2013 -14 STEM Learning Community Evaluation

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EXECUTIVE SUMMARY

The San Francisco Department of Children, Youth and their Families (DCYF) and Techbridge partnered to implement the 2013-14 Science, Technology, Engineering and Math (STEM) Learning Community for DCYF-funded after school programs in San Francisco. The Learning Community included monthly training meetings, one-on-one coaching and STEM Curricula and resources.

This evaluation of the 2013-14 STEM Learning Community uses staff surveys, focus groups, and Trainer and Coach interviews to assess participants' knowledge gains, degree of practice change, and the quality of participants' training experiences. Youth surveys describe how youth benefited from STEM activities facilitated by Learning Community members.

Findings

The Learning Community members gained knowledge about the engineering design process and Next Generation Science Standards. Staff already had positive beliefs about creating equitable STEM opportunities, particularly for girls and traditionally underserved youth.

- Prior to attending the STEM Learning Community, only 14% of elementary school staff and 43% of middle school staff felt that they were knowledgeable about the engineering and design process. At the end of the year 100% of elementary and middle school staff reported being familiar with the engineering and design process.

- The percent of elementary school staff and middle school staff who reported being knowledgeable about Next Generation Science Standards increased by 70% and 55%, respectively.

- Staff unanimously agreed (100%) with the statement that it is important to turn girls onto science as much as boys, both before and after their experience in the Learning Community. Knowledge of how to do so increased after participation in the Learning Community; 100% of staff reported knowing how to create an equitable learning environment at the end of the year, an increase of 50% for elementary staff and 14% for middle school staff.

The Learning Community members reported large gains in the process knowledge required to lead STEM activities, but may need to strengthen their STEM content knowledge.

- At the end of the year, seventy-five percent (75%) more elementary school staff and 50% more middle school staff reported knowing the steps necessary to teach STEM concepts effectively, as compared to at the beginning of the year.

- Observations demonstrated that staff consistently implemented STEM activities that had a clear learning goal.

- Observations and STEM Coach interviews indicated that staff were not consistently supporting youth in better understanding STEM content. Site visit ratings about the strength of STEM Content (2.0 for elementary and 2.4 for middle) were among the lowest rating for STEM activities.

Youth survey results showed that youth were supported, interested, and engaged in STEM activities. Programs made need support helping youth make connections between their STEM learning and their lives outside of the program.

- In the youth survey, participants reported in large numbers (88% of elementary and 78%of middle school youth) that their after school STEM program made them want to learn more about STEM.

- Youth also reported that staff were largely supported youth to learn: 86% of elementary youth and 81% of middle school youth shared that staff supported their learning by answering their questions about STEM.

- Sixty-eight percent (68%) of middle school youth and 73% of elementary school youth reported that the they learned things that really mattered to them in the after school program. Site visit scores about Relevance, or connections to youth lives and communities, for middle (2.4) and elementary (2.0) school programs suggest that this is an area for growth.

The following recommendations recognize and are built from the Learning Community's particular challenges and areas for improvement.

Recommendations

Offer opportunities for Learning Community members to observe experienced STEM facilitators to boost staff members' content and instruction skills. The STEM Coach found that staff learned the most from observing STEM activities led by an experienced facilitator. In addition, some staff mentioned wanting to see others lead STEM activities. Observations of STEM activities could take place at Techbridge sites or at participating Learning Community sites. This happened informally during the Learning Community this year, and could be strengthened if offered as a formal opportunity.

Provide program staff with strategies to use when they are unfamiliar with the STEM content. The STEM Coach interview and site visits suggest that program staff can improve their STEM content knowledge. Providing in-depth training on STEM content is not the focus of the STEM Learning Community, however. Instead, staff would benefit from learning show to respond to youths' questions when they are unfamiliar with the STEM content.

Encourage programs to make STEM implementation goals. It was difficult to assess if there was an increase in youths' exposure to STEM as it was unclear how often programs were implementing STEM prior to participating in the Learning Community. If Supervisor Representatives set goals about how often they will deliver STEM activities and the number of youth they will involve, then the number of STEM offerings and youth attendance could be used to track programs' progress toward their goals.

Develop a plan to mitigate the effects of staff turnover and mid-year program changes. In interviews STEM Trainers cited staff turnover as a challenge to implementing the STEM Learning Community. A plan to address staff turnover could include a review packet for all Learning Community members, complete with materials from prior meetings and a meeting with new staff. STEM Trainers should consider training Supervisor Representatives to lead these orientation meetings with new staff.

Provide additional coaching for Learning Community Participants who struggle with classroom management. The site visitors and STEM Coach noted that staff who did not have strong classroom management skills struggled to facilitate quality STEM activities. DCYF provides on-site coaching to sites for core skills such as classroom management. DCYF should consider allowing the STEM Coach to refer staff members to additional on-site coaching support.

OVERVIEW OF THE STEM LEARNING COMMUNITY

The Department of Children, Youth and their Families (DCYF) and Techbridge partnered to implement the 2013-14 Science, Technology, Engineering and Math (STEM) Learning Community (LC) for DCYF-funded after school programs in San Francisco.

The goals of the STEM Learning Community are to:

- Build the capacity of after school direct service providers to deliver inquiry-based informal STEM education; and
- Provide high quality informal STEM education opportunities to youth.

In addition to the goals above, STEM Trainers tried to expose staff to the issues of racial and gender equity in STEM. Trainers also focused on showing staff how to engage youth in inquiry or the practice of investigating a topic to answer a question.

DCYF and Techbridge selected 24 elementary and middle school programs to participate in the STEM Learning Community through a competitive application process. Two STEM Trainers from Techbridge facilitated the STEM LC and partnered with a consultant to provide on-site coaching. The STEM Trainers have over 3 years of experience facilitating LCs or similarly structured professional development sessions (like Learning Institutes) and a wealth of knowledge about STEM.

STEM Learning Community Model

The Learning Community members received in-depth professional development including monthly trainings, coaching, and curriculum resources with the goal that they would use what they learned to implement STEM activities in their programs[1].

STEM Trainers facilitated 20 LC meetings during the 2013-14 program year. Monthly Learning Community meetings were held separately for elementary and middle school staff; each group participated in 10 LC meetings. Each site was expected to send a supervisor representative (e.g., supervisor representative, program director, executive director) and a line staff representative.

[1] Three sites used a Train the Trainer (ToT) model for the STEM Learning Community. In this model participating staff trained other staff at their site, who then implemented STEM activities. One of the ToT model sites is not currently funded by DCYF. The data collected at ToT sites is presented in Appendix A.

During LC meetings line staff learned about the engineering design process, practiced facilitation strategies, and were introduced to STEM activities. The STEM Trainers focused heavily on modeling and practicing STEM lessons to help staff become more adept at leading STEM activities generally. The meetings were also opportunities for staff to share their experiences leading after school STEM activities.

Engineering Design Process

- ✓ A step-by-step approach to problem solving used by engineers.
- ✓ Key steps in the process include brainstorming, designing, testing, and re-designing.

Supervisor Representatives also participated in LC meetings. For several LC meetings, STEM Trainers led breakout sessions with Supervisor Representatives only. In these sessions, the STEM Trainers helped Supervisor Representatives think through how to bring a stronger STEM focus to their programs and to develop strategies to continue offering STEM activities even after the LC was over. STEM Trainers also supported Supervisor Representatives in setting STEM goals and in planning how to support their STEM LC-participating staff member.

Each STEM LC line staff representative received 2 coaching visits. The STEM Coach has over 15 years of experience working with teachers to improve their science and math instruction. The Coach built rapport with each line staff by taking a non-directive approach to coaching, in which she listened to staff and asked questions that encouraged them to reflect on their strengths and areas for improvement.

Each coaching visit consisted of a pre-observation interview, an observation, and a debrief that highlighted successes and challenges encountered during the observation period. Staff set goals for their STEM activity facilitation as part of the first coaching visit. During the second visit the staff and coach reviewed the goals together. The STEM Coach summarized the coaching visits using the STEM LC Coaching and Reflection form and submitted this to staff members for their review. In addition to the coaching visits, Supervisor Representatives received an informal visit with one of the STEM Trainers during which they discussed successes and challenges in implementing STEM activities.

The STEM Trainers and the STEM Coach provided additional resources to LC members throughout the year. Access to STEM curricula was a coveted resource because staff wanted to have activities that they could immediately use in their programs. All STEM LC members received a copy of the Techbridge curriculum that offers a range of different STEM activities. The STEM trainers also provided handouts, information about STEM conferences, and information on professional development opportunities such as the Click to Science online trainings. The STEM Coach also reported sharing curricula with staff. Participating programs also received a stipend of $5,000 to participate in the STEM LC and help cover the cost of staff time and activity materials. Participating programs that sent three staff members (one supervisor and two line staff) to the STEM LC received stipends of $7,500.

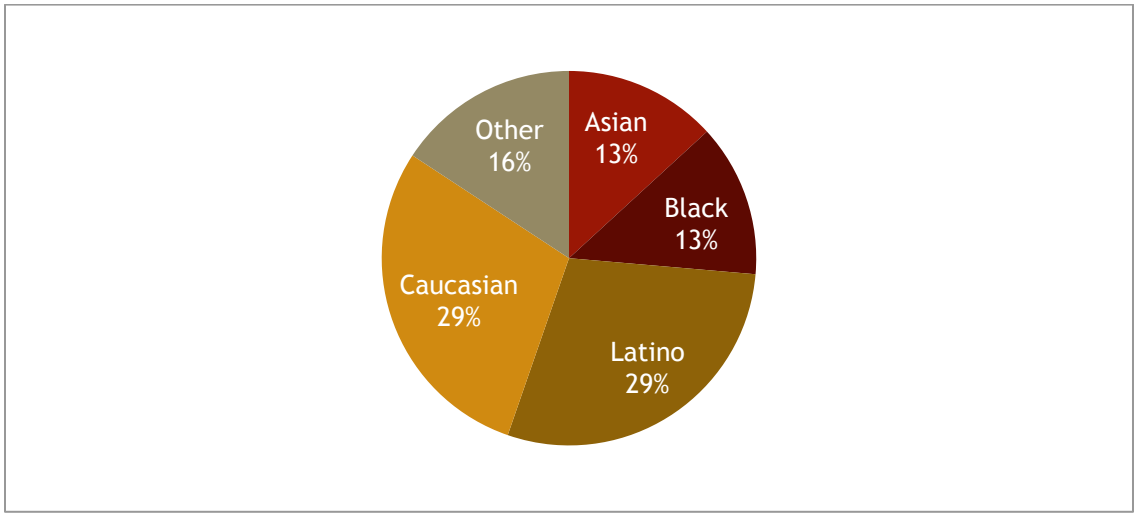
A few programs received additional grants from outside sources to do STEM with their youth. For example, one LC member used extra funds to be able to work full time on implementing STEM and another program used their funds to bring in speakers and go on field trips. The STEM Coach reported that giving staff planning time was a valuable, low-cost, support that not all staff in the LC received.

In a few programs, Supervisor Representatives provided additional support to their staff by using what they learned in the STEM LC to train other staff. They sometimes sought the Trainer's guidance on what topics to cover with their staff. A particularly valuable program support was setting aside time for staff to visit Techbridge programs, which one agency partner took advantage of. This gave the partner an opportunity to see STEM in action.

STEM Learning Community Members

Sixty-one (61) after school program staff completed either the staff pre- or post- survey[2]. There are more female (85%) than male (15%) LC members. The members are from diverse racial/ethnic backgrounds (See Figure 1). Both supervisor representatives (45%) and lead staff (31%) completed either the staff pre- or post-survey. Twenty-four percent (24%) of LC members have other roles in their programs, such as directors and coordinators.

FIGURE 1: THE LEARNING COMMUNITY MEMBERS ARE FROM DIVERSE RACIAL/ETHNIC BACKGROUNDS

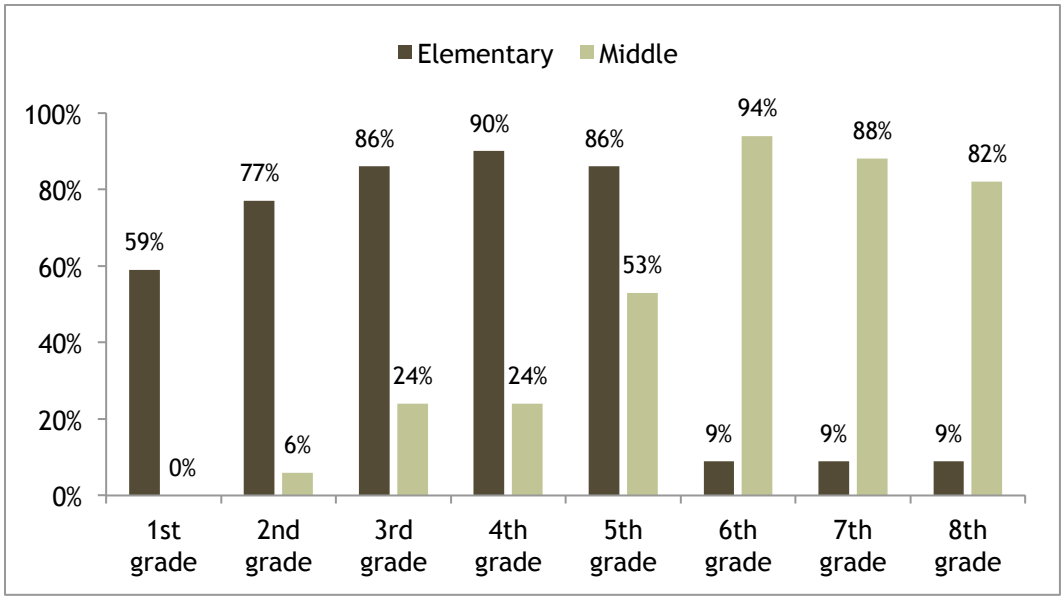


Source: 2013-14 Staff Pre/Post-Survey. N= 61.

[2] Some staff who took the pre survey did not also take the post survey. This section describes the demographics of all staff who completed either the pre- or post-survey to fully illustrate who attended the STEM LC during the year.

