curriculum, and Professional Development



If TBG expands to new cities, consider school districts that are interested in having close partnerships, as with Highline Public Schools. Having a district identify schools and offer support and coordination could be a more efficient way of reaching a pipeline of girls.



Consider strategies to address the challenge of recruitment and retention of girls at middle schools. Recruitment and retention was particularly a challenge in middle school TBG programs. Programs experimented with different strategies to get more participants in TBG. Putting systems in place that provide means to track effective strategies and share across all sites would be valuable. Some stakeholders suggested TBG allow girls the option to participate in the program on a quarterly or semester-by-semester basis rather than commit for the entire year.



Incorporate additional scaffolding in the curriculum regarding science-related content. Feedback from teachers and Dimensions of Success observations suggest that STEM content is an area of growth for TBG.



Find additional ways to show program staff and teachers what TBG 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 staff to observe one another's programs during the year.



Provide more information and resources to girls and families on education pathways toward a career a STEM. According to teachers, girls are very aware of the career opportunities in STEM, but not as much information was shared on educational tracks to obtain those careers.



Investigate cumulative program outcomes for girls who participate in TBG for multiple years. As DC and Seattle are seeking to provide a TBG experience that would be offered for girls throughout their K-12

education (available to them in elementary, middle and then high school), they should theoretically experience a higher level of impact.

9.2 Conclusion

In summary, Techbridge Girls successfully established afterschool programming for elementary and middle school girls in two new regions of the U.S. TBG successfully enrolled girls from groups that are underrepresented in STEM (racially diverse, low-income, and first generation to college). Participating girls, parents, teachers, principals, and school district personnel almost universally praised the program for its high quality programming, the responsiveness and quality of TBG staff members, and for the positive experiences it provided for girls.

TBG had a positive impact on participating girls. TBG’s supportive learning environment and hands-on STEM activities gave girls opportunities to become familiar with the engineering design process, become more confident in themselves and their STEM abilities, and more aware of STEM career opportunities. A number of participants said the TBG curriculum, role model visits, and field trips helped them learn about careers in STEM that they had not previously heard of, and motivated them to consider pursuing a STEM career. The program had an especially strong influence on girls’ understanding of practices and process commonly used in STEM, such as the engineering design process. TBG girls were also somewhat more likely than non-participating students to report a greater sense of belonging in STEM; knowledge of STEM educational and career pathways; and increased interested in STEM and STEM careers.

The expansion to two new regions was not without growing pains. TBG experienced major staffing changes throughout the length of the project, which gave rise to new opportunities, but also strained remaining staff and internal systems. Partly as a result, TBG leadership decided not expand to a third geographic location as originally planned, and instead focused on strengthening the expansion sites and central systems.

Sustainability became a key concern of TBG as a whole. The loss of two major funders created financial pressures, and changes in the central office development staff meant that fundraising for the expansion sites took more time to develop than originally anticipated. In order to become more sustainable and extend TBG’s reach, TBG leadership also decided to change its elementary school model in 2017 to one that could potentially reach more girls while requiring less Techbridge staff time.

The new elementary program, named Inspire, had a successful first year. Girls enjoyed the 12-week program and reported a positive impact on their interest in and attitudes toward STEM. Teachers generally reported that TBG’s supports were sufficient for them to implement the curriculum. Some girls and teachers who had participated in the previous version of the afterschool program wanted a longer program and missed the field trips and role model visits, which data suggest were particularly powerful ways to engage, inform, and motivate girls in STEM.

Two key challenges going forward will be identifying additional funding and retaining the highly talented staff TBG that has continued to attract (or recruiting more such “unicorns”).

TBG has proven to be flexible and nimble in maintaining high quality programming throughout the last several years amidst the expansion and staffing-related challenges. Continuing to successfully navigate these challenges, addressing funding issues, and using the recent strategic plan as a guide will help Techbridge Girls to keep having a high impact on girls, whether they are in the current schools or regions, new regions, or reached through other means, such as professional development for educators.