Evaluation of the California Subject Matter Project

California Science Project Case Study

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May 2012

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Introduction

What began as a University of California, San Francisco (UCSF) scientist finding ways to share resources with the public schools has grown into an interconnected series of supports for San Francisco teachers from the Science and Health Education Partnership (SEP) at UCSF. This case study describes how SEP brings together scientists who are interested in giving back to the community and igniting passion for science in young people with teachers seeking to improve the quality and quantity of their science teaching. These supports are especially important in the current high-stakes testing climate that prioritizes language arts and mathematics over science and other content areas.

We begin by describing the history of SEP and the programs SEP offers elementary teachers and the scientists who work with them. Then we describe one of these programs, Scientist Teacher Action Teams (STAT), in detail. This is followed by an examination of the benefits to teachers, students, and scientists from participation in STAT. We end by reviewing supports and challenges that SEP faces.

History

Exhibit 1
Characteristics of San Francisco Unified School District

Comprising the entire city and county of San Francisco, the San Francisco Unified School District is the seventh largest district in California. The district enrolls 55,000 students from diverse backgrounds: Approximately 89% are from minority populations, 27% are English language learners, and 61% qualify for free and reduced-price lunch. A total of 73 elementary and K–8 schools are in the district.

The Science and Health Education Partnership was founded in 1987. At the time Bruce Alberts, Chair of the Department of Biochemistry and Biophysics at UCSF, and his wife were concerned about the lack of resources for science education at their children's San Francisco public school (Exhibit 1). Anxious to do something, Dr. Alberts developed a way for UCSF to donate surplus laboratory equipment and supplies to the San Francisco schools. As part of the process, he enlisted the help of David Ramsay who was then Vice Chancellor for Academic Affairs at UCSF. Dr. Ramsay's support was crucial because as an administrator he was able to develop an official mechanism to transfer surplus materials to K–12 schools. Finally and critically, Dr. Alberts asked teachers how UCSF could support their science teaching. They responded that "The supplies and equipment are great and we can really use them, but what we really want is access to the intellectual resources of UCSF. We want to be able to work with scientists."[1] Heeding this input, Drs. Alberts and Ramsay hired a program coordinator and SEP was born. From this humble beginning programs were added over time until SEP became the thriving center that it is today offering school programs, internships, workshops, classes, and materials for K–12 teachers. In 1999, after over a decade of working with teachers, SEP joined the California Science Project (Exhibit 2).

[1] SEP website, http://biochemistry.ucsf.edu/programs/sep/about-sep-our-history.html

SEP Programs Supporting Elementary Science Education

Over the years, SEP has developed a series of interconnected offerings for elementary teachers and the scientists they work with. Through these programs, teachers and scientists can gain science content and pedagogical content knowledge. Furthermore, SEP's offerings provide multiple entry points to participanting teachers.

Exhibit 2
The California Science Project

The California Science Project network of 18 sites strives to provide high-quality, standards-based professional development for teachers throughout the state. The objective is to build teachers' content and pedagogical content knowledge, facilitate teachers' use of the state frameworks and standards, and support the development of academic English. In addition, the California Science Project works to link schools and universities and to develop a group of teacher leaders and university scholars to conduct professional development.

SEP offers the following supports for elementary teachers and the scientists who work with them:

- *The Daly Ralston Resource Center:* With its collection of more than 3,000 materials, the Daly Ralston Resource Center is a treasure trove open to all San Francisco Unified School District science teachers. Materials include over 120 wet human anatomical specimens, animal skulls of 50 different species, sets of compound and dissecting microscopes, models, sets of scientific equipment (e.g., magnifying glasses), curricula and activity guides, and science kits. Teachers can check materials out for a 1- to 2-week period.
- *Scientist Teacher Action Teams (STAT):* Through the STAT program, scientists and teachers work together in teams to design and implement a series of science lessons for elementary school students. Teams are usually composed of two scientists and two teachers. Together, they plan and deliver four lessons in each partner teacher's classroom with the support of the SEP staff and materials from the Resource Center.
- *City Science Summer Institute:* In the City Science Summer Institute, K–5 teachers learn how to use the adopted science instructional materials (Full Option Science System) to create inquiry-based science learning experiences for students. Each grade-level-specific institute is led by specially selected teachers and scientists who jointly develop this 1-week summer program after co-teaching one FOSS kit in the teacher partner's classroom. The lessons are standards based and either are drawn from the FOSS kits or provide extensions to enhance student understanding. During the summer, teachers attend the institute section corresponding to the grade level they teach. Participating teachers engage in the lessons as students and also spend time exploring and discussing science concepts to build their understanding of the content and pedagogy.
- *Scientist Teaching Workshops:* This series of three 3-hour workshops is designed to enable scientists to deliver science lessons in schools. During the workshops scientists are introduced to such topics as lesson planning, assessment practices, classroom and materials management, and cognitive development by participating in hands-on science lessons.

