

In exploring the relationship between scientific process and concept development, Mei-ling Wiedmeyer, a teacher from Burbank MS, carefully measures the drop angle for a pendulum at the third Triad Professional Development Day.

Learning, Teaching, and Doing— They’re All Linked in the Lab

An interesting transformation occurs when teachers and scientists work together in the laboratory. Scientists, spending their lives immersed in inquiry, may still view science education as the memorization of facts and vocabulary — the way most of us were taught. Teachers, spending every day with students constructing their own understanding of the world, may also maintain a view of science as a collection of specialized facts. But what happens in the laboratory? Can concepts such as molecular structures, electricity, polymers, buffers, proteins, and cells remain unrelated? If so, how could we use electrophoresis to investigate the production of antibodies by immune cells? And how does this relate to teaching? Working together, both teachers and scientists come to see how what we know and how we know it are inextricably intertwined both in the lab and the classroom.

Scientists who host teachers in their labs have a number of experiences that are rare on this graduate campus. They get the opportunity to teach at a level similar to an undergraduate course. They get practice talking about science in general and their work in particular, to someone who’s not a specialist. Teachers are typically a curious,

(Learning continued on page 5)

Experienced Participants Enrich the Triad Introductory Program

There have been some extraordinary transformations this year in the way professional development has been approached in Triad (SEP’s NSF-funded program in gender equity). The changes started with the expansion of the program into three strands; the Introductory Program for beginning participants, and the Mentorship/Leadership (M/L) Group and the Collaborative Inquiry (CI) Group, both for advanced participants. Professional development for the Introductory Program took place in three day-long sessions, as in the past. This year, however, these days were each organized around the Triad core themes of Girl Goals, Equity Teaching Goals, and Science Goals respectively. For the

first time, veteran Triad teachers and scientists from the advanced strands worked side by side with staff in planning, facilitating, and evaluating the PD Days.

In the planning process, M/L and CI Group members joined staff in designing and practicing activities chosen for their ability to support the objectives of the day. In the process, the team further defined the core themes, chewed on weighty concepts like “inquiry” and “content,” and debated which teaching strategies to employ within activities. These discussions shaped what the days looked like, from the practical to the philosophical, and helped the staff refine the agenda.

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About SEP

The Science & Health Education Partnership (SEP) is a collaboration between the University of California, San Francisco (UCSF) and the San Francisco Unified School District (SFUSD). SEP's mission is to promote partnership between scientists and educators in support of high quality science education. To these ends, SEP develops and implements programs that 1) support teaching and learning among teachers, students, and scientists; 2) promote an understanding of science as a creative discipline, a process, and a body of integrated concepts; and 3) develop a deeper understanding of partnership. SEP is an Academic Unit under the UCSF Office of Student Academic Affairs and is made possible in part through funds from the UC Office of the President, the National Science Foundation, the Howard Hughes Medical Institute, the UCSF Chancellor, and private donations.

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SEP Goes on the Road

Language & Science

What is the relationship between language development and learning science? After designing and implementing a host of professional development and summer school programs, researchers led by Trish Stoddart at the University of California, Santa Cruz have found that integrating English and science learning enhances understanding of both.

Today in California, 40% of all K-12 students are from non-English speaking homes. A critical issue for these students is that English language learning tends to be separated from academic content learning. Consequently, they have limited access to high quality science instruction, especially at the high school level, and experience subsequent low achievement levels. The good news, however, is that inquiry science promotes the development of language in a highly contextualized setting. In turn, the resulting deeper level of discourse promotes a higher level of science concept development.

