

Summer Science Pilot Project: Watts Up! Energy and Conservation

Evaluation Findings 2012

September 2012

Prepared by the Partnership for Children and Youth
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About the Summer Science Pilot Project

The Summer Science Pilot Project supports the availability and quality of science, technology, engineering, and mathematics (STEM) summer enrichment programs in Oakland and Mt. Diablo, California. The Summer Science Pilot is led by the Partnership for Children and Youth (PCY) and by Techbridge, in collaboration with the Oakland Unified and Mt. Diablo Unified School Districts. The project combines the resources and experiences of PCY's Summer Matters Campaign and Techbridge's informal science education curriculum and out-of-school time professional development.

Programmatic Elements:

The Summer Science Pilot Project supports summer STEM programming through:

- **Training:** In Spring 2012, Techbridge conducted two trainings each for summer program staff at Oakland and Mt. Diablo Unified School Districts. The trainings addressed teaching strategies that promote inquiry-based, hands-on science.
- **Coaching:** In Summer 2012, Techbridge staff and partner school districts collaborated to provide on-site coaching for participating staff. Coaching included one or two observations of staff members leading an informal science activity, followed by a debriefing session with a Techbridge coach. In Mt. Diablo, on-site teachers provided coaching daily. Additional coaching visits were scheduled if necessary or requested.
- **Quality Assessment:** Year-round technical assistance, including training, coaching, mentoring, consultation, and resource brokering was followed by onsite quality assessment site visits utilizing the Comprehensive Assessment of Summer Programs (CASP) Site Observation Tool.

Partner Agencies:

The Summer Science Pilot Project is a collaborative project of:

- **Partnership for Children and Youth (PCY):** Partnership for Children and Youth was formed in 1997 by government, philanthropy and business leaders who were concerned about the persistent poverty and ongoing difficulties faced by children and youth in specific Bay Area communities. An extensive analysis found that these poorest communities were vastly underutilizing funding streams which could cover the costs of critical support programs for children and youth. The Partnership was created to connect schools and their community partners in these underserved communities with available public and private resources, and to improve the effectiveness of funding streams serving poor children. Our primary clients are those institutions that provide critical support services to disadvantaged children—including schools and school districts, community-based agencies, and state and local government. PCY's work is organized around three key program areas: Out of School Time, Community Schools, and Policy and Advocacy.
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- **Techbridge:** Founded by Chabot Space & Science Center with support from the National Science Foundation, Techbridge was launched in 2000 to expand the academic and career options of girls and to help increase the representation of women and underrepresented youth in STEM. Building on 11 years of success, Techbridge spun off as an independent nonprofit organization in 2011. Techbridge has reached over 3,000 girls in the Bay Area through after-school and summer programs for girls that offer innovative hands-on projects, role models and worksite visits, and academic and career guidance.
- **Oakland Unified School District After School Programs Office:** The OUSD After School Programs Office oversees 75 state and federally funded elementary, middle and high school programs, supporting the implementation of quality academic and enrichment out-of-school-time programs for 17,720 students.
- **Mt. Diablo CARES:** Mt. Diablo CARES administers elementary, middle and high school programs at 16 school sites with support from 23 community partners. The program is the result of an ongoing collaboration between the Mt Diablo School District, City of Concord Parks & Recreation, and Bay Area Community Resources. CARES is supported by several funding sources including grants from state and city initiatives.

Participating Sites

In Summer 2012, Summer Science Pilot programming was implemented at the following elementary schools:

Mt. Diablo Unified

- Cambridge
- Delta View
- El Monte
- Fair Oaks
- Ygnacio Valley

Oakland Unified

- Allendale
- Sobrante Park
- East Oakland Pride
- Global Family
- Greenleaf

Watts Up? Energy and Conservation

The Summer Science Pilot Project implemented the Watts Up? Energy and Conservation curriculum during the summer of 2012. Designed and developed by Techbridge, this 19-day curriculum is composed of four units of hands-on activities and icebreakers on the theme of energy conservation:

- In the introductory lessons, youth learn about the various forms of energy with a focus on electrical energy, including where energy comes from.
- Youth gain an understanding of the distinction between renewable and nonrenewable sources by reviewing the environmental impact of energy consumption.
- An energy audit provides youth with the opportunity to apply their knowledge by assessing how energy is used in their classroom and develop suggestions for how to be more energy-efficient.
- In the final project, youth develop a commercial on a topic related to energy conservation that they can share at a culminating science family event.
- The curriculum also includes supplemental resources such as take-home extension activities and kid-friendly science articles.