- *Architecture of Life* and *Chemistry of Life:* SEP coordinators teach these weeklong courses in an inquiry-based way with the goal of helping teachers teach science through investigation. The Architecture of Life course is on biology, and the Chemistry of Life class is on chemistry.

Besides having the chance to work together on STAT and to use the Resource Center, scientists and teachers can take workshops and classes to fill gaps in their knowledge. Further, a group of teachers at a school can come together to form a professional learning community for science teaching. SEP's offerings also provide multiple entry points to participating teachers. For instance, one teacher remarked that participating on STAT "sparked my interest," and she went on to take the Architecture of Life course and eventually participate in all the SEP elementary offerings.

When teachers and scientists take part in multiple programs, their learning can be reinforced and expanded. For instance, a STAT scientist spoke to us about how he learned about the importance of preassessment from the Scientist Teaching Workshops. He then applied what he learned when he spoke with students on a visit to his collaborating teachers' classrooms and during the lessons he taught. For example, in the lessons he was particularly concerned that students understood all the vocabulary he was using because the information he learned about preassessment drew his attention to the difference in vocabulary between a scientist and a second-grader.

Scientist Teacher Action Teams

We now turn our focus to STAT. We concentrate on STAT because it is the elementary program that brings scientists and teachers together in large numbers to plan and deliver science lessons to San Francisco public elementary school students.[2] This popular program supported 55 teams of 101 teachers and 119 UCSF scientists during the 2010–11 school year. Together, they worked with more than 2,300 K–5 students in 29 schools. Sixty percent of these schools work with majority low-income students, and 39% were named low performing (API 1-4) by the state of California.

Through STAT, two sets of professionals with very different skills collaborate, with the goal of improving science education for elementary school students. To enable the teachers and scientists to have the most productive experience possible, they are teamed in groups of four, with two scientists and two teachers on each team. This structure enables the team members to support each other as they venture into a new work environment, and it facilitates delivery of the actual lessons. With three or four adults in the classroom for each of the lessons, engaging students in hands-on science is much easier. Team members often debrief after teaching the lesson in the first classroom to reflect on what went well and what could be improved before delivering the lesson a second time.

[2] Teachers and scientists co-teach the City Science Summer Institute, but the number of teams is far smaller than in STAT and those teacher-scientist teams are carefully selected by SEP staff members.

STAT begins with a 2-hour kickoff meeting that sets the stage for how the team members will work together. The goal is to have them get to know each other and build mutual respect and trust. As a participant recounted, "They come at you like this is your experience, this is my experience. How can we put it together and make something that's even better?" Team members discuss their workdays and what they love about their professions. The team members also read, discuss, and answer questions about two case studies. The cases describe common partnership challenges from teachers' and scientists' perspectives. Finally, the team members set dates for visits and lessons and start to plan with the help of the SEP staff.

Exhibit 3
Example of Teachers and Scientists Planning Together

The two teachers and two scientists on the team gather in the Resource Center to talk about the four lessons they will teach together. The room is packed with scientific equipment, kits, videos/DVDs, skeletons, models, organ specimens, books, posters, and binders with lesson plans. The team members sit at a table while an SEP staff member stands ready to help find resources. The discussion weaves from person to person as they talk about an SEP lesson on germs. Both the teachers and scientists have thought about the lesson and have suggestions about materials they could use and processes they could follow. As the teachers and scientists propose different materials and activities, the SEP staff member quietly looks for resources, demonstrates how to use them, and brings in other materials he thinks might be useful. Although the whole team has thought about the lesson, it is clear that the teachers and scientists have different areas of expertise. For instance, the scientists explain how to prepare and cultivate agar plates while the teachers read books on germs to determine which would be most appropriate for the students. Once they decide on the lesson on germs, they move on to talk about lessons on plants and organs in a similar manner.

