Sometimes something happens in education that is so right for children that you can’t help smiling right from your heart when you watch it unfold. There’s a program like that in a little school in the desert in southern California, where summer days are often above 100°F, and cold winter winds can blow right through you. There is not much rain, no forests, no streams, except when the dry washes fill with flash floods after a rare storm. But there’s a program there where children are laughing and exploring and reading and writing and learning about their world and their skills and themselves, and it makes you smile all the way to your heart!

The Joy of Science
By Cathy Klinesteker, Co-Director, FOSS California Professional Development, Lawrence Hall of Science
Photos by Jenny Lopez Ngigi

Jenny Lopez Ngigi started the after-school science program because her school had been designated an underperforming school, and mandatory time for language arts and math had crowded out time for science. Of course, any great teacher who has integrated these skills into the rich content area of science knows that children’s enthusiasm carries the day, and conceptual growth across subject areas happens seamlessly. The Coachella program is one creative way to find time for science.

A first-grader counted the seedlings planted in a cup as it was passed from child to child around the table. There were four cups, one for each child. The parent volunteer talked with the children, one at a time. The fourth-grade student-volunteer helped with the counting and writing as needed: “uno, dos, tres…ocho y nueve.”

The first-grader drew all 19 of the seedlings, complete with leaves, stems, and roots and labeled the parts in Spanish. But there wasn’t a purple crayon for the few leaves that had a purple hue as they first sprouted, so he went to the supply table to find a purple crayon. The cups continued to be passed on, and when the first-grader returned, there was a cup at his seat with only seven plants. The student-volunteer came by and asked about the 19 plants, since there were only seven in the cup he now had. His was also the only picture in the classroom.

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with any purple on it. Confidently he explained to the older student and the volunteer parent that he had, indeed, seen purple, that it was in new leaves, and that the cup he’d had before had 19 plants. If only all students could be so confident and articulate!

And so it goes in Cesar Chavez Elementary School in Coachella, California, where the after-school dual immersion program engages in FOSS hands-on science. The students meet for eight weeks, three times a week for 1.5 hours after school. They complete one FOSS module during this period. On a typical day, first- and fourth-grade students arrive about the same time, right after school. The two “buddy teachers,” Ramon Ortega and Raquel Delgado, who will help expand the program next year, arrive as the parent volunteers are arriving. Fourth graders distribute snacks provided by the school after they escort the first graders on a bathroom and hand-washing break. While the children eat their snack, the parents and teachers gather at a large round table where Jenny introduces the lesson to the parents, complete with science content, processes, and written directions, which include questions to ask the children during the investigation. The entire program is conducted in Spanish, so the written materials given to parents are in Spanish. When the process is clearly understood by all parents and the last question is answered, the fun begins!

Jenny gathers the children at the rug. They review the material covered in the last lesson, referring to their word bank and science content charts. In response to probing questions, the children recall what they did and learned in the previous class while Jenny records their responses in words and pictures, reinforcing the science as well as the language skills. Then they go to their table groups where a parent volunteer leads the group, assisted by fourth-grade student helpers. The three teachers travel from group to group, listening, assisting if necessary, taking pictures, and otherwise supporting the groups as needed. The table group session includes hands-on activity, question response, charting by the parent to reinforce science content,
process skills, language skills, pair and group oral sharing, and science notebook entries. It is a noisy, exciting, busy time in the classroom!

Of the 21 first graders, a third speak only English, a third speak only Spanish, and a third are bilingual. Because all instruction and work is conducted in Spanish, the Spanish speakers help the English speakers with their Spanish, and, in doing so, learn English. Bilingual students help all students with both languages. Parents are required to volunteer one day per week and are instructed in the science content and pedagogy before each lesson. Fourth grade helpers are bilingual and work with first graders on writing in their science notebooks, science processes, and task completion. These older student volunteers are chosen partially because they are the youngest in their own families, and their teacher has determined that the opportunity for them to work with younger children will promote their growth and responsibility.

At the completion of the table group session, parents arrive to pick up both the first- and fourth-grade children, and one more session of the program comes to an end. Then teachers and parent volunteers gather for an informal debriefing session to discuss how the lesson went, what they learned, what went well, and possible improvements for future sessions. This reflection and self-correction provides a means of continuous improvement of the details of the program and input from parents that has proven to be a source of enrichment and growing ownership for the success of the program.