To learn more about this powerful relationship, a team from SEP/SFUSD attended an English Language Learners Leadership Institute in Santa Cruz. The institute was conducted by the staff and participants from the Life Lab Science Program and the NSF-funded Language Acquisition in Science Education for Rural Schools (LASERS) and sponsored by the California Science Project. The SEP/SFUSD team found the substance and strategies presented in the meeting to be highly valuable and have already begun to integrate them within programs. Look for more in future newsletters. ▲ —LC



Joyce Swenor, Program Director, LASERS



Roberta Jaffe, Executive Director for the Life Lab Science Program and Site Director, Monterey Bay CSP

Partnership Models Shared in Seattle

Three members of the SEP staff joined seven Seattle-area science education outreach organizations at a conference in Seattle on January 27th to exchange experiences and ideas. Lively discussions were held on issues of general concern to outreach, including program assessment, sustainability, and dissemination. SEP staff described SEP partnership programs that operate within the San Francisco Unified School District and learned about a variety of outreach efforts in Seattle. The conference was organized and hosted by Nancy Hutchison of the Fred Hutchinson Cancer Research Center (FHCRC) and funded by the Howard Hughes Medical Institute (HHMI). The FHCRC has its own organization, modeled after UCSF's SEP, which conducts summer institutes for teachers, makes biotechnology kits available for loan to institute graduates, and has a summer institute for students called Hutchlab.

Ellen Kuwana, a former UCSF SEP volunteer who writes for the Neuroscience for Kids web site at the University of Washington (UW), also attended along with representatives from other outreach programs at UW: The Molecular Biotechnology Education Outreach; the Department of Biobehavioral Nursing; and the new K-12 Institute for Science, Mathematics, and Technology Education.

Representatives from Biolab (a private foundation), the Immunex Corporation, and HHMI also attended.

▲ —EW

SEP Bids a Fond Farewell to Helen Doyle

On January 3, 2000, one desk at the SEP office was unusually empty. On any given day in the last five years, one would have found Helen Doyle, SEP Middle School Coordinator, busily engaged in her efforts in science education by 8 am. The SEP staff is saddened but proud that on that day Helen started a new phase of her career as a Science Program Officer at the David and Lucile Packard Foundation. It is difficult to convey the enthusiasm and creativity that Helen brought to SEP, and the warm regard with which SEP staff, UCSF volunteers, and SFUSD teachers and students will remember her efforts.

"...at the Packard Foundation I have the opportunity to support science education reform efforts on a broader, national scale."

Soon after her arrival at UCSF as a postdoctoral fellow, Helen came to SEP and began to demonstrate the passion and commitment to science education that continues to be a hallmark of her work. In the fall of 1991, Helen embarked on her first partnership at Aptos Middle School introducing students to the wonders of development through examining live embryos under microscopes. Following three years of outstanding volunteer work through City Science, SF Base, and individual partnerships, Helen was hired in 1994 as the SEP Middle School Coordinator. She brought new ideas and vigor to existing programs such as MedTeach, the Lesson Plan Contest, and the High School Summer Intern Program; she was instrumental in the design and growth of HealthTeach, Links (a California Science Project), and Bridges; and she worked intimately with Triad and the SFUSD initiative, INQUIRES. Her contributions behind the scenes at SEP, often through her efforts in the SEP Resource Center, will be especially missed.

As a program officer, Helen joins the Science Program team in the review and funding of a wide variety of grant proposals to support projects focused on scientific research and science education. Since the Foundation's Science Program has a particular commitment to supporting educational opportunities for Hispanic, African American, and American Indian individuals, Helen is deeply involved in supporting the students, faculty, and science programs at the nation's Tribal Colleges and Historically Black Colleges and Universities. Asked how her work with the Packard Foundation differs from her work with SEP, Helen said, "At a place like SEP, I could support and influence the work of 20 teachers and their present, and potentially, future students, whereas at the Packard Foundation I have the opportunity to support science education reform efforts on a broader, national scale."

Helen misses working directly with teachers and students, and thinking

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about teaching and learning in the immediate context of classrooms, but also enjoys her new charges. "It's really nice to have the luxury of time to read the literature again, find out what's going on around the country, and think deeply about scientific research again." The SEP staff salutes Helen's many years of work with teachers, students, and volunteers to support high quality science education in San Francisco's public schools. We wish her well in all her new pursuits! ▲ —KT



Helen Doyle (middle) working on Genetic Onionneering in the old SEP Resource Center.