Fifty-six percent (56%) of the members represent elementary schools and 44% work in middle school programs. There is some overlap in the grades taught by elementary and middle school Learning Community members. For example, nine percent (9%) of Elementary School Learning Community members work with 6th, 7th, or 8th graders, and 24% of the Middle School Learning Community members work with 3rd or 4th graders (See Figure 2).

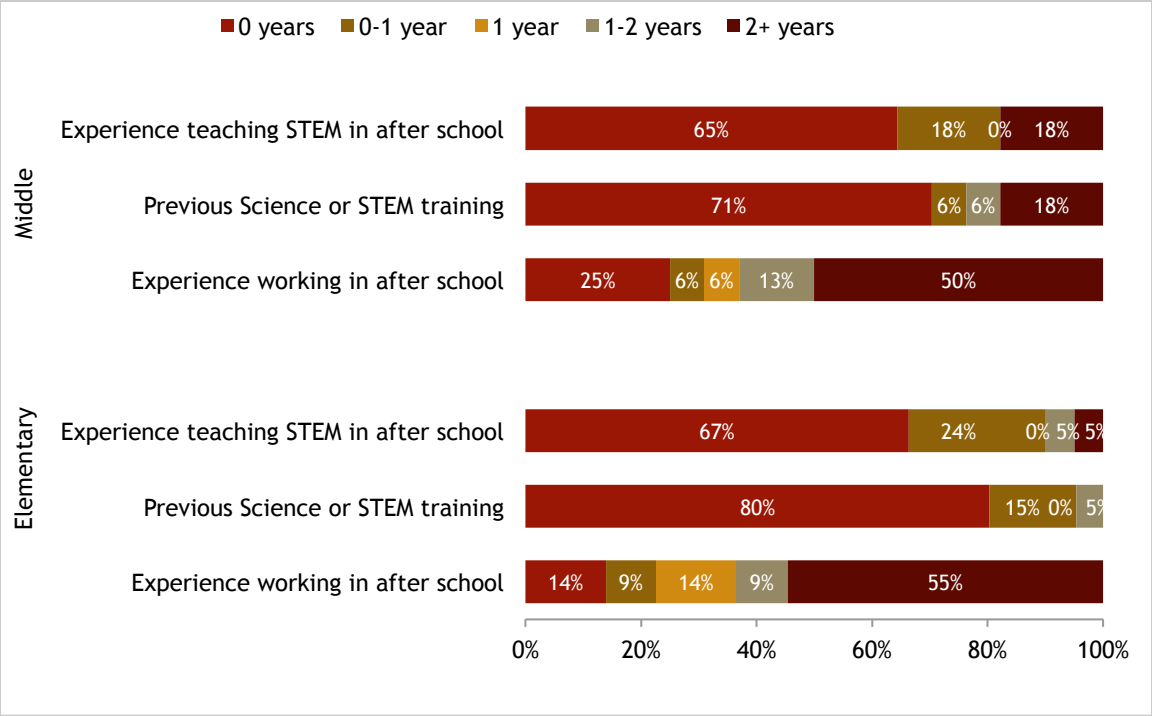
FIGURE 2: LEARNING COMMUNITY MEMBERS SERVE YOUTH IN A VARIETY OF GRADE LEVELS



Source: 2013-14 Staff Pre/Post-Survey. N= 61.
Totals may equal than 100% because respondents could check all grade levels they served.

Learning Community members have a range of experience and prior STEM training. Over half of elementary (55%) and half of middle school (50%) program staff have worked in after school for more than 2 years. Learning Community members had little prior STEM training. More than half (67%) of the elementary school staff did not have any experience teaching STEM in after school. Also, 65% of the middle school staff had no prior experience teaching STEM in after school. A few elementary (10%) and middle school (18%) Learning Community members majored in a STEM related field in college.

FIGURE 3: ELEMENTARY AND MIDDLE SCHOOL LEARNING COMMUNITY MEMBERS HAVE SIMILAR TRAINING AND EXPERIENCE



Source: 2013-14 Staff Pre/Post-Survey. N= 61.

EVALUATION OVERVIEW

DCYF and Techbridge commissioned an independent evaluation of the STEM Learning Community to assess participants' knowledge gains, practice change, and the quality of their experiences in the LC.

Evaluation Data Sources and Questions

The evaluation questions that guide this evaluation are:

- To what extent do participating staff increase their confidence, competence, and motivation to lead STEM learning opportunities?
- To what extent do participating sites increase the intensity, duration, and quality of STEM learning opportunities?
- To what extent do youth who participate in STEM learning activities demonstrate improved engagement, interest, and applied knowledge of STEM content and processes?
- In what ways do participating programs increase linkages between the instructional school day curriculum and the out-of-school time program?
- To what extent do youth who participate in STEM learning activities demonstrate stronger awareness of and commitment to pursuing academic, career, and lifelong pathways in STEM-related fields?

The evaluation consists of program staff surveys, youth surveys, observations of STEM activities, a focus group with staff, and interviews with the STEM Coach and Trainers.

Surveys

Staff Surveys

The staff surveys document changes in staff members' ability to lead high quality informal science activities, focusing particularly on their teaching self-efficacy, content-area knowledge, and familiarity with effective teaching practices. Surveys also explore participants' satisfaction with the coaching services provided through the LC. The full set of staff pre-survey questions can be found in Appendix B, and the post-survey questions can be found in Appendix C. Open-ended responses from the staff post-survey can be found in Appendix D. Not all staff who participated in the STEM LC completed both the pre- and post-survey. The staff survey results summarized in this report describe the growth of staff who completed both the pre- and post-survey, unless otherwise noted.

Youth Surveys

The youth surveys document participants' engagement and interest in science, as well as their content-area familiarity with specific science concepts. The youth surveys also asked youth about their opportunities to engage in STEM practices such as forming a hypothesis. The evaluation team referenced validated tools such as the Science Process Skills inventory and the Common Assessments Survey to develop the youth survey.

Observation of STEM Activities

Point of service-focused site visits measure the quality of STEM learning opportunities provided by participating programs.

The evaluation team used the Dimensions of Success (DoS) informal science learning observation tool, developed and validated by the Program in Education, Afterschool and Resiliency (PEAR) at Harvard University. The DoS tool is being implemented statewide through the Power of Discovery: STEM² initiative in 2013-14.

Youth Attendance

Youth attendance records measure the extent to which participating programs improved the intensity and duration of STEM activities.[3]

[3] Youths' attendance records are not connected to their survey results in this study.

Interviews

Focus Group

End-of-project focus groups complement the staff survey and offer an opportunity to collect additional qualitative data about changes in staff members' knowledge and behaviors, examples of ways in which youth demonstrated deeper engagement with STEM, and opportunities to further improve STEM-focused professional development.

The evaluation team conducted two focus groups, one at the Elementary STEM LC and another at the Middle School STEM LC. The focus groups included a large group discussion and a written reflection about staff members' experiences.

Trainer and Coach Interviews

Similar to the staff focus group, end-of-project Coach and Trainer interviews provide qualitative data regarding the implementation of high quality informal STEM activities in after school settings, on factors that support or hinder successful implementation of the LC design, and on opportunities to further improve STEM-focused professional development.

EVALUATION FINDINGS

This section summarizes the findings for each of the evaluation questions, drawing on the aforementioned data sources. Throughout the report, the relevant evaluation question(s) and data sources will be presented at the beginning of each section.

Staff Knowledge and Practice

The goal of the STEM LC is to improve participants' STEM content knowledge and practices. In a survey, staff reported what they know and also how they lead STEM activities in their programs, both before and after participating in the Learning Community. We highlight changes in the proportion of staff who felt more certain about their knowledge and skills.

Evaluation Question:

To what extent do participating staff increase their confidence, competence, and motivation to lead STEM learning opportunities?

Data sources:

- ✓ Staff pre- or post-survey
- ✓ Staff focus groups
- ✓ Coach and Trainer interviews

Knowledge of STEM Topics

The evaluation team used statistical tests[4] to compare participating staff members' pre- and post-survey responses to understand growth in their STEM knowledge. Elementary school staff reported gaining knowledge of the steps in the engineering and design process, as well as knowledge about Next Generation Science Standards since participating in the STEM LC; these findings were statistically significant. Prior to the program, only 14% of elementary school staff felt that they were knowledgeable about the engineering and design process steps, but at the conclusion of the program, all (100%) of the elementary school staff gained knowledge in the engineering and design process steps. Middle school staff members' knowledge about the engineering and design process, as well as knowledge about Next Generation Science Standards, statistically significantly improved after participating in the STEM Learning Community. Forty-three percent (43%) of the middle school staff felt that they were knowledgeable about the engineering and design process steps prior to the program, but at the conclusion of the program, all (100%) of the elementary school staff gained knowledge in the engineering and design process steps. During the focus group, elementary and middle school staff members also mentioned learning about the engineering and design process in the LC. While there was a decline in the percent of middle school staff who felt that they were knowledgeable about STEM careers, these results were not statistically significant.

[4] We used t-tests to compare pre- and post-survey responses. T-tests compare the average response of staff before participating in the LC with staff members' average response after completing the LC activities.

TABLE 1: LEARNING COMMUNITY MEMBERS GAINED KNOWLEDGE ABOUT THE ENGINEERING DESIGN PROCESS AND THE ENGINEERING DESIGN STANDARDS

	ELEMENTARY (N=14)		MIDDLE (N=14)	
	% Agree		% Agree	
	Pre	Post	Pre	Post
I am knowledgeable about the steps in the engineering and design process.	14%	100%	43%	100%
I am knowledgeable about the Engineering Design Standards from the Next Generation Science Standards.	0%	70%	33%	88%
I am knowledgeable about different careers/disciplines within science and engineering.	67%	100%	100%	86%
I am knowledgeable about topics in science and engineering.	67%	92%	67%	88%

Source: 2013-14 Staff Pre- and Post-Survey. Shading represents Pre- and Post-Survey significance at $p<0.05$.

Leading STEM Activities

Leading STEM activities may seem more challenging for staff members than leading other after school activities, as staff may feel as if they should have some STEM content expertise to be prepared to lead after school activities. Table 2 presents how Learning Community members felt about their ability to lead STEM activities prior to and after participating in the Learning Community. Elementary school LC participants showed statistically significant changes in their ability to teach STEM concepts effectively both by knowing the necessary steps in this process and in their ability to monitor STEM activities.

Prior to the program, 25% of elementary staff felt that they were knowledgeable about the steps necessary to teach STEM concepts and monitor STEM activities effectively, but at the conclusion of the program, all (100%) of the elementary school staff gained knowledge in these two areas. Elementary school staffs' knowledge about understanding different STEM concepts in order to effectively lead STEM activities also grew, although these findings were not statistically significant. Middle school Learning Community members showed growth in their knowledge about the steps needed to teach STEM concepts, with a 50% increase in the percent of middle school staff; these findings were statistically significant. There was a 11% decrease in the percentage of middle school Learning Community members who learned how to lead STEM activities as well as they lead other activities. However, this finding was not statistically significant.

TABLE 2: LEARNING COMMUNITY MEMBERS IMPROVED IN THEIR ABILTY TO LEAD AND TEACH STEM ACTIVITIES

	ELEMENTARY (N=14)		MIDDLE (N=14)	
	% Agree		% Agree	
	Pre	Post	Pre	Post
I know the steps necessary to teach STEM concepts effectively.	25%	100%	40%	90%
I am very effective in monitoring STEM activities.	25%	100%	67%	89%
When I try very hard, I lead STEM activities as well as I lead most other activities.	78%	92%	100%	89%
I am continually finding better ways to lead STEM activities.	75%	100%	50%	88%
I understand STEM concepts well enough to be effective in leading STEM activities.	56%	100%	67%	89%

Source: 2013-14 Staff Pre- and Post-Survey. Shading represents Pre- and Post-Survey significance at $p<0.05$.

STEM Practices

The staff pre- and post-surveys asked Learning Community members about their competence using both general and STEM-specific best practices. Staff received training on practices related to structuring STEM activities, and survey responses related to these practices are presented in Table 3. Staff also received training on practices related to facilitating STEM-related discussions. Staffs' survey responses for these practices are summarized in Table 4.

As shown in Table 3, many of the elementary Learning Community members started the year not knowing how to lead an activity with the engineering and design process embedded within it. For example, prior to participating in the program, only 20% of elementary school staff school staff felt that they could lead an activity embedded with the engineering design process, while at the conclusion of the program, all (100%) elementary school staff felt that they could now lead such activities; these findings were statistically significant. Although middle school staffs' knowledge of leading activities with the engineering design process embedded within it increased, these results were not statistically significant.

TABLE 3: LEARNING COMMUNITY MEMBERS GAINED SKILLS IN THEIR ABILITY TO STRUCTURE AND LEAD STEM ACTIVITIES

	ELEMENTARY (N=14)		MIDDLE (N=14)	
	% Agree		% Agree	
	Pre	Post	Pre	Post
I know how to lead an activity with the engineering design process embedded within it.	20%	100%	67%	100%
I know how to lead a structured lesson plan with a learning objective, introduction, hands-on activity, and reflection.	85%	100%	91%	89%

Source: 2013-14 Staff Pre- and Post-Survey. Shading represents Pre- and Post-Survey significance at $p<0.05$.

Although staff surveys did not show statistically significant improvements in the skills needed to lead a structured STEM lesson, in the focus group staff noted that they now understood the importance of different parts of the STEM activities such as the introduction, reflection, and asking intentional questions. As shown in Table 4, prior to receiving STEM training in the LC, program staff report strong practices around engaging youth in questioning, leading a structured lesson plan, and leading reflection. Elementary school staff reported a significant positive change in their ability to embed discussions of careers within a hands-on science activity, with a 42 percentage point increase in elementary school Learning Community members who improved their knowledge in this skill as a result of participating in the STEM LC.

Elementary school staffs' knowledge in engaging youth in inquiry processes and in the use of reflection techniques also grew, although these findings are not statistically significant. Middle school staff began the STEM Learning Community with strong practices; therefore, there was no change in these areas.