Summer Science Pilot Goals

The Science Pilot has 6 established goals. Available evidence suggests that the Pilot completely met four and partially met two goals. For goals 4 and 5, we expect to continue learning and moving forward in these two areas. Public Profit assisted in the analysis of staff and participant surveys to measure progress on goals 2 and 3; these goals were completely met according to available evidence. Further detail on data sources is located in Appendix A of this report.

Pilot Goals	Progress Toward Goals
1. <i>Launch Summer Science sites in 2 communities serving at least 600 youth with 120 hours of programming.</i>	●
2. <i>Increase participating youths' interest in STEM learning and knowledge of specific STEM topics.</i>	●
3. <i>Strengthen line staff's ability and confidence to teach science lessons in summer and after school.</i>	●
4. <i>Develop a replicable and sustainable system of technical assistance for summer STEM programs in other communities in California</i>	◐
5. <i>Define how this system integrates with the developing STEM in OST and CSLNet infrastructure.</i>	◐
6. <i>Prepare Bay Area summer programs as showcases for high quality STEM education.</i>	●
Key	
●	Complete
◐	Partial Completion
○	Not Yet Started

Launch Summer Science sites in 2 communities serving at least 600 youth with 120 hours of programming.

In Summer 2012, the Summer Science Pilot served 623 youth at 10 sites in the Oakland Unified and Mount Diablo Unified School Districts.

In Oakland Unified:

- Programming ran from June 26, 2012 to Friday, July 20, 2012, including a total of 126 total hours of programming.
- A total of 292 youth were served from 8:30AM-3:30PM daily which included 4 hours of summer school instruction.
- An average of 212 youth attended daily, receiving an average of 90 hours of programming each.

Table 1. Attendance by Site: Oakland Unified School District

Site Name	Total Served	Attendance (Average Daily)	Attendance (Average Total Hours)
Allendale	59	37	79
Sobrante Park	36	22	77
East Oakland Pride	68	49	91
Global Family	60	51	107
Greenleaf	69	53	97

Source: <https://www.youthservices.net/ofcy/index.asp>

In Mount Diablo Unified:

- Programming ran from June 25, 2012 to July 20, 2012, including a total of 114 hours of programming.
- A total of 331 youth were served from 8:00AM-2:00PM daily.
- An average of 276 youth attended daily, receiving an average of 94 hours of programming each.

Table 2. Attendance by Site: Mt. Diablo Unified School District

Site Name	Total Served	Attendance (Average Daily)	Attendance (Average Total Hours)
Cambridge	110	96	99
Delta View	67	58	99
El Monte	71	52	83
Fair Oaks	39	32	93
Ygnacio Valley	44	38	98

Source: <http://afterschoolattendance.net/>

Increase participating youths' interest in STEM learning and knowledge of specific STEM topics.

When asked about program quality, 92% of participating youth report that the summer science program had fun activities and 91% report the program had nice instructors.

The youth retrospective pre-test measures the extent to which participants report increased interest and engagement with science. According to pre-test survey results, participants report increased interest in STEM learning as a result of summer science program participation. Nearly all youth report that the summer science program taught them new things (94%), made science more interesting (93%), and made science more fun (92%).¹ In survey free responses, youth describe activities using subject-specific concepts, demonstrating a grasp of the topics as outlined in the Watts Up? Energy and Conservation curriculum.

When asked what they liked most about summer science activities, youth most commonly report appreciating the hands-on nature of learning activities, a positive affinity with teaching staff, and a deepened understanding of science. When asked about program quality, participating youth report that the summer science program has fun activities (92%) and nice instructors (91%).²

¹ These figures are reported for the 355 youth that submitted valid responses on the youth survey.