For an update on HealthTeach/MedTeach, a program most dear to Helen's heart, read on

"My favorite organ is the skeletal system. I learned if we don't have a skeleton we will look kind of like pudding." This student response came from an interactive learning project about science and the human body done by a HealthTeach team (Mandy Chan, Nelson Chee, Shawn Haugtaling, Elena Lee, Sandra Matsumura, Eliza Wang, and Cindy Yen) with Giannini MS 6th graders. Two years ago Helen Doyle formed the HealthTeach program for 1st year pharmacy students to join the long-existing MedTeach program. The current four HealthTeach and seven MedTeach teams recently participated in a focus group with SEP coordinators, sharing the many rewards and challenges that occur when working with adolescents in the SFUSD schools. For a complete list of the teams please see our web site at www.ucsf.edu/sep.medteach.html. ▲ —SJH

The Science of the Spice Trade: A STAT Team Experiments with Curriculum Integration

When Rome was besieged in 408 A.D. by Alarich, leader of the Goths, the ransom to liberate the city was set as 5000 pounds of gold and 3000 pounds of pepper. At first reading this looks like a misprint — nearly as much pepper as gold? But in fact spices have been as valuable as gold through much of history. So valuable that Queen Isabella was willing to pay for Columbus's voyage West to find a new trade route to the Spice Islands.

“When the petri dishes containing the results of the experiments were returned to the students from the incubator, the excitement in the air was palpable. Students eagerly looked at their own plates and ran from group to group comparing results of the different trials.”

This past fall a Scientist Teacher Action Team (STAT), working at Yick Wo Alternative Elementary School, designed a curricular unit through which students used science to explore history and in which their history studies framed the context of their science investigations. STAT partnerships pair two scientists and two elementary school teachers, and the team members then work together to design and implement science explorations for the teachers' classrooms. The Yick Wo team was composed of scientists Marni Goldman, a post-doc from UC Berkeley, and Rebecca Smith, a post-doc from UCSF, with teachers Ruby Lipscomb, 5th grade, and Gerry Ehrmann, 4th grade. The team sought to link the history the students had learned about the age of exploration with science investigations that would help explain why spices were so valuable.

The wide use of spices across Asia and Europe, despite their high cost, suggested that spices had a practical value. In fact, it is now known that some spices can inhibit the growth of bacteria in food, thereby slowing food spoilage, an important feat in the age before refrigeration. The STAT team designed experiments that would allow the students to investigate the role of spices in food spoilage. During the sessions that the STAT team met, the student investigators tested a number of different conditions. First, the 4th and 5th graders investigated the rate of bacterial growth in homemade chicken broth stored at various temperatures, seeing first hand how valuable an alternate means of food preservation would have been in the absence of refrigeration. They next tested whether the addition of garlic or salt to the broth had any effect on bacterial growth. In the course of doing the early experiments, the students learned two things about drawing valid conclusions from an experiment. First, there must be a control and, second, variables must be changed one at a time. As the students conducted each experiment, they wrote up detailed notes including methods and observations in their lab notebooks, to which they referred in later experiments and used to support their conclusions at the end of the unit.

After learning how to structure an experiment, the students were given the freedom to test any variable that interested them. Each team consulted with the scientists to help them settle on the

proper controls for their experiments. Among the conditions tested were different concentrations of ginger, allspice, and pepper. When the petri dishes containing the results of the experiments were returned to the students from the incubator, the excitement in the air was palpable. Students eagerly looked at their own plates and ran from group to group comparing results of the different trials. After drawing their own conclusions, the students described their experiment (with controls) and present-



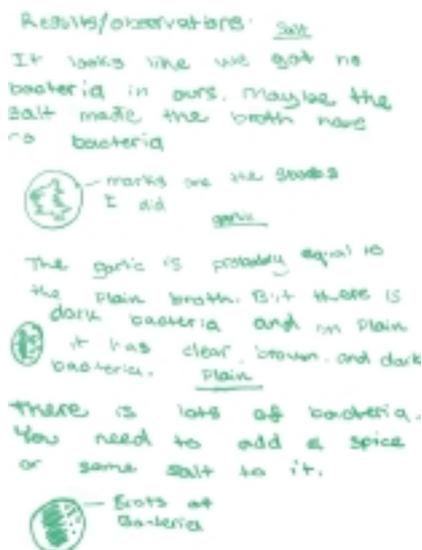
We streaked one dish with a plain broth and the other with the allspice.