TABLE 4: ELEMENTARY SCHOOL LEARNING COMMUNITY MEMBERS LEARNED HOW TO DISCUSS STEM CAREERS WITH THEIR YOUTH

	ELEMENTARY (N=14)		MIDDLE (N=14)	
	% Agree		% Agree	
	Pre	Post	Pre	Post
I know how to embed discussion of careers within a hands-on science activity.	58%	100%	100%	100%
I know how to engage youth in the inquiry process.	69%	100%	100%	100%
I know how to use questioning to engage youth.	92%	100%	100%	100%
I know how to use reflection techniques in the classroom that engage all youth (i.e., not just a large group discussion).	82%	100%	91%	100%

Source: 2013-14 Staff Pre- and Post-Survey. Shading represents Pre- and Post-Survey significance at $p<0.05$.

Supporting Youth to Explore STEM Content

An important part of leading STEM activities is encouraging youth to explore STEM content both in and out of school. Table 5 shows that elementary and middle school staff began the STEM Learning Community with strong practices in demonstrating to youth the importance of possibly having a STEM-related career and how STEM is related to the world. Elementary school staff who participated in the Learning Community improved in their ability to turn youth on to STEM. The survey question related to this concept is a negatively worded question, meaning disagreement to this item would be a positive or desirable response (for example, "*I don't know what to do to turn children and youth on to STEM*"). Participants in the elementary Learning Community showed statistically significant changes in their ability to turn youth on to STEM. No elementary school staff reported feeling that they were unable to turn youth on to STEM. While middle school staff improved in their ability to turn youth on to STEM, these findings were not statistically significant.

TABLE 5: LEARNING COMMUNITY MEMBERS BELIEVE IT IS IMPORTANT TO ENCOURAGE YOUTH TO EXPLRE STEM CONTENT AND STEM CAREERS

	ELEMENTARY (N=14)		MIDDLE (N=14)	
	% Agree		% Agree	
	Pre	Post	Pre	Post
I don't know what to do to turn children and youth on to STEM. *	43%	0%	20%	11%
It is important to show children and youth the possibility of having a career in a STEM-related field.	100%	100%	100%	100%
It is important to show children and youth that STEM is related to the world around them.	100%	100%	100%	100%

Source: 2013-14 Staff Pre- and Post-Survey. Shading represents Pre- and Post-Survey significance at $p<0.05$.
*Percentages represent staff members' agreement with a negatively worded survey item.

Supporting Youths' Understanding of STEM Content

To lead a high quality STEM activity, program staff must be able to help youth understand STEM content. The survey question related to this concept is also a negatively worded question (as described in the previous section). Middle school staff who participated in the Learning Community improved in their ability to help youth understand a difficult STEM concept. After participating in the STEM Learning Community, no middle school staff reported feeling that they were at a loss when helping youth understand a difficulty STEM concept, and these findings were statistically significant. In comparison, at the end of the year more elementary school staff were unsure how to help youth understand STEM concepts. This increase was not statistically significant. Elementary school staff improved in their knowledge of being able to answer STEM questions and welcoming questions during a STEM activity, although these findings were not statistically significant.

After participating in the Learning Community, middle school staffs' knowledge in answering STEM questions and welcoming questions from youth during a STEM activity decreased, although these findings were also not statistically significant.

TABLE 6: LEARNING COMMUNITY MEMBERS ARE CONFIDENT THAT THEY CAN SUPPORT YOUTHS' UNDERSTANDING OF STEM CONTENT

	ELEMENTARY (N=14)		MIDDLE (N=14)	
	% Agree		% Agree	
	Pre	Post	Pre	Post
When children and youth have difficulty understanding a STEM concept, I am usually at a loss as to how to help them understand it better.	13%	36%	29%	0%
I am typically able to answer the STEM questions of children and youth in my program.	89%	100%	88%	70%
When leading a STEM activity, I usually welcome questions from children and youth.	92%	100%	100%	89%

Source: 2013-14 Staff Pre- and Post-Survey. Shading represents Pre- and Post-Survey significance at $p<0.05$.

Creating Equitable STEM Learning Opportunities

Traditionally, STEM fields are male dominated and not racially/ethnically diverse. After school programs can help change this by ensuring that STEM activities are welcoming to both boys and girls as well as to youth of different backgrounds. Table 7 presents program staffs' beliefs about creating equitable learning opportunities. There was a statistically significant increase in the number of elementary staff who reported knowing how to create an equitable learning environment, with a 50% increase in the elementary school staff that know how to create an equitable learning environment when leading STEM activities. While there was not a statistically significant change for middle school staff, they reported that their ability to create an equitable learning STEM environment improved. Before participating in the Learning Community, all program staff (100% of elementary and 100% of middle) felt that STEM is equally important for girls and boys. With elementary and middle school staff, many still felt that gender equity in STEM was important, and there was not a statistically significant difference in their beliefs after their STEM training. Elementary and middle school staff felt similarly after participating in the Learning Community.

TABLE 7: LEARNING COMMUNITY MEMBERS STRONGLY BELIEVE THAT THEY CAN CREATE EQUITABLE STEM LEARNING OPPORTUNITIES

	ELEMENTARY (N=14)		MIDDLE (N=14)	
	% Agree		% Agree	
	Pre	Post	Pre	Post
I know how to create an equitable learning environment when leading STEM activities.	50%	100%	86%	100%
I believe girls are equally interested in STEM as boys.	100%	100%	100%	100%
I think it is important to turn girls on to science as much as boys.	100%	100%	100%	100%
I think that it is within my control to turn youth from different linguistic, racial and cultural backgrounds onto science.	100%	100%	100%	91%
I think it is within my control to turn girls on to science as much as boys.	100%	100%	100%	91%

Source: 2013-14 Staff Pre- and Post-Survey. Shading represents Pre- and Post-Survey significance at $p<0.05$.

STEM Trainers were impressed with the changes that they heard were happening at programs. They kept hearing from STEM LC members that STEM was becoming much more familiar to youth. This is notable because in the words of one STEM Trainer,

> *"The youth [that programs] serve start off with them [youth] not thinking STEM is for them. They don't see themselves represented in these fields and don't know anybody who is doing this kind of work. We want them to know they can engage in and feel confident. And it sounds like they were. They would say their kids would run up to them, 'When's STEM happening again?...Can we please do STEM today?'"*

Beliefs About the Impact of STEM Learning in After School

After school STEM activities can provide youth another chance to practice skills that can help improve their school performance. Elementary school staff began the STEM Learning Community with strong positive beliefs about the impact of after school STEM activities on school-year performance and youth interest in school-year activities; consequently, there was no change in these areas. After participating in the Learning Community, middle school staffs' belief that after school STEM activities impact the school-year performance of children and youth in science decreased, although these findings were not statistically significant. At the end of the year, while there was not a statistically significant change for middle school staff, their perception remained similar in their belief that leading STEM activities could boost youths' science achievement.

TABLE 8: LEARNING COMMUNITY MEMBERS BELIEVE THAT AFTER SCHOOL STEM ACTIVITIES IMPACT STUDENTS' SCHOOL-YEAR PERFORMANCE

	ELEMENTARY (N=14)		MIDDLE (N=14)	
	% Agree		% Agree	
	Pre	Post	Pre	Post
Increased effort in leading STEM activities produces little change in the science achievement of children and youth.*	8%	23%	13%	20%
The inadequacy of the STEM background of children and youth can be overcome by leading good STEM activities.	92%	93%	89%	100%
After school STEM activities impact the school-year performance of children and youth in science.	100%	100%	100%	78%
After school STEM activities impact the interest of children and youth in school-year science activities.	100%	100%	100%	90%

Source: 2013-14 Staff Pre- and Post-Survey. Shading represents Pre- and Post-Survey significance at $p<0.05$.
*Percentages represent staff members' agreement with a negatively worded survey item.

Additional STEM Knowledge & Skill Gains

The evaluation team collected qualitative data about what staff gained from participation in the Learning Community from staff and STEM trainers. This data provided a multifaceted view of the value of participating in the STEM Learning Community.

In the focus groups staff members shared additional skills and knowledge that were not asked about in surveys. Some STEM LC members' take away was a shift in their attitude about science. Staff reported that they had a new appreciation for how fun science could be and felt that it is important to expose youth to science. In addition to learning about the engineering and design process, staff also noted that they learned about growth mindset.

> ***"I have learned a wide range of new skills and knowledge from my participation in the STEM LC. I have learned about the importance of STEM education and exposure for youth, teaching techniques, how to promote equity and more. I have also learned that STEM can be made accessible for all.***
> *- STEM LC Member*

Staff shared with the STEM Trainers about how they saw their own practice change. According to the Trainers, staff learned to write agendas and clear objectives and to include reflection in their STEM activity. One staff member even shared that the STEM LC inspired a change from a lecture-based style to a more interactive approach that was more engaging for youth.

Qualitative data from the focus groups and coding methodology can be found in Appendix E.

Youth Exposure to STEM

A desired outcome of the STEM Learning Community was to increase young peoples' exposure to STEM activities. Youth attendance records provided information about how often youth participated in STEM activities. The evaluation team used observations and interviews to assess the quality of the STEM activities youth experienced.

Evaluation Question:

To what extent do participating sites increase the intensity, duration, and quality of STEM learning opportunities?

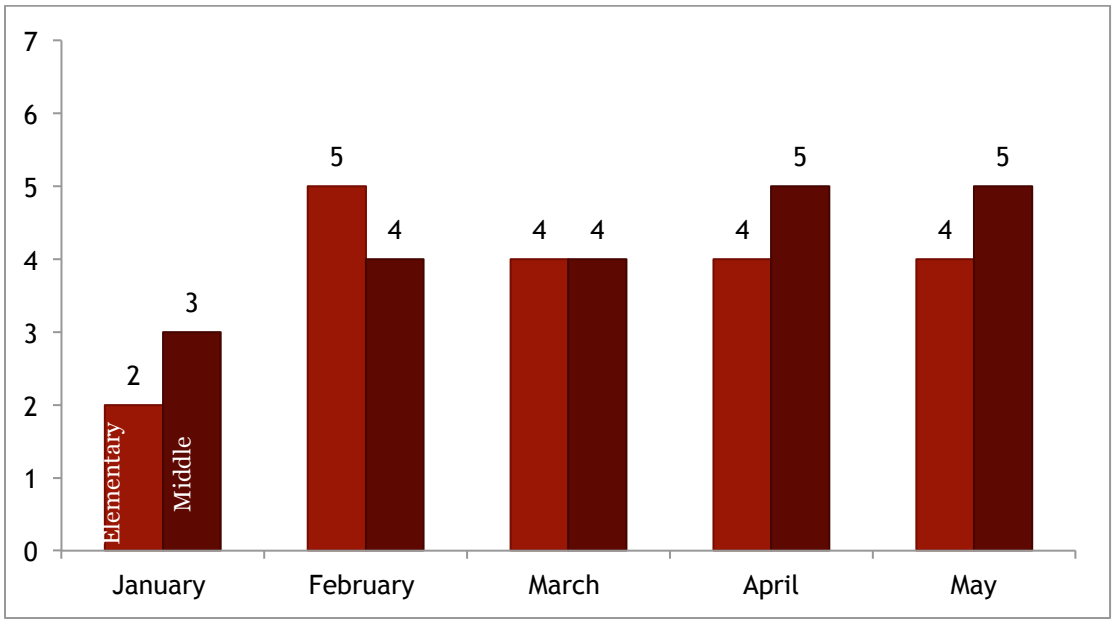
Data sources:

- ✓ Youth attendance data
- ✓ Observations
- ✓ Coach interview

STEM Activity Offerings

Participating sites collected data about how many STEM activities they offered and how many youth attended these offerings. Sites attended 3 Learning Community meetings prior to designing their STEM activities, and tracked the attendance of their youth from January-May 2014. On average, programs delivered 4 activities per month. Figure 4 presents the average number of STEM activities that elementary and middle school staff provided per month from January-May 2014. On average, staff reported having 19 youth in the elementary STEM activities, and 17 youth in the middle school STEM activities. The attendance data should be considered an estimate of youths' exposure to STEM as participating sites did not collect youth attendance data on a consistent basis.

FIGURE 4: STEM LC STAFF OFFERED AN AVERAGE OF 4 STEM ACTIVITIES PER MONTH



Source: 2014 youth attendance data, self-reported. N=17 sites.
Note: Three sites did not report attendance and enrollment data.

Quality of STEM Activities

The evaluation team observed the STEM Learning Community members to assess the quality of STEM activities. Site visitors used the Dimensions of Success (DoS) observation tool during their visits to programs. The DoS tool assesses the quality of informal STEM learning activities in after school programs in 12 areas or "dimensions." Table 24 in Appendix H presents a brief summary of the 12 practice areas. DoS scores can range from 1 to 4, where a 1 indicates no evidence that the practice was observed and a 4 indicates compelling evidence that the practice was observed.

The average DoS ratings for the observed sites are shown in Figure 5. Elementary school sites received the highest ratings in Materials (3.8), Space Utilization (3.7), and Relationships (3.6). Elementary school programs also scored higher than the national sample in all domains except Participation (3.1) and Organization (3.4). In these two domains the elementary school programs' score and the national ratings are roughly equivalent. Elementary programs received their lowest ratings in Relevance (2.0), suggesting that staff may need more training on how to connect STEM content to careers and youths' lives outside of the program. They received a similar score on STEM Content (2.1), the domain that assesses how staff support youths' understanding of STEM topics.

Middle school STEM activity ratings received similar scores in the DoS categories. For example, middle schools received the same score on Youth Voice and Relationships (3.3) as well as on Engagement with STEM and Purposeful Activities (3.2). Like their elementary counterparts middle school programs' ratings are higher than the national scores in all domains except Participation (2.8) and Organization (3.1). The national average for Participation and Organization are slightly higher than the score for middle school STEM activities. Similar to elementary programs, the lowest ratings for middle school programs are STEM Content (2.4) and Relevance (2.4).

Site visitors also shared trends that they saw across all sites during an informal observation debrief and noted several promising practices. Site visitors found that:

- Staff were familiar with the Engineering Design Process and the parts of STEM activity including the introduction, hands-on activity, and a reflection.
- Staff introduced the STEM activity using learning targets and provided clear instructions to youth.
- Staff used visual supports to help youth understand the activity such as diagrams, models, and posting learning targets and instructions.
- Staff ask open-ended questions. However, staff also frequently answered these questions before youth could respond.