The SEP staff continues to support the teams when they reconvene to plan in the Resource Center. Each team is required to spend an hour and a half planning in the Resource Center with a staff member facilitating their use of all the materials housed there (Exhibit 3). The staff member can thus monitor the process to make sure that the lesson the team is planning is age appropriate, that all students in the class will have access to materials, and that the team members are working well together. By the end of the planning session, teams have a good idea of what they will do together during the jointly taught lessons.

Finally, the scientists come to the teachers' school to present the lessons (Exhibit 4). The actual implementation varies from classroom to classroom, but generally the scientists lead the lesson with the support of the teacher whose classroom they are working in. The scientists then repeat the lesson in the second teacher's classroom. The teams debrief between lessons in some cases or after having taught both lessons. An SEP staff member observes at least one of the team's lessons during the spring and often provides the scientists with informal feedback.

Exhibit 4
Teaching a Hands-on Lesson

This is the second in a two-lesson unit on which soil plants grow best in and the scientific method. The scientists begin by leading the students through a recap of the previous lesson and of the parts of the scientific process that they covered:

1. Created a question (Which soil will the plants grow best in?)
2. Made observations (They touched, smelled, listened to, and looked at the soil.)
3. Developed a hypothesis (The plant will grow best in ____ soil.)
4. Designed an experiment (They planted radish seeds in each of the different soils.)

Students raise their hands to answer the scientists' questions as they go through this information. Then the scientists introduce what the class is going to do next by telling the students that they will measure their plants (analyze data) in order to make a conclusion. Both the scientists and the teacher circulate while the students measure their plants and fill out their worksheets. As the adults move around, they help the students measure their plants, ask questions about what the students are observing, explain difficult vocabulary the scientists have used, and clarify misconceptions. Then the scientists move the lesson back to a whole-group exercise in which students report out the length of their plants and the scientists create a chart with this information. On the fly, the scientists realize that the second-graders are not going to be able to take an average of these measurements so they decide to find the median, a concept that the students have studied. In general, the students are engaged throughout the lesson and the scientists spend time joking with them and laughing when they themselves make mistakes with the chart. The class ends with the scientists creating a bar graph of the medians for each type of soil and concluding that the best soil to grow plants was the one in which the tallest plant grew. In one class, there was a tie between two soils, so the scientists showed the students how one plant had more leaves and was greener than the other, thereby concluding that the soil it grew in was more conducive to growing plants.

Outcomes

In our interviews teachers, students, and scientists all reported benefiting from participating in the STAT program. Teachers and scientists teach more science, develop greater science and pedagogical knowledge, gain a clearer understanding of the scientific process, and hone their collaboration skills. For students, the reported benefits include an increased interest in science and new images of scientists and of themselves as scientists. In this section, we contextualize findings based on our interviews with findings from evaluations conducted by SEP, which suggest that the patterns in reported outcomes we found generalizes beyond our sample of respondents.

For Teachers

Increase in hands-on standards-based science lessons. Teachers reported that because of their participation in STAT they teach more science, present hands-on lessons they would not have done on their own, and address more content standards. As a participating teacher reported, "SEP

reminds us that science doesn't have to be abandoned." For some teachers, simply having more adults in the classroom makes teaching hands-on science seem feasible. The findings from our interviews are echoed in an end-of-program survey conducted by the SEP, which found that 83% of teachers agreed or strongly agreed that they had taught new concepts from the standards as a result of their work in STAT.[3, 4]

Improved understanding of science and the scientific process. Teachers are able to deliver more science lessons partly because they can develop a better understanding of science and the scientific processes through their participation in STAT. A teacher described her transformation from assuming that there was only one correct answer to a science experiment to seeing that the results of an experiment open up other paths for exploration:

> I assumed that people always got the standard answer that my chemistry teacher had always wanted me to get. The reality is that that doesn't happen and there's lots of variation, there's lots of reasons why. So how do we look at those reasons why? How do we learn from those?

This teacher and others we interviewed gained a clearer understanding of how science is done in the real world as a result of her participation in STAT. An end-of program survey by SEP suggests that the experiences of the teachers we interviewed are quite common. An overwhelming majority of teachers reported that STAT improved their understanding of science and the scientific process in the survey (Exhibit 5). Returning teachers reported even higher levels of learning than first-time participants in STAT. This may be because they learned about more topics the second time around or because it takes time to really understand the scientific process.

Exhibit 5
Teacher-Reported Changes in Their Understanding of Scientific Concepts and the Process of Science (percent)

Teachers' STAT participation status:	Returning	New
Through this partnership program, I have deepened my understanding of some scientific concepts.	93	83
Through this partnership program, I have deepened my understanding of the process of science.	93	71

Source: Update to the Annual Progress Report Submitted to the S. D. Bechtel, Jr. Foundation.