² These figures are reported for the 355 youth that submitted valid responses on the youth survey.

Table 3. Youth Survey Response by Question³

Youth Survey Questions: <i>The Summer Science Program...</i>	Total (n=355)
The summer science program taught me new things.	94%
The summer science program made science more interesting.	93%
The summer science program made science more fun.	92%
The summer science program made me more excited to do science activities.	86%
The summer science program made me want to learn more about science.	85%
The summer science program taught me more about science topics that matter to me.	84%
The summer science program made me want to play more with science toys (for example, a microscope, magnifying glass, a robot, etc.).	83%
The summer science program made me more excited to learn about science in school.	81%
The summer science program taught me things that I shared with my family.	77%
The summer science program made me more interested in a science job when I'm older.	57%

Reported for proportion of youth responding “yes” to each of the questions listed above.

Source: Summer Science Pilot Youth Survey, n = 355, July 2012

Student responses to survey questions demonstrate an appreciation of activities. One participant noted, “We learned a lot of stuff and still remember [those things]”. Another says,

[The program] helps me learn new things so I can teach my family and my cousin and my best friend in my old school and I love summer science activities.

Students also describe the inclusiveness of activities. One participant writes,

What I liked best about the summer science activities was that we all got to participate and that made it fun. I liked that all activities included helping the earth to a better place.

In survey free response questions, many students specifically describe learning new things in summer science programs. One student writes that the activities were fun and, “we experienced new things.” Another reports that,

³ For a complete breakdown of student response by site, district, and race/ethnicity see Appendix B and C.

What I liked about my summer science activities is that we learned about new science things we haven't heard about.

Students also demonstrate increased knowledge of STEM specific topics. One participant describing her/his favorite activity writes,

[In the] Wetlands [activity]...we got to build our own land then pour the dirt and pollution and see how it affects our ocean.

Another student describing her/his favorite activity demonstrates an understanding of the connection between science concepts and her/his daily life, writing,

[I like that] they taught the way I learn. [I learned that] because I am already right handed...I use the right side of my brain more than my left.

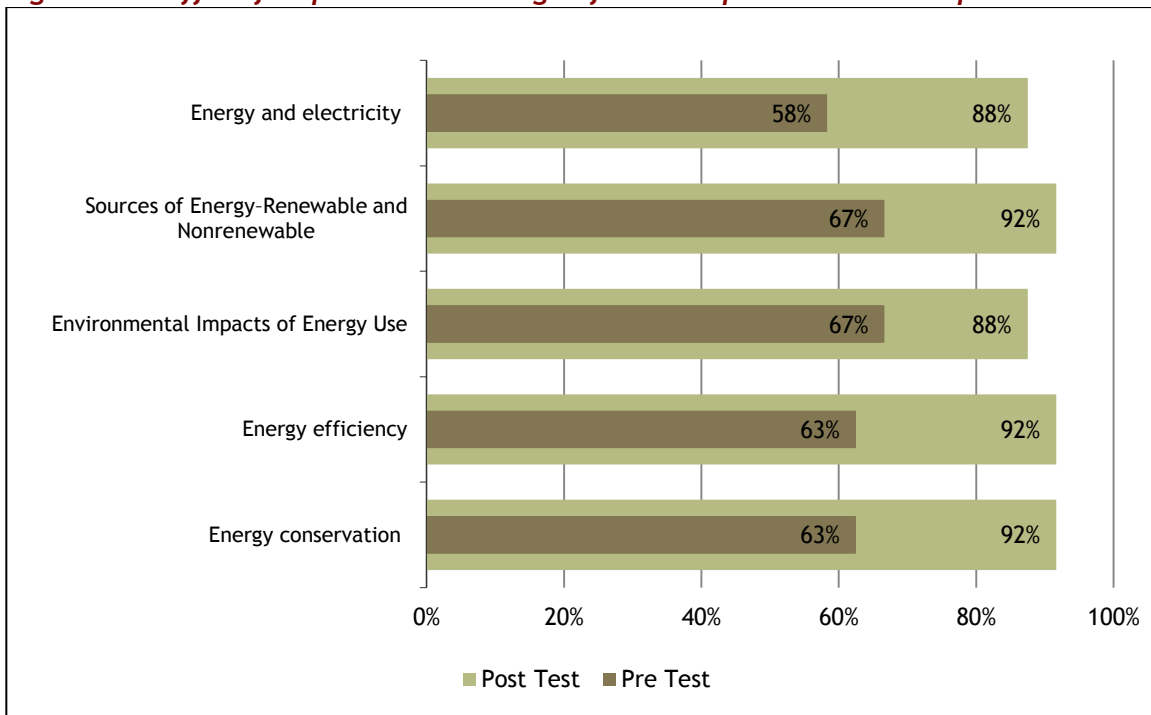
Strengthen line staff’s ability and confidence to teach science lessons in summer and after school.