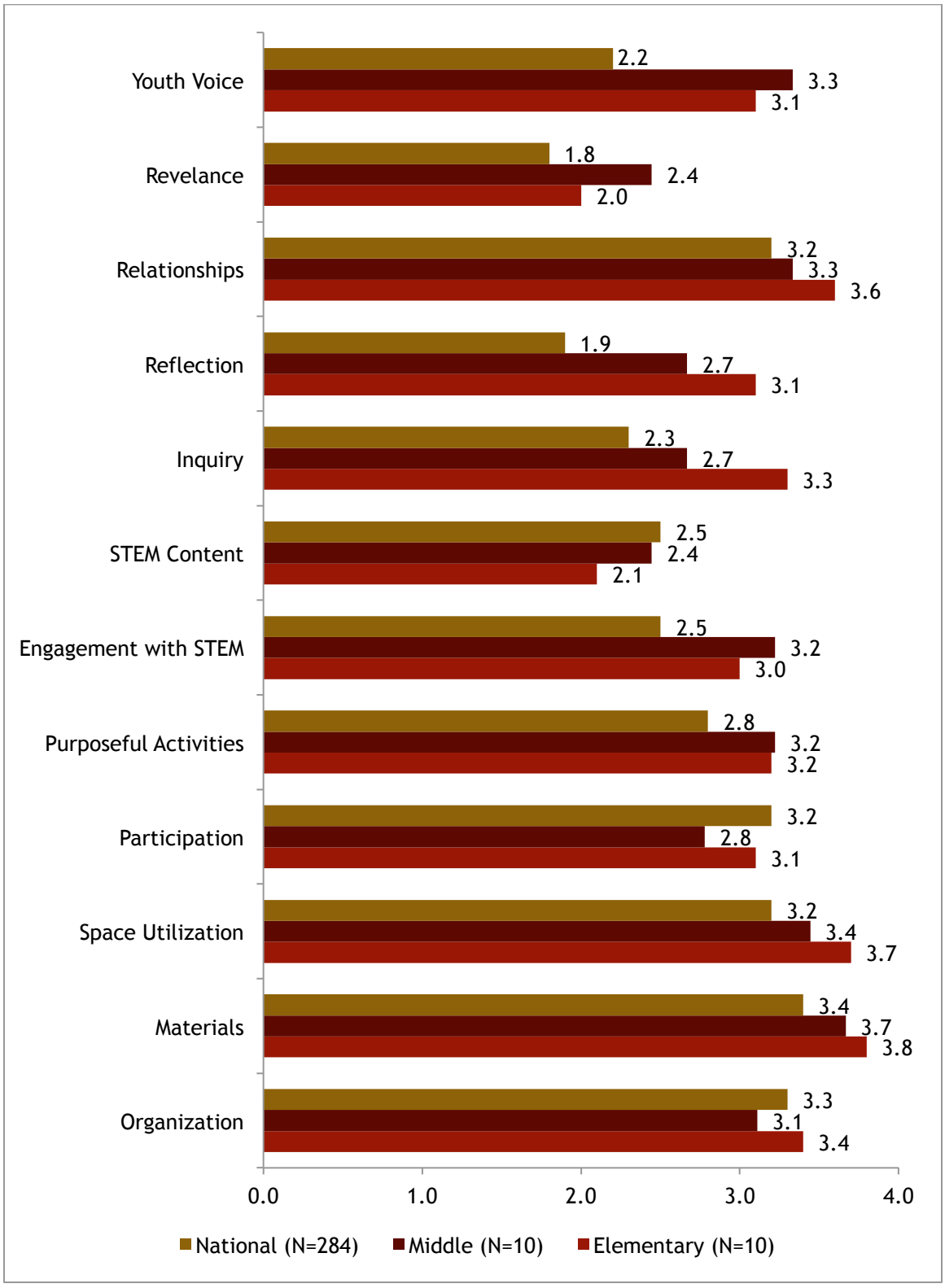
Site visitors also shared the challenges that they observed staff members having. In particular, site visitors noted that:

- Staff struggled with pacing. Some staff had a hard time finishing the planned STEM activity in 45 – 60 minutes. Other staff ended activities early because youth finish tasks quickly.
- Very few staff were observed helping youth to connect the STEM content to their lives or the broader context/real world. Staff also did not make strong connections between the activity and the STEM Content. More often, youth and staff were focused on completing the activity.
- A lack of strong classroom management skills interfered with staff members' ability to facilitate STEM activities.

The DoS Ratings indicate that, on average, elementary and middle school Learning Community members' practice is higher than the national average in all but two domains, Participation and Organization. Site visitors' observations emphasize that staff members regularly provide clear learning targets, contributing to a high DoS score in Purposeful Activities. Site visitors also identified strengths that were not part of the DoS tool such as a strong understanding of the engineering design process.

STEM Content and Relevance are two domains in which elementary and middle school staff have room to improve. During the informal debrief, site visitors also noted these as areas for improvement for staff. As noted earlier, LC members can also improve their classroom management skills, though this is not captured in DoS ratings.

FIGURE 5: DOS RATINGS SHOW LEARNING COMMUNITY'S STRENGTHS AND AREAS FOR IMPROVEMENT



Source: Dimensions of Success (DoS) site visits, spring 2014, N=20.
Program practices are rated on a 1-4 scale.

The STEM Learning Community members also received two visits from the STEM Coach. The primary purpose of the STEM coaching was to provide individualized support to Learning Community staff; however, the Coach also shared about the quality of the STEM activities in an interview.

The STEM Coach reported seeing growth in LC members' instructional practice. After the first visit, the STEM Coach noted that staff were struggling with classroom management and with following the STEM lesson plans. In some cases it was obvious that the staff did not have time to prepare for the STEM activity. In these first coaching visits, the STEM Coach also noted that full participation from youth was uncommon.

After the second coaching visit, youth were more engaged in the STEM activities. The STEM Coach attributed this to staff improvements in the way staff prepared to deliver STEM lesson plans, the use of different grouping strategies, and in the clarity of explaining instructions. With practice, staff also seemed to be able to discern what types of activities their youth enjoyed and which ones were developmentally appropriate for their age group. Overall, the STEM Coach felt that staff were more confident leading STEM activities and were much more motivated to do so.

Youth Outcomes

In surveys, elementary and middle school youth shared their experiences in STEM activities. In the end-of-year focus groups, staff also shared their perspectives about how youth benefited from STEM activities.

A total of 313 youth from 19 programs completed surveys. The youth who completed surveys self-reported that they come from diverse racial and ethnic backgrounds. More than one-quarter of youth (28%) are Hispanic or Latino, and just less than one-quarter (23%) are Asian or Pacific Islander.

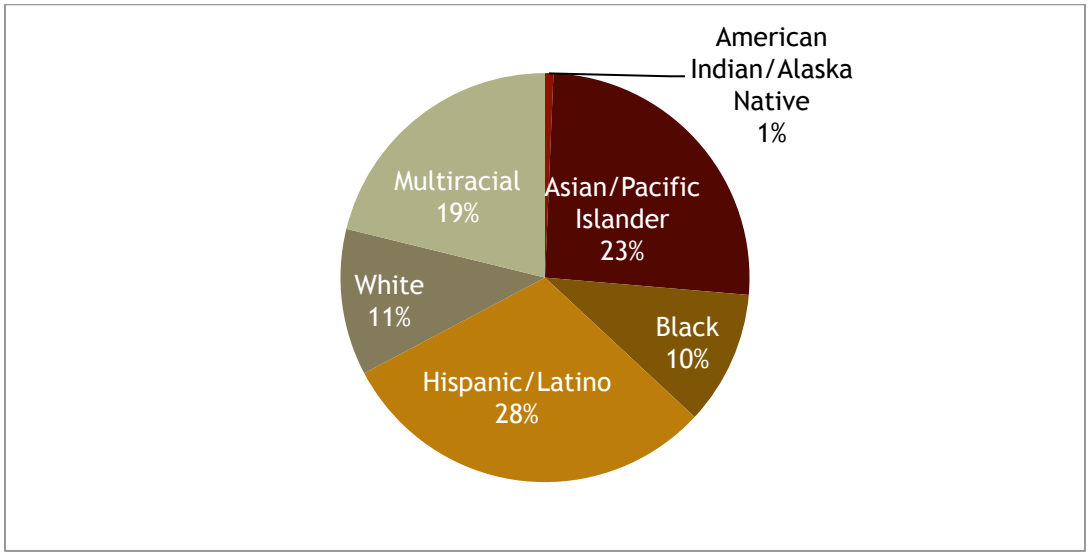
Evaluation Question:

To what extent do youth who participate in STEM learning activities demonstrate improved engagement, interest and applied knowledge of STEM content and process?

Data sources:

- ✓ Youth surveys
- ✓ Staff focus groups

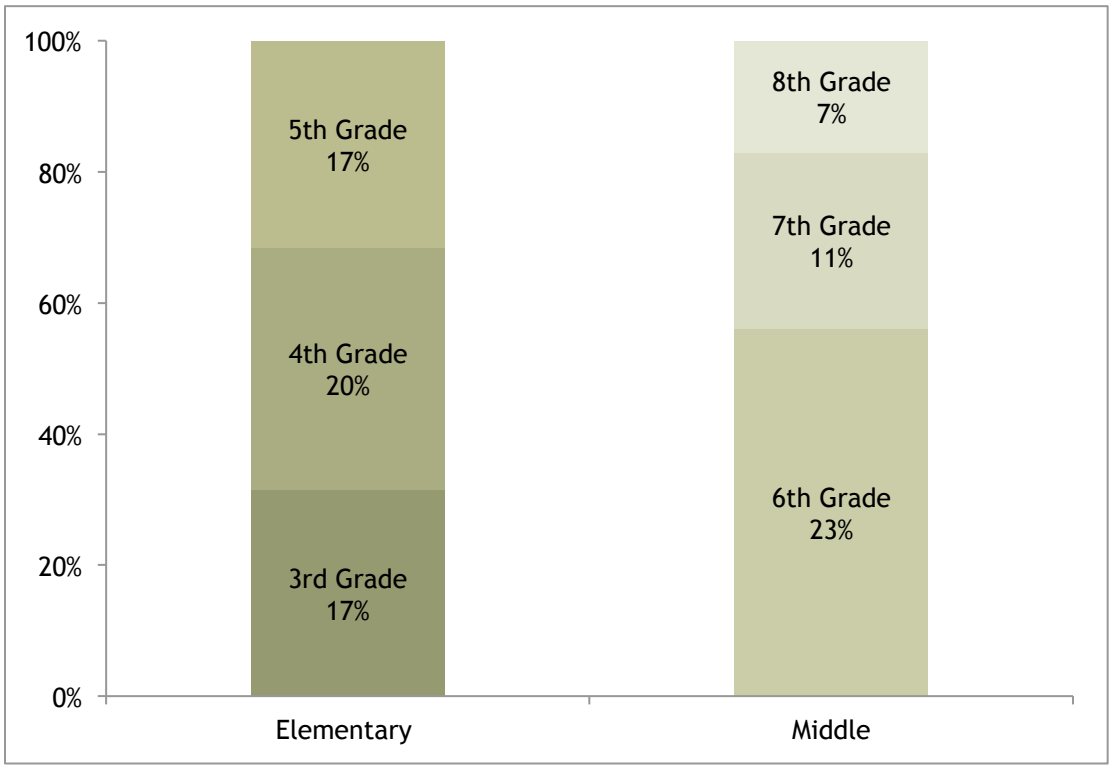
FIGURE 6: A MAJORITY OF PARTICIPANTS ARE YOUTH OF COLOR



Source: 2013- 2014 Youth Surveys, N=313. Note: 9% of respondents chose not to report their race or ethnicity, and are not included in the figure.

Slightly more than half of youth survey respondents (51%) were from grades three through five and participated in elementary STEM activities.

FIGURE 7: ELEMENTARY AND MIDDLE SCHOOL STUDENTS PARTICPATED IN STEM PROGRAMS IN NEARLY EQUAL NUMBERS

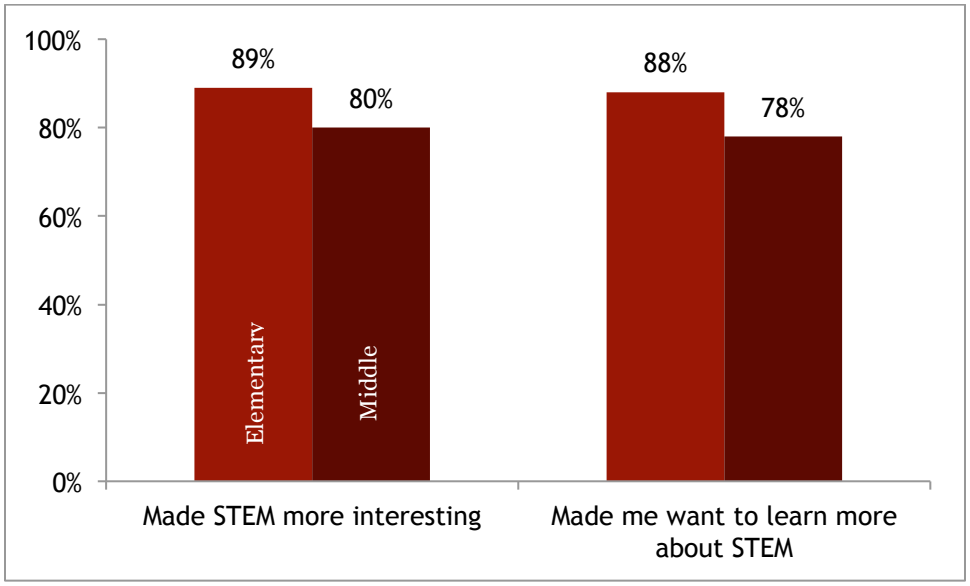


Source: 2013-2014 Youth Surveys, N=313.

Youth Interest in STEM

A goal of the STEM Learning Community is to get youth interested and excited about STEM. Eighty-nine percent (89%) of elementary and 80% of middle school youth shared that their after school STEM program made STEM more interesting. In addition, 88% of elementary youth and 78% of middle school youth shared that their after school STEM program made them want to learn more about STEM.

FIGURE 8: YOUTHS' INTEREST IN STEM INCREASES WITH EXPOSURE



Source: 2013-2014 Youth Surveys, N=313.