Observation
I can see that plain broth would grow a lot of bacteria. It looks like another kind of bacteria. It looks bumpy. The one with allspice has no bacteria on it, but there are some allspice left on the plate. It looks smooth.

ed their results to the class. The results prompted excited discussions about the effects of the different spices.

One of the positive aspects about partnership in general, exemplified here, is how much all members in a partnership learn from the experience. The students in these classes experienced what it is like to do science by pursuing open-ended investigations and by developing their understanding of a process as their conclusions built on one another. Scientists had the opportunity to work with outstanding and creative teachers, and in the process gained teaching experience and confidence, learned about pedagogy, and saw how differently students at different

grade levels learn. Working with the scientists helped expand the teachers' understanding about the process of science. The excitement of developing a unit that linked science and history helped ignite their enthusiasm for continued explorations. With this team an added bonus was learning how a unit that integrated two subjects could stimulate interest in all the participants — students, teachers and scientists alike.



Many thanks to Eden, Joey and Cindy from Ruby Lipscomb's 5th grade class at Yick Wo Alternative Elementary school for providing their lab notebooks for the illustrations for this article. ▲ —RS

(Learning continued from page 1) perseverant group who are willing to be patient while you figure out how to talk simply and clearly about your work, which can be invaluable to scientists struggling to make their work accessible. As one scientist put it, "The teachers were relentless with questions and this made me feel like they were interested." In addition, working with a teacher to translate a lab experience into the classroom can provide great insight into teaching practice (beyond the lecture mode with which we all have plenty of experience). "The feedback was great. Listening to the teacher afterward made me really feel like they learned something as well as enjoyed it." Working with teachers at UCSF has proven advantageous to scientists in many ways. One scientist



Links teacher Matt Chapman organized the Family Science Night at Aptos MS with Triad colleague Patricia Kudritzki, shown here.

said, "The teachers' comments really helped to re-enthuse me about my work."

Teachers take away different rewards, including a more complete understanding of what it means to do science. They can look deeper at science in a context and with time and resources not available during the teaching day. "Scientific thinking is used as heavily in deciding what went wrong as it is in measuring what goes correctly," noted one teacher. Teachers in labs can experience a holistic approach to science where concepts are interrelated and relevant to the problem at hand. "Caring about the validity of the outcome makes a person a careful scientist, just like in the best classroom activities." With access to labs and experience with scientists, it becomes clear that science — while having its own special language and culture (just

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"Teachers are typically a curious, perseverant group who are willing to be patient while you figure out how to talk simply and clearly about your work, which can be invaluable to scientists struggling to make their work accessible."

like education) — is accessible to the layman and not really so different from the normal ways people think about and solve problems in many contexts. "Troubleshooting is a transferable skill — I knew I was good at it in the classroom and that gave me confidence to help solve problems in the lab."

If this sounds intriguing, opportunities abound. This summer, SEP is bringing a new group of high school science teachers to UCSF for six weeks through the California Science Project, and is planning to bring elementary school teachers to campus next year for a project funded by the Howard Hughes Medical Institute. Interested scientists and teachers should contact Tracy Stevens or Erin Strauss. ▲ —TS

A Curious Bunch: Team SEP Expands



Three new staff members joined SEP this year: Elisa Stone, Rebecca Smith, and Sue Jean Halvorsen (left to right).

We are pleased to welcome Elisa Stone, Rebecca Smith, and Sue Jean Halvorsen to the SEP team. All three share a clear dedication to working with students. Add their curiosity and wonder for the world around them, throw in a belief that science is not just a dry list of facts, and you have a great contribution to the world of science education at SEP.