“I felt much more comfortable and confident with all the tools I learned [in the trainings].”

Staff participants in Summer Science Trainings report notable growth in perceived self-efficacy in teaching informal science activities, increased confidence teaching STEM topics, and an increased tendency to “welcome questions from children and youth” when leading science activities.

According to pre-post assessments, staff also report increased knowledge of the topics outlined in the Watts Up? Techbridge Curriculum, with the most marked growth in Energy and Electricity topics.

Figure 1. Staff Self-Reported Knowledge of Watts Up? Curriculum Topics



Source: Staff Pre-Survey and Post Survey, n=24, April, May 2012

When asked about the Watts Up? Curriculum, staff reports that the trainings were successful and led to increased efficacy in the classroom. One staff writes,

I felt [the trainings were] a great idea, because staff get to demonstrate activities before they bring it to the youth. It’s a great way to ensure staff has proper training. It made me fell more confident that I could successfully teach the curriculum.

Another staff member notes that the training itself was fun, and when implementing the curriculum, observed positive impact for youth. This respondent writes,

“[The trainings were] extremely helpful, I don’t think I would have been able to lead the lessons as well without the training. I felt much more comfortable and confident with all the tools I learned there.”

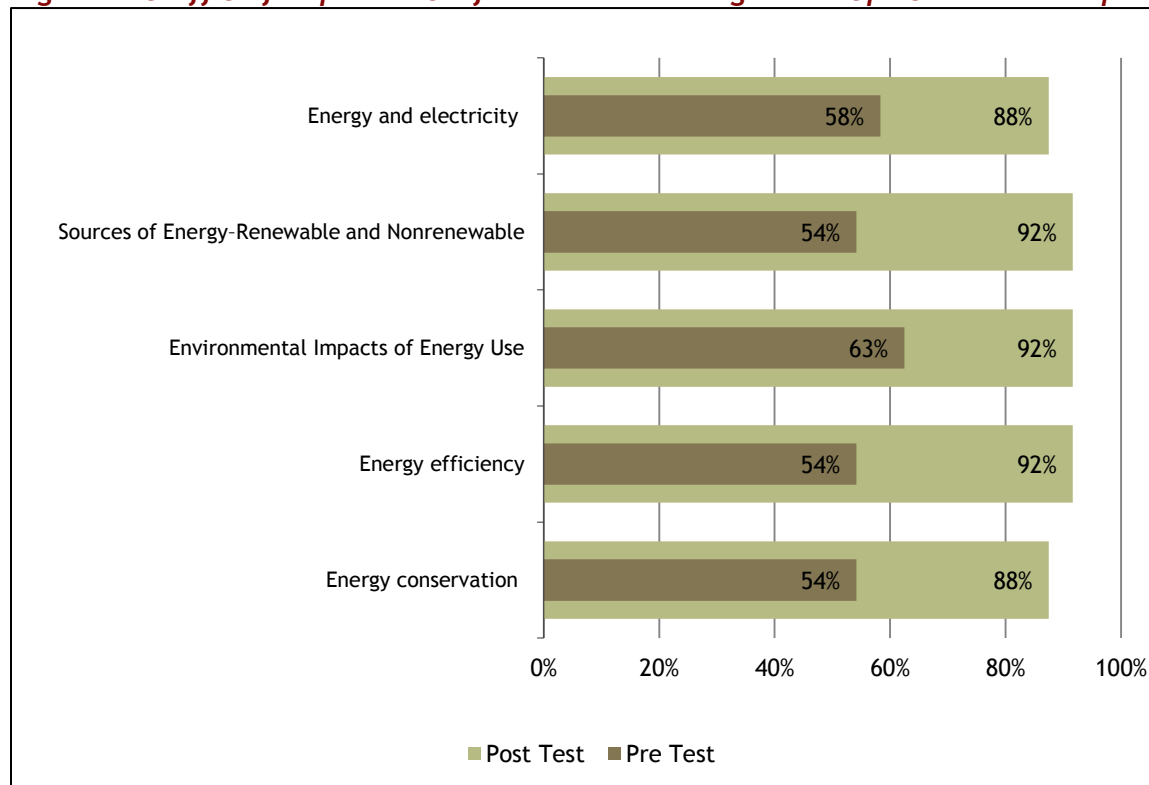
It was really fun. I learned a lot. And it is a great program for children. My class of 3rd and 4th [graders] really enjoyed and understood everything. We loved the hands on activities.