> ***Eighty-six (86%) percent of elementary and middle school youth say that their after school program made STEM more fun!***

In focus groups, staff reported that they noticed changes in youths' interest in STEM, stating that youth were more excited to participate in STEM activities than previously. From the staff members' perspective, youths' interest and engagement in STEM seemed to go hand in hand. Staff often noted the hands-on nature of activities as the reason for youths' growing interest and engagement.

Youth Engagement in STEM

The STEM Learning Community also aimed to engage youth in the STEM activities that participating staff offered. Youth survey results suggest that some youth were already engaged with STEM prior to the beginning of the Learning Community activities. Approximately half of both elementary (49%) and middle school (50%) students said they do STEM projects outside of school, and 84% of elementary youth and 80% of middle school youth said they enjoy learning STEM in their classes at school (outside of their Learning Community activities). Given this exposure to STEM activities in a variety of contexts, 81% of elementary youth and 74% of middle school youth consider themselves to be good at STEM.

TABLE 9: YOUTH HAVE PRIOR ENGAGEMENT, INTEREST, AND SKILLS IN STEM

	ELEMENTARY (N=159)	MIDDLE (N=154)
	% Agree	% Agree
I am good at STEM.	81%	74%
I enjoy learning STEM in my class at school.	84%	80%
I do STEM projects when I am not in school.	49%	51%

Source: 2013-2014 Youth Surveys, N=313.

Evidence suggests that the STEM activities built on youths' prior engagement with STEM. More than nine in ten elementary youth (91%) and eight in ten middle school students (81%) said that their after school program made STEM more fun. A majority of youth (69% of elementary youth and 77% of middle school youth) said that they had to think hard during their after school STEM activities. Youths' engagement in STEM often carried over into the home environment: 76% of elementary youth and 62% of middle school youth said they shared what they learned in their STEM program with their family.

TABLE 10: AFTER SCHOOL STEM CHALLENGED AND EXCITED YOUTH

	ELEMENTARY (N=159)	MIDDLE (N=154)
	% Agree	% Agree
The after school STEM program made STEM more fun.	91%	81%
The after school STEM program taught me things that I shared with my family.	76%	62%
I had to think hard when I did the after school STEM activities.	69%	77%

Source: 2013-2014 Youth Surveys, N=313.

During focus groups some staff also reported that their youth were engaged in the STEM activities. One staff noted: *"Some activities have engaged students that typically don't 'try' in the classroom."*

STEM Content Learning

The STEM activities provided youth an opportunity to learn STEM content that they may not have learned about otherwise. A central part of the learning experience for youth was behaving like STEM professionals, including using correct terminology and explaining the results.

As a result, a majority of youth (60% of elementary and 72% of middle school youth) said they used STEM terminology to talk about their STEM projects in the after school program. Additionally, three-quarters of both elementary and middle school youth could explain what they learned in their STEM program to others.

Middle school youth are at a developmental stage in which they can practice more advanced STEM practices, such as forming and testing hypotheses. Approximately seven in ten (69%) middle school youth said they learned how to form and test hypotheses in their after school STEM program, and that they learned to use facts to help explain their STEM activities (71%).

TABLE 11: YOUTH GAINED KNOWLEDGE OF THE SCIENTIFIC METHOD

	ELEMENTARY (N=159)	MIDDLE (N=154)
	% Agree	% Agree
In the after school STEM program, I used new STEM words to talk about my STEM projects.	60%	72%
When I was done with a STEM project, I could explain what I learned to others.	76%	75%
In the after school STEM program, I learned how to form a hypothesis.	N/A	69%
In the after school STEM program, I learned how to tell if my hypothesis was correct.	N/A	71%
In the after school STEM program, I learned to use facts to help me explain my STEM projects.	N/A	72%

Source: 2013-2014 Youth Surveys, N=313.

A majority of youth (86% of elementary and 81% of middle school youth) felt that staff supported their learning by answering their questions about STEM. With support from staff, 92% of elementary youth and 78% of middle school youth reported that they understood the STEM topics that they discussed in their programs.

In general, youth felt that they learned new things in their after school STEM activities (90% of elementary and 82% of middle school youth). Furthermore, youth cared about the topics that they were learning about. Seventy-three percent (73%) of elementary and 68% of middle school youth reported that they learned things that "really mattered to me."

TABLE 12: YOUTH FELT SUPPORTED IN STEM CONTENT LEARNING

	ELEMENTARY (N=159)	MIDDLE (N=154)
	% Agree	% Agree
In the after school STEM program, the adults answer my questions about STEM.	86%	81%
In the after school STEM program, I understood the STEM topics that we talked about.	92%	78%
In the after school STEM program, I learned new things.	90%	82%
In the after school STEM program, I learned about things that matter to me.	73%	68%

Source: 2013-2014 Youth Surveys, N=313.

During focus groups, when staff mentioned changes in youth knowledge, they emphasized that youth had a greater awareness of STEM and corresponding careers.

> ***My students all now know what STEM is, what STEM looks like and how STEM plays out in the real professional world.***
> *- STEM LC member*

STEM Connections to School and Careers

Evaluation Question:

In what ways does participating programs increase linkages between the instructional school day curriculum and the out-of-school time program?

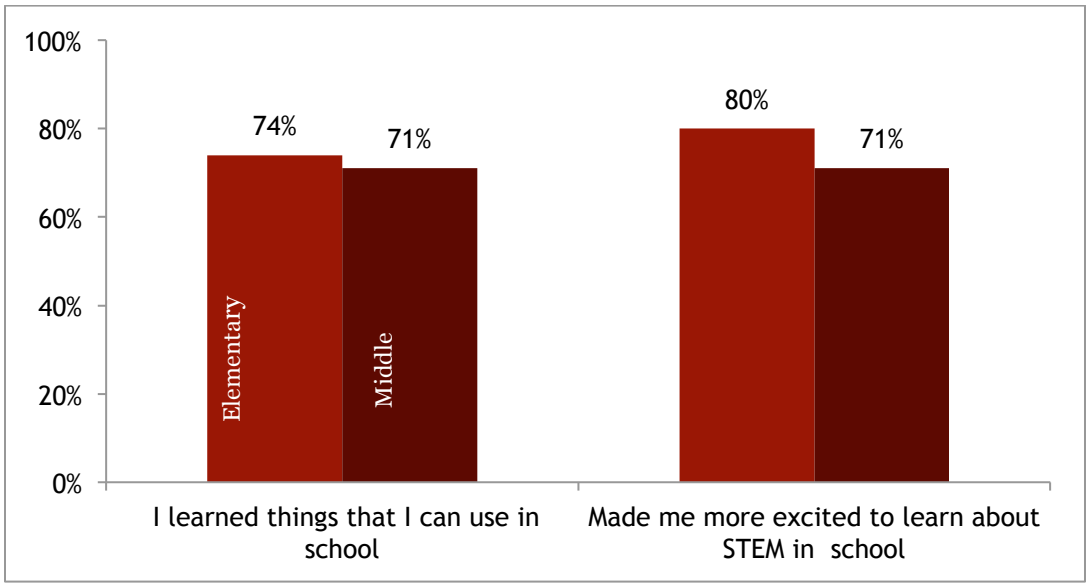
Data sources:

- ✓ Youth surveys
- ✓ Coach Interview

STEM Trainers encouraged the Learning Community members to help youth understand how STEM content may connect to their lives in school and future career options.

Approximately seven in ten youth (74% of elementary and 71% of middle school youth) said they gained knowledge in their after school STEM program that they can use in school. Eight in ten elementary youth and seven in ten middle school youth said that the after school STEM program made them more excited to learn about STEM in school.

FIGURE 9: AFTER SCHOOL STEM IMPACTS YOUTHS' SCHOOL DAY



Source: 2013-2014 Youth Surveys, N=313.

The STEM Coach found that some staff were making an effort to connect their STEM activities to the school day. In one program the STEM LC member worked with teachers to incorporate the science standards into the STEM activities. In another program the staff agreed to facilitate the hands-on STEM activities that the teachers couldn't fit into the school day.

Most youth reported an understanding of the connection between their after school STEM learning and potential careers: 75% of elementary and 74% of middle school youth said they know what scientists and engineers do at work. More than half of youth (56% of elementary and 63% of middle school participants) said that their STEM program made them think about getting a STEM job someday.

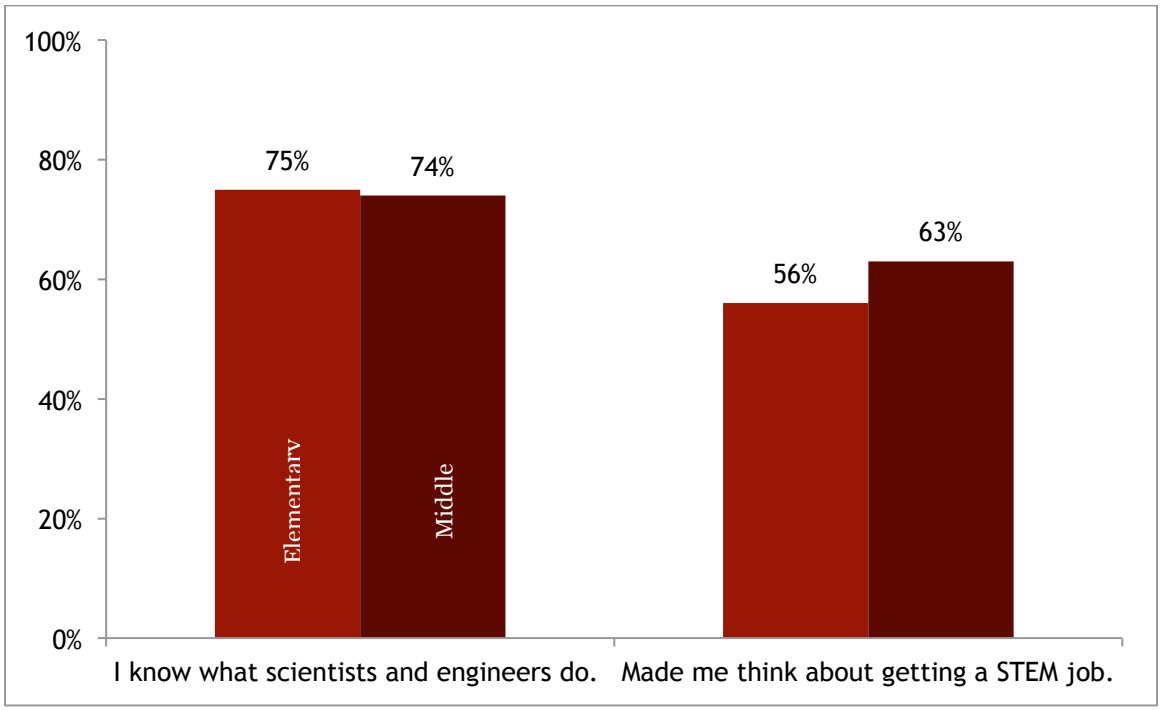
Evaluation Question:

To what extent do youth who participate in STEM learning activities demonstrate stronger awareness of and commitment to pursuing academic, career and lifelong pathways in STEM-related fields?

Data source:

✓ Youth surveys

FIGURE 10: YOUTH GAINED KNOWLEDGE OF STEM CAREERS



Source: 2013-2014 Youth Surveys, N=313.

In focus groups, a few staff stated that the structure of the STEM activities contributed to the youths' teamwork skills and a willingness to engage in inquiry. These are skills that can help young people in STEM careers as well as in other professions.

Gender and Race Differences in Youth Outcomes

One of the aims of the STEM Learning Community was to explore issues of racial and gender equity within STEM fields. A close look at youth survey data reveals differences in outcomes for youth based on their race/ethnicity and gender. All of the following results are statistically significant.

Youth showed differences based on race/ethnicity in the degree to which they were challenged by the activities in their after school STEM program.

- White youth were less likely than any other group (57% of white youth versus 74% of all other youth) to report that they had to think hard when completing STEM activities.

Youths' use of STEM terminology to talk about their STEM projects also differed both by race and by gender.

- African-American youth were more likely than any other racial or ethnic group (83% of African-American youth versus 64% of all other youth) to say that they used STEM terms to talk about their STEM projects in their after school program.

- Additionally, boys were more likely than girls (73% of boys versus 58% of girls) to say they used STEM words to talk about their STEM activities.

Differences by gender also surfaced in whether youth learned concepts related to the scientific method.

- Among middle school youth, boys were more likely than girls (76% of boys versus 61% of girls) to say they learned how to tell if a hypothesis was correct.

Further breakdown of youth survey results by race/ethnicity and gender can be found in Appendices F and G.

STEM Learning Community Implementation

Coaching

As part of the Learning Community model, each front line staff member was to receive two coaching visits. Supervisor Representatives did not receive coaching visits. At the end of the year, 10 of 12 front line staff received two visits, and another 2 front line staff received at least one coaching visit.

The staff post-survey asked Learning Community members about their experience with the coaching visit. All elementary and middle school line staff were highly satisfied with the support form the coaching visit. Staff members used the support from the STEM coach to set goals related to leading STEM activities. Participants in the Learning Community also felt supported by the STEM Coach in her ability to answer questions related to STEM activities and to provide valuable feedback.

TABLE 13: THE STEM COACH PROVIDED THE LEARNING COMMUNITY MEMBERS STRONG SUPPORT AND FEEDBACK IN STEM CONCEPTS

	ELEMENTARY (N=7)	MIDDLE (N=5)
	% Agree	% Agree
I worked with the STEM Coach to set goals related to how I lead STEM activities.	100%	100%
The STEM Coach answered my questions about leading STEM activities.	100%	100%
I received valuable feedback from the STEM Coach.	100%	100%

Source: 2013–14 Staff Post Survey, N=12. Only survey responses from front line staff are included because Supervisor Representatives did not receive coaching.

As shown in Table 14, Learning Community members received strong support from the STEM Coach to improve the quality of their STEM activities. All Learning Community members felt more confident in leading STEM activities. However, slightly more middle school staff received support from the STEM Coach that increased their motivation to lead STEM activities.