Greater comfort in teaching science. Perhaps because of the knowledge gained through the STAT program, interviewed teachers reported feeling more confident teaching science. As one teacher who participated in STAT for 3 years explained, "They made me feel not only super comfortable, but super excited I could do science and be a scientist."

In the end-of-program survey a majority of teachers, especially returning teachers, reported feeling more comfortable teaching science. This was also true when they were asked specifically

[3] UCSF Science & Health Education Partnership. (2009). *Update to the annual progress report submitted to the S.D. Bechtel, Jr. Foundation 2008–09 Outcomes.* San Francisco, CA: Author.

[4] Data reported here are from *Update to the annual progress report submitted to the S.D. Bechtel, Jr. Foundation 2008–09 Outcomes* a mixed-methods evaluation of STAT by SEP. Adult participants completed a Partnership Survey at the end of the STAT program. The survey response rate was 73% in 2008–09. Qualitative data were used to corroborate quantitative survey data.

about teaching investigative science (Exhibit 6). In this case, the difference between teachers returning to STAT and teachers new to it was particularly marked.

Exhibit 6
Teacher-Reported Changes in Their Confidence in Teaching Science, Especially Investigative Science (percent)

Teachers' STAT participation status:	Returning	New
Since my participation in this program, I am more comfortable teaching science.	90	58
Through this partnership program, I have gained confidence in teaching investigative science.	87	70

Source: Update to the Annual Progress Report Submitted to the S. D. Bechtel, Jr. Foundation.

In this case, the difference between teachers returning to STAT and teachers new to it was particularly marked.

Enhanced collaboration skills. Finally, teachers we interviewed reported developing collaboration skills as a result of their work in STAT. The premise of the program is that both teachers and scientists have different strengths that they contribute to the partnership, so it is important for them to work well together. SEP has similar findings in their own evaluations of their work. One teacher they interviewed was particularly eloquent in explaining how SEP builds these skills,

> The partnership helped me to learn how to work on a team with other professionals to make rewarding learning experiences that run smoothly...it was a perfect partnership because our visiting scientists could help by providing materials and subject knowledge and my co-teacher and I could help to present it in an organized way that students could understand.
>
> —Update to the Annual Progress Report Submitted to the S. D. Bechtel, Jr. Foundation by the UCSF Science & Health Education Partnership, 2008–09

Her report on the partnership exemplifies how scientists can contribute scientific knowledge and materials, while the teachers can supply knowledge about their students and how to effectively deliver lessons.

For Students

When students participate in STAT lessons they experience hands-on science and have the opportunity to meet real scientists. A participating teacher talked about the multiple benefits that she saw her students getting from participating in STAT lessons.

> The thing I love the most about it is it brings really quality science lessons to the kids and the kids love it. They light up! ... To have two people who have a background in science is really important, I think. It is nice because they have that background knowledge that I might not have so they can answer questions that the kids have. And it's also great for the kids to be meeting scientists and know that scientists aren't people who put potions together and blow things up…a lot of times they'll say, "I want to be scientist when I grow up" after doing this program.

According to this teacher, in addition to participating in high-quality science lessons students gain an interest in science, a better understanding of who scientists are, and, at times, a desire to become scientists themselves.

SEP's own evaluations suggest that this finding from our interviews is common among STAT participants. In the vast majority of cases, teachers answering an end-of-program survey reported that participation in STAT lessons resulted in students gaining a greater interest in science, changing their perceptions of who scientists are, and viewing themselves as scientists (Exhibit 7).

Exhibit 7
Teacher-Reported Changes in Students' Views of Science, Scientists, and Themselves as Scientists (percent)

Teachers' STAT participation status:	Returning	New
Through participation in this program, some of my students became more enthusiastic about science	97	87
My students' views of who can be a scientist changed through our participation in this program	90	83
Through this program, my students began to see themselves as scientists.	97	83

Source: Update to the Annual Progress Report Submitted to the S. D. Bechtel, Jr. Foundation.

Scientists

Scientists also reported multiple benefits from participating in the STAT program in the *Update to the annual progress report submitted to the S.D. Bechtel, Jr. Foundation 2008-09 Outcomes*. While these findings are not supported by our limited sample of scientists, they may be important reasons why so many scientists become involved with and continue to participate in SEP after their first year. According to a SEP end-of-project questionnaire, a large majority of scientists gained pedagogical content knowledge, new insights into science content and the scientific process, and improved collaboration skills by taking part in STAT (Exhibit 8).