Staff reports that training sessions had a direct impact on their ability to teach informal science; staff also reports satisfaction with the trainings. One staff writes that,

[The trainings were] extremely helpful, I don’t think I would have been able to lead the lessons as well without the training. I felt much more comfortable and confident with all the tools I learned there.

According to pre-post assessments, staff increased their confidence in teaching the topics outlined in the Watts Up? Energy and Conservation Techbridge Curriculum. Surveyed staff members reported especially strong growth in confidence teaching Energy Efficiency, demonstrating nearly 40-percentage point increase following the trainings.

Figure 2. Staff Self-Reported Confidence in Teaching Watts Up? Curriculum Topics



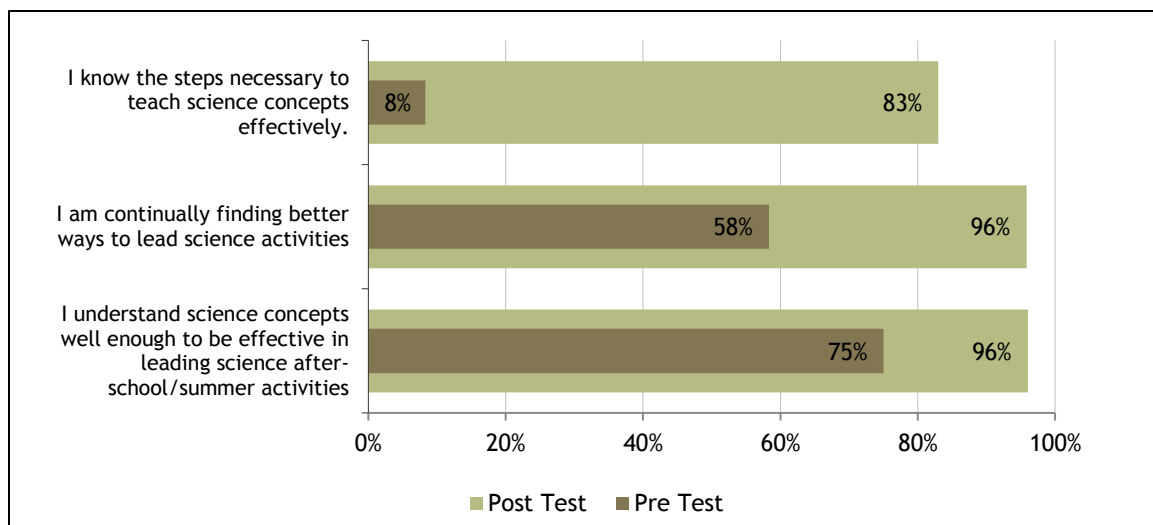
Source: Staff Pre-Survey and Post Survey, n=24, April, May 2012

Despite increased confidence in teaching curriculum topics, several staff note a disconnect between the level of vocabulary included in the curriculum relative to the abilities of youth in their programs. One staff member writes,

The hands on activities are very engaging but the wording of experiments are too difficult, even with repetition and simplifying the words, I feel like [the students] can't really grasp the ideas.