TABLE 14: LEARNING COMMUNITY MEMBERS USED FEEDBACK FROM THE STEM COACH TO IMPROVE THEIR TECHNIQUES IN STEM PRACTICES

	ELEMENTARY (N=7)	MIDDLE (N=5)
	% Agree	% Agree
I used the feedback from the STEM Coach to improve how I led STEM activities.	100%	100%
The support I received from the STEM Coach helped me feel more confident in leading STEM activities.	100%	100%
My motivation to lead STEM activities increased because of the support I received from the STEM Coach.	71%	100%

Source: 2013–14 Staff Post Survey, N=12. Only survey responses from front line staff are included because Supervisor Representatives did not receive coaching.

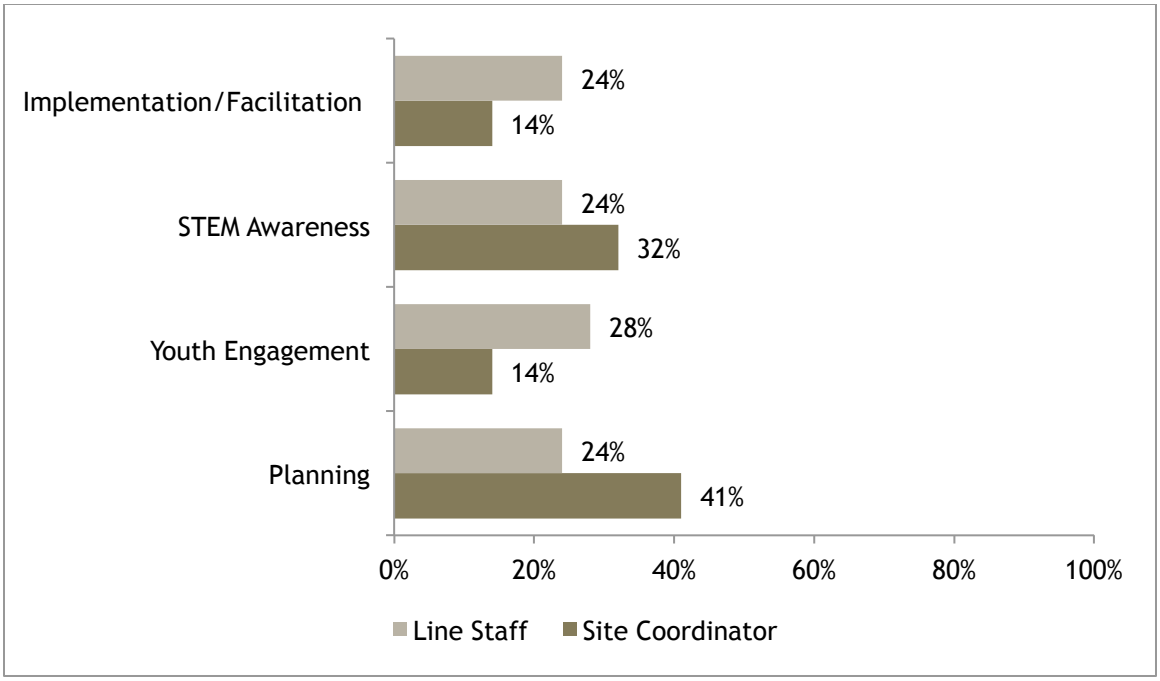
Learning Community Monthly Meetings

Monthly Meeting Successes

There were many accomplishments that should be celebrated for the first year of the San Francisco STEM Learning Community. When asked, "What was the most important thing that you learned in the STEM LC?" staff members had much to say. Table 15 shows that staff valued learning how to plan their STEM activities. This skill seemed especially important for Supervisor Representatives, with 41% stating that planning was the most important skill that they learned. Another important skill for Supervisor Representatives was learning more about STEM in general. Thirty-two percent (32%) of Supervisor Representatives cited STEM awareness as their most important take away from the STEM LC.

In comparison, 28% of front line staff felt that the most important thing they learned was how to make STEM activities engaging and fun. About the same proportion of staff reported that learning how to facilitate STEM activities (24%), STEM Awareness (24%), and planning STEM activities (24%) were valuable skills they had learned.

TABLE 15: LEARNING COMMUNITY MEMBERS LEARNED VALUABLE STEM PRACTICES FROM PARTICIPATING IN THE LEARNING COMMUNITY



Source: 2013-14 Staff Post Survey, N = 29 (of which Supervisor representative: N = 17, Line Staff: N = 12).

The STEM Trainers found the new partnership between DCYF and Techbridge to be a strength of the STEM Learning Community. DCYF was particularly supportive during the planning phase of the project, helping shape the STEM Learning Community to San Francisco's communities, providing practical advice about the application process, and suggesting that Supervisor Representatives be involved in the Learning Community. The STEM Trainers were also impressed with the dedication of the participating programs and their staff. They are looking forward to continuing the partnership with DCYF and San Francisco after school programs in the upcoming year.

Monthly Meeting Challenges

As with any new initiative, the Trainers faced challenges while implementing the STEM Learning Community.

In general, staff turnover is challenging for after school programs. The STEM Trainers noticed that when site's line staff left the program, the site struggled to fully engage in the STEM LC. The new Learning Community member quickly became part of the group, but it was challenging for them to catch up as they had missed prior sessions that laid the groundwork for current sessions. Trainers addressed the staff turnover challenge by providing one-on-one support to sites.

Trainers may want to consider providing new LC members with a packet of materials that have been covered in prior sessions and schedule a meeting with them to provide them additional information about the STEM Learning Community such as introducing them to the Learning Community model. Supervisor Representatives could be trained to complete this introduction for their new staff.

STEM Trainers also noted that the STEM LC model was not as clear to participants as they had intended. The STEM LC model was to include one participating line staff and one Supervisor Representative from the same site. However, some programs sent more than one supervisor or sent line staff and supervisors from different sites. It was not always clear to the Trainers the role of the LC member in their program, either. This made it difficult for the Trainers to ensure that participating staff were following the STEM LC model.

Next year the Trainers plan to address this by providing LC members with a document that describes the STEM LC model and expectations. This document will be reviewed at the 2014-15 Kick Off meeting to ensure that everyone is aware of the plans for the upcoming year.

Other challenges that the Trainers mentioned are managing logistics for the group and engaging Supervisor Representatives and middle school LC members in meaningful ways. This was the first time that STEM Trainers were responsible for more of the logistics of the STEM Learning Community. After this year's experience STEM Trainers

are more prepared to handle logistics. Similarly, it was the first time that the STEM Trainers included Supervisor Representatives in the Learning Community and they have already developed a different model for the Supervisor Representative's involvement.

Middle school staff representatives participated less frequently than their peers. The reasons behind middle school staff members' inconsistent level of engagement are unclear. STEM Trainers speculate that it could be due to staff turnover in programs or inconsistent attendance of middle school Supervisor Representatives. The STEM Trainers plan to try different ways to encourage participation of middle school staff next year.

The STEM Coach also faced some challenges. During site visits, the STEM Coach noticed many staff who struggled with classroom management. For the Coach it became important not to give staff more than they were ready to learn. She strived to help staff improve classroom management skills and facilitate STEM activities. That balance was not easily achieved. The Coach reported explicitly suggesting next steps to staff to improve classroom management skills and in some cases encouraged them to watch others facilitate activities.

DCYF offers coaching to after school programs and next year this resource could be used to help support staff members to build classroom management skills. The STEM Coach, who visits all staff, can recommend Learning Community members who would benefit from this extra coaching. Ideally, these recommendations would take place in the fall so that DCYF Coaches would have time to visit the Learning Community participants.

Learning Community Model Strengths

Looking back over the year, the Trainers and STEM Coach identified the strongest elements of the STEM Learning Community. Trainers felt that the monthly in-person trainings were the most valuable aspect of the STEM Learning Community. During these trainings staff members had opportunities to share ideas, to practice leading activities, and receive feedback from their peers. For the Trainers, the monthly meetings also allowed them to see how much staff had grown. A close second to the monthly in-person meetings was the individualized coaching visits.

The STEM Coach found the STEM Trainers modeling activities and opportunities to practice leading activities to be strengths of the STEM LC model. From her perspective, staff members learned the most from watching STEM Trainers model reflection time and trying to develop their own activities.

Learning Community Model Areas for Growth

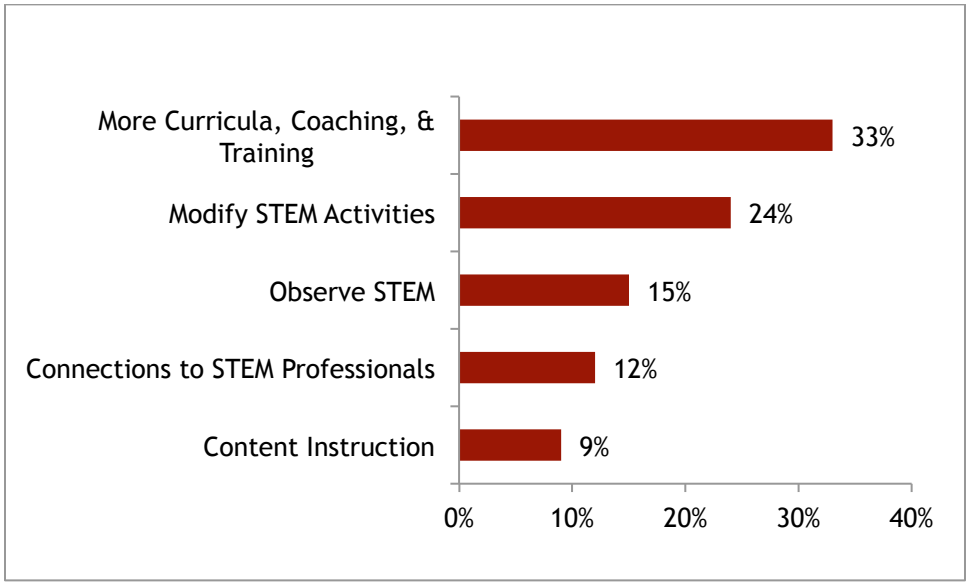
Staff, Trainers, and the STEM Coach had several suggestions for improving the STEM Learning Community for future participants.

The STEM Learning Community members wanted to see more diverse topics in the curriculum, such as computer programming and robotics. They also suggested simplifying the language in the curriculum and including tips to help staff modify activities for different learning styles. The STEM Learning Community members also thought it would be helpful to clarify the granting process at the beginning of the year. Staff wanted to know what to expect regarding reporting and to receive guidelines for spending the stipend.

During the focus group, 33 staff reported on additional resources that they would like to receive as part of the STEM Learning Community. Figure 11 shows the proportion of staff that was interested in various supports. Thirty-three percent (33%) of staff who mentioned additional resources wanted more of the same type of supports that were available to them as members of the STEM Learning Community. This includes more STEM activities, coaching, and site visits. Staff also mentioned receiving some supports even earlier in the year, such as coaching and leading practice STEM sessions. About one-quarter of staff (24%) was also interested in learning how to modify STEM activities for different age groups and how to change the complexity of the activity to meet the needs of youth.

Fifteen percent (15%) of staff were interested in seeing STEM activities in action. They mentioned wanting to observe other programs or watch videos of staff leading STEM activities. Twelve percent (12%) of staff wanted to have more connections with STEM professionals with whom they could talk about different STEM careers. Fewer staff (9%) wanted a deeper introduction to the STEM topics that they were talking to youth about.

FIGURE 11: STEM LC MEMBERS WANT TO LEARN HOW TO MODIFY STEM ACTIVITIES



Source: 2013-14 STEM Reflection Sheet administered during staff focus group, N = 33. Additional data from the Staff Reflection can be found in Appendix F.

Reflecting on the year, the STEM Trainers suggest changing the way in which the Supervisor Representatives were involved in the monthly trainings. In the 2013-14 year, half of the monthly meetings included a one-hour break out session that focused on helping supervisor representatives include STEM in their programs. STEM LC members' views on the Supervisor Representatives' involvement varied; some staff felt that the their role should be de-emphasized while others wanted Supervisor Representatives to stay with the line staff for the entire monthly meetings.

The STEM Trainers felt that they could support Supervisor Representatives in fewer meetings. The Trainers also thought that the Supervisor Representative break out sessions started too late in the year. The meetings began in October 2013 after programs had already started implementing STEM. For the upcoming year (2014-15), the STEM Trainers intend to begin planning sessions with Supervisor Representatives in August and only invite Supervisor Representatives to those monthly meetings that will be dedicated to planning. The earlier start will help all Supervisor Representatives plan their STEM activities prior to the start of their programs.

The STEM Coach suggests that it would be helpful for participating staff if the STEM LC provided more clarity about the goals for young people. Without clear goals for the STEM LC staff developed their own which varied from making connections between STEM topics to exposure to STEM. If staff fully understand the STEM LC's goals for youth, they will be better positioned to make connections between their training and their work with youth. It may also help STEM Trainers design supports that are more tailored to the needs of the Learning Community members.

The STEM Coach identified time management and understanding of STEM content as areas in which staff still had room to grow. Even after the second coaching visit, staff had trouble getting through a whole STEM lesson that included an introduction, hands-on activity, and reflection. The Coach thought that more planning and preparation would help staff to better pace their activities. Providing planning time could be incorporated in the Supervisor Representative's planning sessions for next year. The STEM Coach also recommended that the STEM Trainers help staff identify where to break STEM activities into smaller blocks that may fit their program structure better.

The STEM coach suggested that staff receive more in-depth training about STEM content, particularly around why inquiry is so important. The STEM Coach observed some staff limiting youths' inquiry by encouraging youth to copy the examples they provided or directing youth how to complete a task without letting young people explore. The STEM Coach recommended that Learning Community members have the opportunity to observe experienced STEM facilitators leading activities with youth.

Safety was another topic that the STEM coached recommended be covered more thoroughly in the upcoming year. Although no youth were hurt, there were a few instances in which the STEM activity was not set up with safety in mind.

CONCLUSION

Based on the findings in this evaluation, the STEM Learning Community was particularly effective at improving staff members' knowledge about the engineering and design process and teaching staff the steps needed to facilitate STEM activities. The staff survey results indicate that many staff arrived at the Learning Community with strong positive beliefs about equity but not all staff understood what equity looked like in practice. The STEM Learning Community helped improve participants' ability to create an equitable learning environment, particularly for elementary school staff. To get a better understanding of how the STEM Learning Community supported this skill more questions about specific strategies could be added to the staff survey.