Elisa Stone,
Triad Alliance Coordinator

Elisa has traveled far from her native Alabama; in fact she's traveled all over the world in her quest for knowledge. After earning her B.Sc. at Vanderbilt in Nashville and her Ph.D. in genetics at SUNY, Stony Brook, Elisa did research at the University of Leeds in England, Kyoto University in Japan, and the Swiss Institute of Experimental Cancer Research in Lausanne. She then did postdoctoral work at the University of Colorado, Boulder and the University of California, San Diego. It was her science research background and her volunteer community work with disadvantaged girls and women which led to her interest in science education and her arrival at SEP.

Elisa brings an impish sense of humor as well as strong "get-to-the-point" problem-solving skills. She immediately plunged into the Triad Alliance Program with a zeal for science education reform and an enthusi-

asm for gender equity in science teaching and learning.

Elisa says that professionally and personally "curiosity drives me; in fact it is my primary motivator." When

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asked what the combination of travel, science, and life have given her, she responded, "I have learned to continually challenge my assumptions." Elisa has already made major contributions to SEP, and we hope that her curiosity is continually piqued and her assumptions are challenged for as long as she is here.

Rebecca Smith,
SEP Scientist Intern

Rebecca is a familiar face at SEP, having worked as a STAT volunteer (article on page 4), with SF Base, and with the Lesson Plan Contest. For the next two years she will be learning the ropes of planning and implementing education outreach programs.

Originally from Connecticut, Rebecca received her BA in Biology from Bard College and her Ph.D. in Biochemistry at UCSF. It was her early experience as a judge in science fairs in college, participation in outreach pro-

grams in graduate school, and exposure to excellent science teachers and professors throughout her schooling that led to her interest in science education.

Rebecca bicycled and canoed in Germany, toured Great Britain and Ireland, and traveled in India, expanding her interest and understanding of other cultures. She recently moved to San Mateo where she is utilizing her science background to benefit her garden — avidly putting together a compost heap and worm farm. We are looking forward to what Rebecca will bring to us — not only vegetables from her garden, but also her initiative and enthusiasm for SEP programs.

Sue Jean Halvorsen,
SEP Office Manager

With a background as a theatre stage-manager and a philosophy that "if it needs to get done, I'll do it," Sue Jean loves the balancing act of keeping students and staff happy, meeting program requirements, and managing SEP office needs.

Sue Jean came to UCSF in 1988 as a curriculum assistant assigning Family Practice pre-doctoral medical students at SFGH to their clinical and community project sites. She frequently used SEP as a resource to find teaching sites for these students. A brief stint at UCB Extension before coming to SEP had her placing international students in San Francisco financial institutions for their internships.

Leaving the farm in Michigan and high-school science behind, Sue Jean kept up by taking science classes for non-science majors while majoring in Literature and Philosophy at City College of San Francisco and San Francisco State University. She satisfies her curiosity for other cultures and countries through her passionate interest in international film and cuisine. As a San Francisco Film Society Benefactor Member, she makes a point to see their Schools at the Festival film program - many made by and about SFUSD students. SEP is pleased to have Sue Jean's energetic organizing efforts and yummy baked goods; Sue Jean is pleased to continue supporting students through her work at SEP.

▲ —SJH

(Triad continued from page 1)

Everyone learned much in the process. As Adam Singer, a Marina MS teacher from the M/L Group, commented, “It was an eye-opening experience to see what all goes into planning such a day. It felt great to have been included in the discussion as a colleague; our ideas and concerns were not only heard, but really valued.”

The M/L and CI Group members then played specific roles during the implementation of the PD Days. M/L Group participants facilitated the sessions that modeled club activities; they introduced the activity, interacted with experimenters, and facilitated group discussions. During the activities, CI Group participants employed their developing action research skills by making focused observations in order to provide data on the extent to which the theme of the day was put into practice.