Staff also improved their sense of professional efficacy in informal science education. Surveyed staff members report remarkable growth in their ability to know the steps necessary to teach science concepts effectively, rising from just 8% reporting agreeing, “I know the steps necessary to teach science concepts effectively” at the start of trainings to 83% at the conclusion.

Figure 3. Staff Confidence in Teaching Informal Science Activities



Source: Staff Pre-Survey and Post Survey, n=24, April, May 2012

Staff with more experience leading after school and summer activities demonstrate greater increases in perceived self-efficacy following participation in Summer Science Pilot trainings; all participating staff indicate increased receptiveness to youth questions following the trainings.

Staff with one year or more experience working in summer or after school programming respond to the statement, “I am typically able to answer the science questions of children and youth in my program”, with a 16 percentage point higher increase in agreement in post test response than those with less than one year of experience; both experienced and less experienced staff report a 17 percentage point increase in agreement on the post test when asked if they “usually welcome questions” from youth.⁴

Staff who have previously received STEM training as well as those that had not previously received STEM training report increased overall agreement with the statement “I am

⁴ These figures are reported for the 16 staff who have more than one year of experience teaching summer and afterschool programming and the 6 staff who have less than one year of experience.

continually finding better ways to lead science activities” at 100% on post tests; staff with previous training increased their level of agreement by 46 percentage points, staff without increased their level of agreement by 29 percentage points. Staff with previous training also report a 16 percentage point greater increase in level of agreement to the statement, “I am typically able to answer the science questions of children and youth in my program.”⁵

⁵ These figures are reported for the 14 staff who have received informal science education previously and the 7 staff who have not received informal science training previously.

Develop a replicable and sustainable system of technical assistance for summer STEM programs in other communities in California

The technical assistance (TA) system is in development. This past summer, we learned a great deal about the training and coaching needs of front-line staff. We also learned about the benefits and challenges of implementing STEM-focused TA alongside an overall quality improvement effort. These two initiatives taking place side-by-side in a short period of time required significant commitment from program staff and managers. They rose to the occasion and provided substantial insight and learning about TA.

A few of the core elements of training and coaching that were learned or reinforced this summer and will be part of a statewide Summer Science model include:

- Layer STEM teaching strategies on existing teaching skill sets of classroom management and organization (i.e. start with experienced program staff).
- From the onset, have clearly defined and distinct programmatic roles and training requirements for line staff, site coordinators, and teacher coaches.
- Provide STEM training over a series of workshops before summer programming starts with opportunities for practice in between sessions. This requires CBO and/or school district partners to plan and hire staff well before the start of summer.
- Train to a prepared curriculum, but focus on the methods of teaching more than content, with a particular emphasis on intentionality and debrief of learning. Model the methods of teaching through the curriculum and training.
- Provide a variety of curriculum options to reach all age levels participating in summer programming, including lesson modification and extension.
- Once summer starts, provide on-site coaching with immediate feedback.
- If possible, include experienced teachers in the STEM training and have them available on-site during the summer to continue coaching the summer staff.

These strategies were critically important to the success of the Summer Science Project and resulted in the documented changes in staff confidence in, and ability to, teach science. They also showed evidence of increased intentionality and improved lesson planning in the non-STEM aspects of the program. We expect to include these core aspects into any recommended systems for statewide TA on STEM.

In terms of overall quality support, the TA model for quality improvement - involving the Complete Assessment of Summer Programs (CASP) assessment tool, an improvement plan, and on-site TA - was well-developed through the Summer Matters pilot communities funded by the Packard Foundation over the past 4 summers. Based on this year, we would recommend that the quality improvement system and plan be formally integrated with the STEM training and coaching process so that - as much as possible - the two efforts are perceived as a collective quality improvement initiative. In summer 2013, we hope to explore specific strategies to integrate the two models. The intentional learning goals of the CASP tool complement the Techbridge model of an effective science program. Thus, integrating PCY and Techbridge's TA models seems like a natural fit and will be a key focus for the upcoming project year.