The findings about staff members' ability to support youths' understanding of STEM are mixed. Staff survey results suggest that LC participants feel confident in their ability to support youth; however, the DoS-based observations suggest that staff should strengthen the ways in which they help youth understand STEM content and support youth to make connections between the STEM content and the real world. The STEM Coach also suggested that Learning Community members receive more training on STEM content.

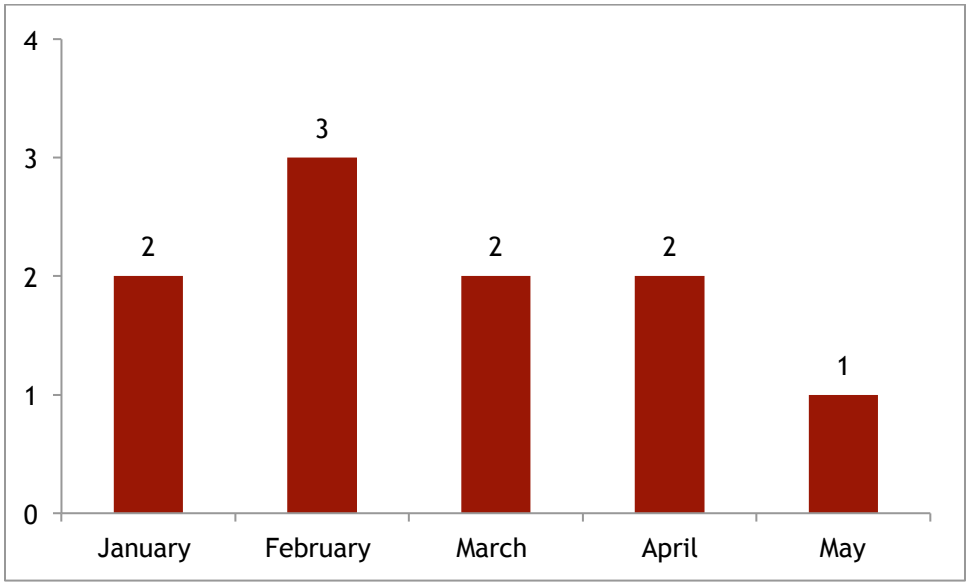
It was difficult to assess if there was an increase in youths' exposure to STEM, as it was unclear how often programs were implementing STEM prior to participating in the Learning Community. It may be helpful to have Supervisor Representatives set a goal about how often they will deliver STEM activities and the number of youth they plan to involve in each session. That way, data about implementing STEM activities and youth attendance could be used to track programs' progress toward their goals.

The youth survey results were very positive. It is particularly notable that over 90% of elementary and over 80% of middle school youth thought that their after school program made STEM more fun. In contrast to the mixed findings about staff members' ability to support youth, 85% of youth reported that they learned new things in their after school program, and 86% reported that they understood the STEM topics explored. The youth survey findings indicate that most youth used STEM practices and were introduced to STEM terminology, but some youth did not report gains in these skills

APPENDIX A: YOUTH ATTENDANCE AND OUTCOMES FOR THE TRAINER OF TRAINER MODEL SITES

Three participating agencies used a Trainer-of-Trainers (ToT) model where participants would go back to their agencies and train colleagues who would then lead STEM programs with youth. All of the ToT sites were at elementary schools. On average, ToT Model programs delivered two activities per month. The number of STEM activities offered per month ranged from one to five. Figure 12 presents the average number of STEM activities provided by elementary staff from ToT Model sites between January and May 2014. On average, staff reported having 12 youth in each STEM activity.

FIGURE 12: STAFF AT TOT MODEL SITES OFFERED AN AVERAGE OF 2 STEM ACTIVITIES PER MONTH



Source: 2013-2014 youth attendance data, N= 6 sites.
Note: three sites did not report attendance and enrollment data.

TABLE 16: YOUTH SURVEY RESULTS FROM TOT MODEL SITES

	ELEMENTARY (N=83)
	% AGREE
YOUTH INTEREST IN STEM	
The after school STEM program made me want to learn more about STEM.	42%
The after school STEM program made STEM more fun.	74%
The after school STEM program made STEM interesting.	72%
YOUTH ENGAGEMENT IN STEM	
The after school STEM program taught me things that I shared with my family.	48%
I am good at STEM.	64%
I do STEM projects when I am not in school.	39%
I enjoy learning STEM in my class at school.	59%
I had to think hard when I did the after school STEM activities.	56%
STEM CONTENT LEARNING	
In the after school STEM program, I used new STEM words to talk about my STEM projects.	29%
When I was done with a STEM project, I could explain what I learned to others.	58%
In the after school STEM program, the adults answer my questions about STEM.	59%
In the after school STEM program, I understood the STEM topics that we talked about.	80%
In the after school STEM program, I learned new things.	77%
In the after school STEM program, I learned about things that matter to me.	44%

	ELEMENTARY (N = 83)
STEM CONNECTIONS TO SCHOOL AND CAREERS	
The after school STEM program made me more excited to learn about STEM in my class at school.	49%
In the after school STEM program, I learned things that I can use in my class at school.	48%
The after school STEM program made me think about getting a STEM job when I'm older.	18%
I know what scientists and engineers do at work.	62%

Source: 2013-2014 Youth Surveys.

APPENDIX B: STAFF PRE-SURVEY RESPONSES

TABLE 17: STAFF RESULTS FROM THE PRE-SURVEY

	ELEMENTARY (N=23)	*MIDDLE (N=17)*
	% AGREE	**% AGREE**
STAFF KNOWLEDGE OF STEM TOPICS		
I am knowledgeable about different careers/disciplines within science and engineering.	57%	69%
I am knowledgeable about topics in science and engineering.	52%	56%
I am knowledgeable about the steps in the engineering and design process.	5%	25%
I am knowledgeable about the Engineering Design Standards from the Next Generation Science Standards.	0%	20%
LEADING STEM ACTIVITIES		
When I try very hard, I lead STEM activities as well as I lead most other activities.	55%	64%
I know the steps necessary to teach STEM concepts effectively.	14%	21%
I am very effective in monitoring STEM activities.	20%	33%
I am continually finding better ways to lead STEM activities.	57%	33%
I understand STEM concepts well enough to be effective in leading STEM activities.	33%	29%
STEM PRACTICES		
I know how to lead an activity with the engineering design process embedded within it.	23%	20%
I know how to create an equitable learning environment when leading STEM activities.	38%	53%
I know how to lead a structured lesson plan with a learning objective, introduction, hands-on activity, and reflection.	82%	81%

	ELEMENTARY (N = 23)	MIDDLE (N = 17)
I know how to engage youth in the inquiry process.	64%	56%
I know how to embed discussion of careers within a hands-on science activity.	57%	69%
I know how to use questioning to engage youth.	83%	81%
I know how to use reflection techniques in the classroom that engage all youth (i.e., not just a large group discussion).	70%	82%
SUPPORTING YOUTH TO EXPLORE STEM CONTENT		
I don't know what to do to turn children and youth on to STEM.	30%	25%
It is important to show children and youth the possibility of having a career in a STEM-related field.	96%	88%
It is important to show children and youth that STEM is related to the world around them.	96%	94%
SUPPORTING YOUTH'S UNDERSTANDING OF STEM CONTENT		
When children and youth have difficulty understanding a STEM concept, I am usually at a loss as to how to help them understand it better.	14%	14%
I am typically able to answer the STEM questions of children and youth in my program.	48%	64%
When leading a STEM activity, I usually welcome questions from children and youth.	90%	86%
CREATING EQUITABLE STEM LEARNING OPPORTUNITIES		
I believe girls are equally interested in STEM as boys.	83%	63%
I think it is important to turn girls on to science as much as boys.	96%	88%
I think that it is within my control to turn youth from different linguistic, racial and cultural backgrounds onto science.	96%	76%
I think it is within my control to turn girls on to science as much as boys.	96%	71%

	ELEMENTARY (N=23)	MIDDLE (N=17)
CREATING EQUITABLE STEM LEARNING OPPORTUNITIES		
Increased effort in leading STEM activities produces little change in the science achievement of children and youth.	5%	6%
The inadequacy of the STEM background of children and youth can be overcome by leading good STEM activities.	73%	88%
After school STEM activities impact the school-year performance of children and youth in science.	91%	82%
After school STEM activities impact the interest of children and youth in school-year science activities.	87%	82%

Source: 2013-14 Staff Pre-Surveys.

APPENDIX C: STAFF POST-SURVEY RESPONSES

TABLE 18: STAFF RESULTS FROM THE POST-SURVEY

	ELEMENTARY (N=22)	*MIDDLE (N=17)*
	% AGREE	**% AGREE**
STAFF KNOWLEDGE OF STEM TOPICS		
I am knowledgeable about different careers/disciplines within science and engineering.	95%	75%
I am knowledgeable about topics in science and engineering.	81%	81%
I am knowledgeable about the steps in the engineering and design process.	95%	94%
I am knowledgeable about the Engineering Design Standards from the Next Generation Science Standards.	48%	69%
LEADING STEM ACTIVITIES		
When I try very hard, I lead STEM activities as well as I lead most other activities.	94%	92%
I know the steps necessary to teach STEM concepts effectively.	95%	93%
I am very effective in monitoring STEM activities.	100%	81%
I am continually finding better ways to lead STEM activities.	96%	85%
I understand STEM concepts well enough to be effective in leading STEM activities.	90%	85%
STEM PRACTICES		
I know how to lead an activity with the engineering design process embedded within it.	100%	93%
I know how to create an equitable learning environment when leading STEM activities.	95%	93%
I know how to lead a structured lesson plan with a learning objective, introduction, hands-on activity, and reflection.	100%	87%

	ELEMENTARY (N=22)	MIDDLE (N=17)
I know how to engage youth in the inquiry process.	91%	100%
I know how to embed discussion of careers within a hands-on science activity.	95%	93%
I know how to use questioning to engage youth.	100%	100%
I know how to use reflection techniques in the classroom that engage all youth (i.e., not just a large group discussion).	86%	87%
SUPPORTING YOUTH TO EXPLORE STEM CONTENT		
I don't know what to do to turn children and youth on to STEM.	0%	7%
It is important to show children and youth the possibility of having a career in a STEM-related field.	96%	100%
It is important to show children and youth that STEM is related to the world around them.	100%	100%
SUPPORTING YOUTH'S UNDERSTANDING OF STEM CONTENT		
When children and youth have difficulty understanding a STEM concept, I am usually at a loss as to how to help them understand it better.	24%	0%
I am typically able to answer the STEM questions of children and youth in my program.	90%	69%
When leading a STEM activity, I usually welcome questions from children and youth.	100%	91%
CREATING EQUITABLE STEM LEARNING OPPORTUNITIES		
I believe girls are equally interested in STEM as boys.	91%	94%
I think it is important to turn girls on to science as much as boys.	100%	100%
I think that it is within my control to turn youth from different linguistic, racial and cultural backgrounds onto science.	96%	81%
I think it is within my control to turn girls on to science as much as boys.	96%	88%

	ELEMENTARY (N = 22)	MIDDLE (N = 17)
CREATING EQUITABLE STEM LEARNING OPPORTUNITIES		
Increased effort in leading STEM activities produces little change in the science achievement of children and youth.	23%	7%
The inadequacy of the STEM background of children and youth can be overcome by leading good STEM activities.	91%	77%
After school STEM activities impact the school-year performance of children and youth in science.	82%	65%
After school STEM activities impact the interest of children and youth in school-year science activities.	91%	77%
STEM COACH EXPERIENCE		
I worked with the STEM Coach to set goals related to how I lead STEM activities.	91%	91%
The STEM Coach answered my questions about leading STEM activities.	100%	91%
I received valuable feedback from the STEM Coach.	100%	92%
I used the feedback from the STEM Coach to improve how I led STEM activities.	100%	92%
The support I received from the STEM Coach helped me feel more confident in leading STEM activities.	100%	92%
My motivation to lead STEM activities increased because of the support I received from the STEM Coach.	73%	92%

Source: 2013 -14 Staff Post-Surveys.

APPENDIX D: STAFF POST-SURVEY OPEN-ENDED RESPONSES

TABLE 19: STAFF POST-SURVEY RESPONSES TO LEARNED EXPERIENCES IN THE STEM LEARNING COMMUNITY

WHAT ARE THE THREE MOST IMPORTANT THINGS THAT YOU LEARNED FROM PARTICIPATING IN THE STEM LEARNING COMMUNITY?		
RESPONSE ONE	RESPONSE TWO	RESPONSE THREE
Science is for everyone	Working in groups is valuable	A lesson can have multiple objectives
The Engineering Design Process	Resources for School-Age Curriculum and PD	There are many different ways to infuse STEM into After School
Each person has a voice. I let all my kids share to the rest of the group as much as possible	I don't have to have all the answers. We can figure it out as it goes.	Take your time leading the activity. It doesn't have to be finished in one day.
Rebuild process	Learning from each other	Circle time
Ways to support line staff in implementing STEM	How to connect school day concepts to after school	Importance of facilitation strategies
Working in teams is important	Stereotype threat	Adapting activities
Science is everywhere!	Science can be fun!	Science is for everyone!
The value of reflection.	The importance of having STEM programs.	How to lead a STEM activity
STEM fields are wrought with inequity. These inequities begin in elementary schools.	After school can provide important learning experiences for students	STEM is fun!
The importance of the inquiry process	Making equity a priority in programming	Ways to make stem come alive
My line staff received coaching	NA	NA
Informative	Fun	Great resources
The importance in planning the lesson - so it goes smoothly - such as thinking ahead of time of questions that students might have	Incorporating STEM activities that reflect interests that students have shown in the after school program	Budgeting for STEM activities - and where to find free stuff in SF
How to create and adapt lesson plans w/ clear learning targets	The importance of equity in STEM learning	New ideas and techniques from group of peers

Learned new curriculum	Share with peers about what did and did not work in STEM	Educational standards related to STEM
Youth have little knowledge about STEM	If I engage youth and I am excited about my activity, they will also be willing to learn and have fun.	STEM is for any time not just during school hours.
Engineering Design Process	How to encourage inquiry	Astronomical Science
I learned that teaching and learning about STEM do not have to be intimidating, technical, or out of reach.	I learned how to effectively utilize inquiry techniques to engage students during the learning process.	I learned that STEM education is very important for youth.
Important to get youth involved in inquiry process.	Small steps in recognizing STEM in real world applications are just as important as getting an A on a test.	It is effective to pose a real world challenge to youth as an engineering design challenge.
How simple planning can make STEM so FUN for youth (and adults!)	How STEM is intergraded in almost everything we do during our day-to-day lives.	How 'hungry' our youth are to learn new things - especially when it is hands-on, interesting activities.
Principals of teaching and facilitating STEM activities	Tools and activity ideas	How to incorporate other skill sets while teaching STEM: critical thinking; writing/reflections; group participation/questioning
How to implement inquiry-based activities in an after-school setting	How to present STEM concepts with equity	How to effectively present a STEM lesson
The engineering process	How to check for standard alignment within program plan	Different experiments and concepts for STEM
Preparing and facilitating stem every week	Finding activities that are fun and educational	Patience
How to engage students	How to stretch out lessons	How to relate to real world
Stereotype threat	Scaffolding	Failure isn't bad
How to lead a STEM activity	How to engage youth in STEM	How to structure a STEM activity
Engineering design process	Promoting equity	Adapting lesson plans

Source: 2013-14 Staff Post-Surveys.