Exhibit 8
Scientist's Reported Changes in Their Content and Pedagogical Content Knowledge (percent)

Scientists' volunteer status:	Returning	New
My participation in this partnership program has given me insight into how to implement inquiry in my teaching.	76	94
As a result of my participation in STAT, I am more likely to use hands-on science activities in my teaching.	79	91
My participation in this program has increased my understanding of the scientific concepts we taught in our partnership lessons.	72	62
Through my work in this partnership program, I have gained skills in working productively with others.	90	94

Source: Update to the Annual Progress Report Submitted to the S. D. Bechtel, Jr. Foundation.

With regard to teaching, scientists reported gaining insights into how to execute inquiry-based practices and were more likely to use hands-on science activities in their teaching as a result of their work with STAT. The maxim that a person needs to teach something to really know it holds true with these participants. A majority of them felt they better understood both the science content included in their lessons and the process of science as a result of their experiences in STAT. A scientist recounted,

> The classes we taught were designed to give second-graders an idea of what the scientific method is. … This meant that my partner and I had to put a lot of thought into what the scientific method is and how you can distill it to its basic concepts so that our students

> would understand it. This was surprisingly difficult. The difficulty came from the realization that I don't frequently think about the scientific method and that its full ramifications and subtleties are not necessarily familiar to me. … It allowed me to better understand some of the basic assumptions and ways of thinking that drive me as a scientist.
>
> —Update to the Annual Progress Report Submitted to the S. D. Bechtel, Jr. Foundation.

Finally, participating scientists also felt they gained collaboration skills by participating in STAT. When discussing pedagogical content knowledge and collaboration skills, new volunteers reported higher levels of learning than the returning volunteers. This may be because returning volunteers already made changes in their practice or their ways of working with others after their first year of participation.

Supports

A number of factors contribute to the success of STAT and SEP in general. SEP's programs work together to provide synergistic benefits for all participants, the abundance of materials in the Resource Center facilitates the work in STAT, and the quality of the SEP staff is high. Because of the strength of the staff, the center is able to support teachers and scientists and also successfully apply for funding. Finally, UCSF has provided extensive support to the program in terms of funding, materials, and volunteers.

Other SEP offerings. The SEP elementary offerings are designed to support each other. The STAT program brings together the expertise of scientists and teachers, and their knowledge can be supplemented through the other SEP offerings. Scientists take the fall series of workshops to improve their pedagogical and classroom management skills. After taking part in the Scientist Teaching Workshop Series, 100% of the participants reported having a better appreciation for inquiry-based science and that they were better prepared to participate in the STAT program. The hope is that this will translate into a better experience for everyone involved in STAT.

SEP also provides teachers with supports that can enable them to participate more successfully in STAT and improve their science teaching in general. Teachers can improve their content and pedagogical content knowledge through City Science Summer Institute, the Architecture of Life and Chemistry of Life courses, and Schools Focused on Science. It is difficult to separate out how this new knowledge facilitates or motivates their participation in STAT or how participation in STAT can lead them to these other offerings. However, we do know that teachers gain knowledge and skills and those could transfer to their teaching in general and in STAT in particular should they choose to participate in it. As a teacher remarked,

> [Scientists bring] incredible content knowledge that I don't have … but it wouldn't be sufficient. Just working with the scientists doesn't give you 40 hours of your own opportunities to experiment with … the FOSS kits … [or give you] time to develop your content. [This] is what the City Science and [the Architecture of Life and Chemistry of Life courses] provide. So I think they do a really good job of offering different kinds of experiences.

Resource Center. The Resource Center plays an integral role in providing teachers and scientists with a place to meet and access to a plethora of materials that support science teaching. In both ways, the Center facilitates the teaching of science. By providing the teams with a space to meet, the staff creates a common ground between the teachers and the UCSF scientists. The materials support the planning and implementation of lessons in myriad ways. For example, the

materials and equipment supply the teams with whole lesson plans and ideas for extensions to lessons and facilitate lesson execution. As a teacher explained,

> They have the most amazing lending library. When I would teach something I'd say, Oh, I want to do something more hands on with this, and I would go up and tell them what I was teaching and there was always somebody in the lending room who was, like, "Oh, well, we've got a kit on this," or "Here's a video." They would always take you to the next level.