Define how this system integrates with the developing STEM in OST and CSLNet infrastructure.

This year, the Summer Science, CAN STEM in OST and CSLNet infrastructures have been developing side-by-side. All three entities have partnered on policy efforts, specifically with the *Summer is STEMtastic* event in Sacramento where staff from STEM in OST and Techbridge each organized STEM stations for youth, while elected officials and education leaders spoke about the value of both summer learning and STEM education. Jeff Davis of CAN STEM in OST visited Techbridge trainings during the spring and toured summer programming to learn about the model. The Summer Science Project will also present at CSLNet's upcoming STEM Summit on how out-of-school settings are ideal venues for STEM learning.

Partnership for Children and Youth and Techbridge staff have been involved in the planning and implementation of STEM in OST strategies, and will continue to inform the development of the Regional Innovation Centers. Once these are in place and as our TA model becomes further developed, we will look for ways of leveraging the STEM in OST and CSLNet infrastructure and system to disseminate all or portions of the Summer Science TA Model.

Prepare Bay Area summer programs as showcases for high quality STEM education.

The Summer Science pilot sites were highlighted this summer through site visits from our funding partners and an array of other stakeholders interested in summer learning and STEM education. The programs effectively modeled the value of STEM learning in the summer with high-quality teaching and extremely engaging projects. As staff and program managers further strengthen their skills, we would expect to continue showcasing their work to an increasingly broad and diverse set of stakeholders. From the reaction of visitors, it is clear that these model programs are our most compelling argument for the value of STEM learning in summer.

Additionally, staff and youth were expected to showcase their work to the community at a culminating science family event on the last day of programming. A subset of sites hosted a family event, which was warmly received by those in attendance. For summer 2013, the development of better support structures will provide the sites with the necessary resources and time to plan a family event.

Appendix A: Data Sources

1. Youth Retrospective Pre-Test Survey

The youth retrospective pre-test measures the extent to which participants report increased interest and engagement with science learning as a result of program participation. The youth retrospective pre-test was administered during the final week of programming.

2. Staff Pre-Post Survey

The staff pre-post survey measures perceived self-efficacy in leading informal science activities. The survey also measures self-reported confidence and knowledge of the topic areas covered in the Techbridge-led trainings held in Spring 2012. The pre test was administered at the beginning of the first training; the post-test was fielded towards the end of the second training.

3. Training Evaluations

As a complement to staff pre-post surveys, Techbridge fields training evaluations at the end of each session. Evaluations include questions addressing topics covered in the session, usefulness of each topic, and areas for improvement.

4. Comprehensive Assessment of Summer Programs (CASP)

PCY utilizes the CASP before, during, and after the summer with the purpose to support a continuous improvement cycle in the program. Detailed, actionable feedback is the cornerstone of the CASP. The CASP features a set of protocols and tools designed to: collect information related to research-based indicators of summer program quality; provide feedback on program strengths; and make recommendations for continuous improvement. A complete CASP assessment consists of a review of program documents, a full day of observation and interviews or surveys with program leaders and frontline staff.

Appendix B: Youth Survey Results by Race/Ethnicity

Youth Survey Questions: <i>The Summer Science Program...</i>	Total	American Indian or Alaska Native	Asian	Black or African American	Latino	Multi-Race	Native Hawaiian or Pacific Islander	Other	White - non-Latino	No Race Reported
	n=355	n=12	n=18	n=44	n=175	n=17	n=3	n=50	n=16	n=21
The summer science program taught me new things.	94%	75%	100%	95%	93%	76%	100%	100%	88%	100%
The summer science program made science more interesting.	93%	100%	94%	91%	94%	88%	100%	90%	81%	95%
The summer science program made science more fun.	92%	92%	100%	93%	91%	94%	100%	96%	81%	90%
The summer science program made me more excited to do science activities.	86%	75%	89%	95%	85%	94%	67%	82%	94%	84%
The summer science program made me want to learn more about science.	85%	100%	94%	89%	82%	82%	100%	88%	88%	84%
The summer science program taught me more about science topics that matter to me.	84%	67%	89%	89%	87%	76%	100%	74%	88%	74%
The summer science program made me want to play more with science toys (for example, a microscope, magnifying glass, a robot, etc.).	83%	83%	94%	75%	81%	82%	100%	90%	94%	80%
The summer science program made me more excited to learn about science in school.	81%	67%	94%	86%	82%	76%	100%	72%	88%	78%
The summer science program taught me things that I shared with my family.	77%	83%	67%	86%	78%	59%	33%	76%	80%	74%
The summer science program made me more interested in a science job when I'm older.	57%	67%	56%	74%	56%	41%	67%	50%	44%	63%