TABLE 20. STAFF POST SURVEY OPEN-ENDED RESPONSE CODING AND METHODOLOGY

WHAT ARE THE THREE MOST IMPORTANT THINGS THAT YOU LEARNED FROM PARTICIPATING IN THE STEM LEARNING COMMUNITY?	
CODE	SUMMARY
Planning	Responses focused on skills learned that help in planning lessons.
Youth Engagement	Responses focused on skills learned that help engage youth in activities and make STEM fun.
STEM Awareness	Responses focused on increased awareness about STEM, knowledge of STEM activities, or STEM's applicability to everyday life.
Implementation/Facilitation	Responses focused on skills learned that help in facilitating and leading activities.
Inquiry	Responses focused on the importance of the inquiry process and learning how to engage youth in inquiry.
Equity	Responses focused on promoting and prioritizing equity and combatting stereotype threat.
Resources	Responses focused on increased awareness of available resources or usefulness of resources provided.

APPENDIX E: STAFF FOCUS GROUP QUALITATIVE DATA CODING

TABLE 21: END-OF-YEAR STAFF REFLECTION QUALITATIVE DATA CODES AND METHODOLOGY

QUESTION 1: WHAT HAVE YOU LEARNED FROM BEING PART OF THE STEM LEARNING COMMUNITY?	
CODE	**SUMMARY**
Community: Staff mentions the benefits of shared learning.	Staff felt that being a part of the Learning Community was beneficial because it allowed them a chance to share experiences and ideas and get feedback from peers.
Content: Staff mentions specific topics that they learned about.	Some staff mentioned learning more about growth mindsets and the Engineering Design Process, which was a strong focus of the STEM LC.
Resources: Staff mentions the word resources, materials, or activities that they were exposed to.	Some mentioned that the Learning Community made them aware of and gave them exposure to available resources for teaching STEM.
Science Beliefs: Staff mentions general ideas about science or mentions fun, social justice, equity, and confidence.	Some staff members' key takeaway from the STEM LC was a shift in their attitude about science. Staff reported that they had a new appreciation for how fun science could be and felt that it is important to expose youth to science.
Leading Activities: Staff mention the structure of parts of an activity, facilitation or engaging youth.	Being a part of the Learning Community taught staff how to structure STEM activities. Some staff noted that they now understood the importance of different parts of the STEM activities such as the introduction, reflection, and asking intentional questions. Staff also noted that they learned new approaches to leading STEM activities.

QUESTION 2: WHAT CHANGES HAVE YOU SEEN IN YOUTH RELATED TO THEIR ENGAGEMENT IN STEM, INTEREST IN STEM, AND STEM CONTENT KNOWLEDGE?	
CODE	SUMMARY
Interest: Staff mentions that youth have changed in their interest, excitement about or willingness to participate in STEM.	Many of the staff noticed changes in youth's interest in STEM, stating that youth were more excited to participate in STEM activities. The STEM interest and engagement seemed to go hand in hand. And often the hands-on nature of activities was quoted as the reason for youth's growing interest and engagement.

Engagement: Staff mentions youth were engaged in activities or showed enjoyment during activities.	Some staff also reported that their youth were engaged in the STEM activities. One staff noted that, “Some activities have engaged students that typically don’t “try” in the classroom.”
Content knowledge: Staff mentions youth learned about specific topics in STEM such as careers or knowing what STEM means.	When staff mentioned changes in youth knowledge, they emphasized that youth had a greater awareness of STEM and corresponding careers.
Broad skill: Staff mentions broader skills such as collaboration, exploration, creativity etc.	A few staff mentioned how the structure of the STEM activities contributed to the youths’ teamwork skills and a willingness to engage in inquiry.

QUESTION 3: WHAT ADDITIONAL THINGS WOULD YOU HAVE LIKED TO RECEIVE FROM THE STEM LEARNING COMMUNITY? (E.G., MORE TRAINING, MORE COACHING, MORE TEACHING RESOURCES)

CODE	SUMMARY
More: Staff asks for more of a type of support that the Learning Community already offers.	Most staff mentioned wanting more of the same type of supports that were available to them as members of the STEM LC. Staff were particularly interested in more STEM activities.
Adapting: Staff asks for activities to change to meet the staff member's needs.	Staff were interested in learning how to modify STEM activities for different age groups and how to change the complexity of the activity to meet the needs of youth.
Examples of STEM: Staff asks for opportunities to see or observe the STEM activities being facilitated.	A few staff were interested in seeing STEM activities in action. They mentioned wanted to observe other programs or watch videos of staff leading STEM activities.
Careers: Staff asks for resources to connect youth to careers.	A few wanted to have more connections with STEM professionals that they could talk to about different STEM careers.
Content: Staff request support to deepen knowledge of STEM topics.	A few staff wanted a deeper introduction to the STEM topics that they were talking to youth about.

QUESTION 4: WHAT CHANGES WOULD YOU SUGGEST FOR THE 2014-2015 LEARNING COMMUNITY?	
CODE	SUMMARY
Curriculum changes: Staff requests more curriculum or revisiting Techbridge curriculum	The curriculum would be improved by adding more math and science activities and including more diverse topics such as computer programming and robotics. Simplifying the language and making the curriculum easier to modify for different learners will also strengthen the curriculum.
Grant Process: Staff suggests changes to the grant process	Staff indicated that more clarification on the grant process is needed.
Leading activities- Staff comments on how to best prepare staff to lead activities	A few staff requested more specific feedback on leading activities.
Resources: Staff made general suggestions about additional resources	Staff were interested in receiving even more resources. They were particularly interested in videos, resource web pages, training forums and guest speakers.
Training Format- how trainings should be adjusted to better fit the needs of staff	The perspectives of the Supervisor Representatives involvement varied. Some staff felt that the coordinator's role should be de-emphasized others wanted to change how Supervisor Representatives participated. They suggested that Supervisor Representatives stay with the line staff. Other comments suggested introducing some supports earlier such as coaching and leading practice lessons.

APPENDIX F: YOUTH SURVEY RESULTS BY GENDER

TABLE 22: RESULTS ACCORDING TO RESPONDENTS' SELECTED GENDER CATEGORY

	MALES (N=158)	*FEMALES (N=150)*
	% AGREE	**% AGREE**
YOUTH INTEREST IN STEM		
The after school STEM program made me want to learn more about STEM.	83%	82%
The after school STEM program made STEM more fun.	85%	86%
The after school STEM program made STEM interesting.	86%	82%
YOUTH ENGAGEMENT IN STEM		
The after school STEM program taught me things that I shared with my family.	70%	67%
I am good at STEM.	80%	74%
I do STEM projects when I am not in school.	52%	47%
I enjoy learning STEM in my class at school.	82%	82%
I had to think hard when I did the after school STEM activities.	75%	70%
STEM CONTENT LEARNING		
In the after school STEM program, I used new STEM words to talk about my STEM projects.❖	73%	58%
When I was done with a STEM project, I could explain what I learned to others.	75%	76%
In the after school STEM program, the adults answer my questions about STEM.	84%	83%
In the after school STEM program, I understood the STEM topics that we talked about.	87%	83%

	MALES (N=158)	FEMALES (N=150)
In the after school STEM program, I learned new things.	85%	87%
In the after school STEM program, I learned about things that matter to me.	72%	70%
In the after school STEM program, I learned how to form a hypothesis.*	70%	64%
In the after school STEM program, I learned how to tell if my hypothesis was correct.*❖	76%	61%
In the after school STEM program, I learned to use facts to help me explain my STEM projects.*	72%	71%
STEM CONNECTIONS TO SCHOOL AND CAREERS		
The after school STEM program made me more excited to learn about STEM in my class at school.	76%	75%
In the after school STEM program, I learned things that I can use in my class at school.	72%	74%
The after school STEM program made me think about getting a STEM job when I'm older.	60%	58%
I know what scientists and engineers do at work.	75%	73%

*Item was asked only on the middle school survey.
❖ Item was statistically significant between groups at the .05 level.

APPENDIX G: YOUTH SURVEY RESULTS BY RACE AND ETHNICITY

TABLE 23: RESULTS ACCORDING TO RESPONDENTS' SELECTED RACIAL OR ETHNIC CATEGORY

	ASIAN OR PACIFIC ISLANDER (N=73)	BLACK OR AFRICAN AMERICAN (N=30)	HISPANIC (INCLUDING LATINO) (N=86)	WHITE, NON-HISPANIC (N=33)	MULTIRACIAL (N=60)
	% AGREE				
YOUTH INTEREST IN STEM					
The after school STEM program made me want to learn more about STEM.	88%	80%	80%	88%	81%
The after school STEM program made STEM more fun.	86%	87%	87%	82%	90%
The after school STEM program made STEM interesting.	85%	89%	82%	79%	87%
YOUTH ENGAGEMENT IN STEM					
The after school STEM program taught me things that I shared with my family.	62%	79%	71%	61%	73%
I am good at STEM.	76%	87%	78%	73%	81%
I do STEM projects when I am not in school.	49%	52%	45%	52%	59%
I enjoy learning STEM in my class at school.	84%	79%	80%	82%	81%
I had to think hard when I did the after school STEM activities.❖	73%	83%	72%	58%	75%
STEM CONTENT LEARNING					
In the after school STEM program, I used new STEM words to talk about my STEM projects.❖	69%	83%	63%	52%	73%
When I was done with a STEM project, I could explain what I learned to others.	70%	76%	79%	64%	83%

	ASIAN OR PACIFIC ISLANDER (N=73)	BLACK OR AFRICAN AMERICAN (N=30)	HISPANIC (INCLUDING LATINO) (N=86)	WHITE, NON-HISPANIC (N=33)	MULTIRACIAL (N=60)
In the after school STEM program, the adults answer my questions about STEM.	85%	93%	81%	88%	87%
	% AGREE				
In the after school STEM program, I understood the STEM topics that we talked about.	81%	93%	82%	88%	90%
In the after school STEM program, I learned new things.	88%	80%	84%	88%	92%
In the after school STEM program, I learned about things that matter to me.	73%	83%	67%	67%	73%
In the after school STEM program, I learned how to form a hypothesis.◆	71%	78%	69%	22%	89%
In the after school STEM program, I learned how to tell if my hypothesis was correct.◆	67%	84%	72%	44%	82%
In the after school STEM program, I learned to use facts to help me explain my STEM projects.◆	73%	79%	65%	78%	77%
STEM CONNECTIONS TO SCHOOL AND CAREERS					
The after school STEM program made me more excited to learn about STEM in my class at school.	75%	71%	77%	73%	80%
In the after school STEM program, I learned things that I can use in my class at school.	73%	77%	69%	72%	79%
The after school STEM program made me think about getting a STEM job when I'm older.	62%	60%	57%	46%	61%
I know what scientists and engineers do at work.	70%	83%	73%	76%	80%

◆ Item was asked only on the middle school survey.

❖ Item was statistically significant between groups at the .05 level. Items asked only on the middle school survey did not return sample sizes large enough for statistical testing. Note: Race or ethnic groups with N< 5 were omitted from the table.

APPENDIX H: DIMENSIONS OF SUCCESS (DOS) OBSERVATION TOOL

TABLE 24: DOS ASSESSES THE QUALITY OF STEM ACTIVITIES ON 12 DIMENSIONS

Dimension of Success Domains		Description
Features of the Learning Environment	**Organization**	The preparation for the activity is apparent in smooth transitions, available materials, and time spent on learning activities.
	Materials	The materials for the STEM activity are age appropriate, suitable for the learning goal, and hold youths' interest.
	Space Utilization	The space where the STEM activity occurs accommodates the planned activity and limits possible distractions. The space is set up in a way that supports youths' active engagement with STEM content.
Activity Engagement	**Participation**	All youth are on task and completing the learning activity. Staff encourage non-participants to join the group.
	Purposeful Activities	The learning goal for the STEM activity is clear to youth. The link between the STEM activity and the learning goal is apparent and most of the time is spent supporting the learning objectives.
	Engagement with STEM	The planned activities provide hands-on learning opportunities that support youths' understanding of STEM content.
STEM Knowledge and Practices	**STEM Content Learning**	Staff help youth understand the STEM content by making connections across content clear, presenting STEM material accurately, and providing youth opportunities to apply their knowledge.
	Inquiry	The planned activity allows youth to engage in STEM practices such as making observations, developing models, and analyzing and interpreting data.
	Reflection	Youth have opportunities to reflect on the STEM concepts and the STEM activities in a manner that shows their understanding of the STEM content.
Youth Development in STEM	**Relationships**	The youth – youth and staff – youth relationships are also positive.
	Relevance	The STEM activities have a clear link to youths' lives and communities. The youth have opportunities to explore STEM careers that are related to the topic of the STEM activity.
	Youth Voice	Youth have opportunities to express their thoughts, opinions and ideas. There are also opportunities for youth to make choices during the STEM activity.

Source: Dimensions of Success tool. The descriptions above summarize the practices that are included in the DoS tool.