The resource center also serves participants in other courses and workshops and is open to all San Francisco teachers.

Quality of staff. As described above (Exhibit 3), the staff at SEP works hard to support the STAT teams as they get to know each other and plan their lessons together. The staff members embody the science and teaching backgrounds that are combined through the STAT program and thus are able to act as bridges between the two worlds. Over the years, the staff has thoughtfully put together a program to facilitate the success of the partnerships and actively support the teams as they plan together. A teacher participant described the support the Resource Center staff provided her:

> It was great because whoever was working in the Resource Center would hear comments in the room and make connections to things they already had in the Resource Center or different things that they could get for us that as a teacher I wouldn't necessarily have access to. That's the one thing about the Resource Center. I always feel like if I have some crazy science idea, I can just call them up and say, I have this crazy science idea, can you help me? and they will be, like, "Yeah, that sounds great!"

According to this teacher, SEP staff are able to help teachers transform their science teaching ideas into concrete lesson plans.

Budget. In general, the work at SEP is funded through a number of sources. UCSF has supported up to 40% of the SEP budget and has made an effort to support the work even during difficult budgetary times. In addition to the university's contributions, SEP receives funds from the California Science Project, the National Institutes of Health, and various foundations and institutes. Currently, the STAT program is funded by the S. D. Bechtel, Jr. Foundation and UCSF, although its funding sources have changed over the years.

Support from UCSF. UCSF has supported SEP from its inception. Through the work of Drs. Alberts and Ramsay, it has become an institution at the university. After 25 years, the university continues to fund the center, contribute materials to schools, and encourage graduate students and postdoctoral fellows to volunteer with the program.

Challenges

Although STAT and SEP have received numerous and important supports, they have also faced challenges. The first is today's lack of emphasis on science education in elementary schools. STAT is also suffering from its popularity. So many people are interested in participating in the program that the staff feels it is reaching the limits of its capacity to support teams. Finally, relationships are complex, and while most scientist-teacher partnerships are successful, at times individual partnerships need additional support to help them overcome challenges that arise between partners.

Lack of time and support to teach science. A report on the status of elementary school science education in California found that "forty percent of all elementary teachers spend 60 minutes or less on science instruction per week; indeed, 13 percent of elementary teachers spend 30 minutes or less."[5] In large part, this lack of time and support for science is due to accountability pressures in mathematics and English language arts. This pressure has led teachers, especially teachers in high-poverty schools, to severely cut back on their science teaching. This was exemplified by teachers participating on an SEP-convened elementary science advisory board. All the teachers on the board had participated in at least one SEP program and were interested in teaching science. Yet because of other curricular pressures, every one of them was able to teach science for only 1 hour a week.

Scarcity of resources to accommodate demand. The STAT program has grown so much that the SEP staff is starting to discuss whether it can sustain the program at its current size because it is stretched so thin and accommodating all the teams in the Resource Center is difficult. At the same time, staff members do not like to turn anyone away because they feel that the STAT program is so positive for everyone involved.

Relationships. The STAT teachers and scientists generally work well together, but there are times when difficulties arise either because of a personality problem or because the teachers defer to the scientists. In the case of a difficult personality, the staff either gives the person a different placement or releases the person of his or her responsibilities. When teachers are not actively involved in lesson planning, the lesson is generally not as successful as when they are. The SEP staff has addressed the challenge by revising the orientation meeting to include case studies presenting the same situation from the two points of view. These case studies and the questions at the end of them are designed to stimulate conversation and show that both the teachers and the scientists have valuable assets that they contribute to the partnership. Another strategy that the SEP staff has used to facilitate teachers' equal participation is to have them discuss with scientists strategies that they find are successful with their students. This puts the teachers in the position of knowledge and also helps the scientists when they teach the lessons.

Conclusion

Over the years, the SEP has grown to become an interconnected system of supports for K–12 San Francisco public school teachers seeking to improve their science education for students. Through SEP offerings, teachers can work to improve their science content and pedagogical knowledge as well as introduce new people and experiences to their students. One of the ways they can do so is through the STAT program. This program is particularly interesting because of the multiple benefits that it offers participating teachers, students, and scientists and also because it illustrates well how the different elementary offerings can come together to support teachers' science teaching.

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[5] Dorph, R., Shields, P., Tiffany-Morales, J., Hartry, A., McCaffrey, T. (2011). *High hopes—few opportunities: The status of elementary science education in California.* Sacramento, CA: The Center for the Future of Teaching and Learning at WestEd.