Reported for proportion of youth responding "yes" to each of the questions listed above.

Source: Summer Science Pilot Youth Survey, n = 355, July 2012

Appendix C: Youth Survey Results by Gender

Youth Survey Questions: <i>The Summer Science Program...</i>	Total	Girl	Boy
	n=355	n=198	n=157
The summer science program taught me new things.	94%	94%	92%
The summer science program made science more interesting.	93%	94%	89%
The summer science program made science more fun.	92%	94%	89%
The summer science program made me more excited to do science activities.	86%	88%	82%
The summer science program made me want to learn more about science.	85%	87%	82%
The summer science program taught me more about science topics that matter to me.	84%	87%	78%
The summer science program made me want to play more with science toys (for example, a microscope, magnifying glass, a robot, etc.).	83%	86%	78%
The summer science program made me more excited to learn about science in school.	81%	81%	78%
The summer science program taught me things that I shared with my family.	77%	77%	75%
The summer science program made me more interested in a science job when I'm older.	57%	56%	56%

Reported for proportion of youth responding “yes” to each of the questions listed above.

Source: Summer Science Pilot Youth Survey, n = 355, July 2012

Appendix C: Youth Survey Results by Site/District

The following table depicts the overall percentage of agreement for each question of the youth survey by site and by school district. The responses in the table are based on the valid number of surveys submitted for each site.

The summer science program...		1. Made science more interesting.	2. Made science more fun.	3. Made me want to play more with science toys (for example, a microscope, a glass, a robot, etc).	4. Made me want to learn more about science.	5. Made me more excited to do science activities.	6. Made me more interested in a science job when I'm older.	7. Made me more excited to learn about science in school.	8. Taught me things that I shared with my family.	9. Taught me new things.	10. Had fun science activities.	11. Had nice instructors.	12. Taught me more about science topics that matter to me.
Mt. Diablo Unified	CAMBRIDGE	97%	88%	82%	71%	71%	53%	76%	71%	94%	85%	88%	76%
	DELTA VIEW	98%	91%	82%	84%	87%	49%	73%	73%	91%	98%	100%	87%
	EL MONTE	90%	90%	86%	83%	90%	48%	72%	62%	97%	93%	93%	79%
	FAIR OAKS	89%	89%	81%	85%	81%	48%	78%	78%	89%	93%	100%	74%
	YGNACIO VALLEY	87%	92%	66%	76%	84%	45%	74%	58%	92%	95%	82%	76%
Total (n=173)		93%	90%	79%	80%	83%	49%	75%	68%	93%	93%	93%	79%
Oakland Unified	ALLENDALE	92%	95%	95%	97%	92%	59%	87%	97%	95%	90%	92%	97%
	EAST OAKLAND PRIDE	81%	88%	81%	74%	77%	51%	72%	77%	88%	88%	81%	109%
	GLOBAL FAMILY	100%	95%	95%	100%	98%	78%	93%	90%	95%	98%	98%	100%
	GREENLEAF	93%	93%	79%	91%	93%	65%	86%	77%	98%	93%	91%	103%
	SOBRANTE	89%	100%	78%	83%	78%	67%	83%	78%	89%	83%	83%	100%
Total (n=183)		91%	93%	86%	90%	89%	63%	84%	84%	93%	91%	90%	87%

Reported for proportion of youth responding "yes", by site, to each of the questions listed above; total response is aggregated by district.

Source: Summer Science Pilot Youth Survey, Mt. Diablo (n = 173), Oakland (n=183), July 2012