So what did it all look like? As part of the focus on Girl Goals on the first PD Day, Triad invited Judy Gordon from Girls Inc., a long-time friend of the effort, to address the group. She spoke eloquently about the contrast between resilience and learned helplessness in girls, which aligned well with the Girl Goal of Resilience to Failure. Participants then plunged into a bridge building activity, testing the

strength of their bridges and subsequently redesigning them. On the second and third PD Days, participants explored pendulum function in a two-part activity, which focused on Equity Teaching Goals and Science Goals, respectively.

In addition to inquiry-based science activities, several other structures were employed. Dyad discussion groups and concept mapping were introduced as strategies for exploring participants’ beliefs about gender equity in science education. M/L members shared classroom and club dilemmas with new participants through the use of Case Study Teams, which provide a constructive environment for educators to reflect on practice.

Members of the CI Group shared their initial investigations; including Aptos MS teacher Patricia Kudritzki’s presentation of action research data from her classroom. Using the Triad Girl Goals as a starting point, she surveyed students to find out how they perceived themselves with respect to each goal. This presentation resulted in a lively discussion among teachers at the first two PD Days as well as interest in using the survey with more classrooms.

On the final PD Day, participants synthesized their experiences by

exploring the relationships among all three themes of Girl Goals, Teaching Goals, and Science Goals. In the process, they wrestled with how the themes could be integrated in classroom and club settings.

After each PD Day, the planning team met to debrief the event. The group discussed participant feedback from their written evaluations, and each planning team member shared their own impressions of the day. CI members then reported their observational evidence on the extent to which the

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theme of the day was addressed. All of these reflections generated potential directions for the next PD day – and the process started all over again!

The contributions from veteran teachers and scientists were tremendous and allowed the community access to their expertise. Maria Wilson, a UCSF scientist from the CI Group at Giannini MS, noted, “I particularly enjoyed how everyone’s ideas and contributions were woven together to produce the finished product.” That finished product was well received by the Introductory participants. As teacher Claudia Scharff from Alvarado ES exclaimed, “I leave PD Days stimulated, inspired, and excited about my commitment to girls science!” And the staff, finding the involvement of the veterans renewing, was glad to hear Adam’s observation that, “including the advanced strand participants in the process in a meaningful way brought different perspectives to the table. Triad is truly a work in progress, and always will be.”

▲ —EMS, PC, EJS



Students from the Alvarado Triad Club found out what research scientists do during a visit to UCSF organized by Delia Garigan from the Cynthia Kenyon Lab.

Events

Memorial Day Holiday

May 29 (SEP & SFUSD closed)

Last day of school (SFUSD)

June 2

H.S. Intern Program

June 5-July 28

SEP Resource Center open by appointment only

June 5-August 22

CSP Links

June 19-July 28

Independence Day

July 4 (SEP closed)

City Science Summer Institute

July 17-28

CSP / H.S. Interns Joint Poster Session

July 26

PASS Scoring Institute (formerly CSIAC)

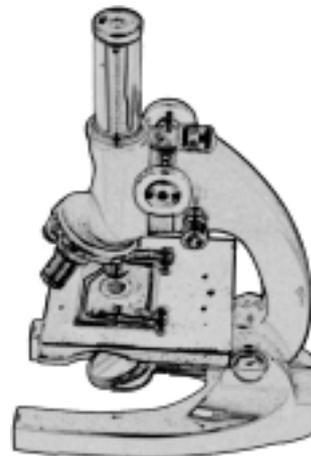
August 7-11

First day of school (SFUSD)

August 23

New Materials at the SEP Resource Center

Ever wonder what is available from the SEP Resource Center Lending Library? Even if you are a frequent visitor, it might soon be time to take a look! This spring we are ordering a tremendous array of exciting new materials from our science wish list. These items will augment the already impressive collection of human organ specimens, models, animal skulls, books, lesson plans, pre-assembled kits, videos, microscopes, and other scientific instruments that are already available in



the Resource Center. In addition, we will be conducting an inventory to make our searchable online Resource Center database more accurate. The database can be browsed at (<http://www.ucsf.edu/sep/resource.html>). The web site will feature ideas on how to use Resource Center items, so take a look! ▲ —EW

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