In summary, the program consists of:

- Eight weeks of instruction, three times a week, using FOSS modules
- Volunteer parents (for students to be in the program, required once a week)
- Volunteer teachers, for the existing program as well as program expansion
- Volunteer fourth grade student assistants
- Hands-on activities that promote discovery and inquiry
- Reading (using FOSS Science Resources books) which promotes content knowledge and reading comprehension
- Science notebooks to support writing and critical thinking
- Support from the school (providing a place to meet, snacks, materials), the K–12 Alliance, FOSS Program, and Delta Education (materials and training)

In the words of the principal of Cesar Chavez Elementary, Maria Sarabia Ponce, “The program is the perfect opportunity for our students in the dual-language program to be exposed to a specialized science curriculum…Jenny…has made everyone realize how important their role is in this program, especially the parents. Their involvement has made all the difference.”

Recently Jenny received a letter from Maritza Rodriguez, coordinator of the Regional School Improvement Unit Division for Riverside County, congratulating her on being selected as her district’s Teacher of the Year in the Bilingual Educators Succeeding Together (BEST) Program. One of the volunteer parents in the program, Edith Paz, is receiving the BEST Parent of the Year award. The program and Jenny have also been accepted to do presentations at this year’s California Science Teachers Association (CSTA) Conference in Palm Springs in October and at the National Staff Development Conference in St. Louis in December. Be sure to look for them!

In the words of Jenny and Ramon, “The science bi-literacy program has the potential to be replicated at other school sites in the district, but organizers stress that success comes only from full participation from parents, teachers and upper-grade students. It’s a big commitment, but one well worth it. Until such programs are routinely found at school sites across California, parents need to rely on everyday opportunities to bridge math and language arts with other areas of student academic achievement, especially science. Working with teachers, administrators, and peer role models, parents realize that academics and learning doesn’t stop when the bell rings at the end of the school day. Those experiences continue as long as the student is eager, and the teacher is ready.”

Author’s Reflections

In the September 1992 issue of Popular Science, Arthur Fisher relayed the following story in his article “Why Johnny Can’t Do Science and Math.” His tale reminds me of the joy of science and discovery at the Cesar Chavez after-school program.

Many years ago when the distinguished Stanford science educator, Mary Budd Rowe, was a teenager visiting Princeton University, she encountered an instantly recognizable figure, Albert Einstein. He was staring raptly at a fountain. “He was tilting his head this way and that, and sometimes moving his hands rapidly up and down,” Rowe remembers. “I stood beside him, puzzled. He said nothing for quite some time. Then he turned to me and said, ‘Can you do it? Can you stop the stream enough to see individual droplets of water?’

Einstein showed the young student how to move her hands to synchronize them with the flow and create a strobe effect that froze the droplets. As they left the fountain, he told her, “Never forget that science is just that kind of exploring and fun.”

The Cesar Chavez after-school science program is the embodiment of just that kind of exploring and fun, the kind of educational experience that invites replication, an exhibition of children’s joy and exhilaration in the wonder of learning that leaves you with a smile all the way to your heart.

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Whittier Science Night:
A Community Celebration of Hands-on Science

By Cathy Klinesteker, Co-Director, FOSS California Professional Development, Lawrence Hall of Science
Photos by Pat Smith

In the Whittier City School District just east of Los Angeles, Science Night filled the house! FOSS science engaged parents and children together in great science from four of the FOSS California modules. At Daniel Phelan School, over 250 students, parents, and other family members spent an action-filled night in celebration of hands-on science.

This fantastic event—intended to occur annually—is the outgrowth of a multi-year leadership project sponsored by the FOSS Program at the Lawrence Hall of Science at UC Berkeley, the California K–12 Alliance, and Delta Education. Participating schools send a team of four teachers and a principal for three years of extensive support for the implementation of FOSS science into their schools. In Whittier this leadership team, along with the on-site buddy teachers (eight total) planned their science night in the fall on a release day facilitated by Jo Topps and Pat Smith. Jo is the K–12 Alliance staff member who serves as the coach for this team, and Pat is the district science coordinator.

A month later, the big event brought the joy of learning and sharing to a new level at Daniel Phelan School.

During the planning day, the team members drafted the parent invitation letter for the event, designed the general announcement, and made “homework stamp cards” on which each student who participated in at least four events received stamps for those events. Four or more stamps were worth a homework pass, which meant the student could use the pass as an exemption for one homework assignment. All of these materials were in finished form and final copies printed by the end of the planning day.

They also planned the specifics of how the night would look and flow. Most of the event planning was completed on this release day. They also purchased all supplies and tested activities as a team, a sort of practice run for the big day. In general, the team determined that the event would be completely hands-on with at least one “make-and-take” item per room so participants left with a reminder of the fun of hands-on science.

In a world where teachers have more demands on their time than they can hope to meet, a work/planning day with the goal of having the event ready to go is essential. In the words of Pat, district science coordinator, “All the work on the planning day developed people into a team. Work was divided and made simple by many hands contributing. We had a solid master plan that everyone helped develop so there was no duplication of effort.”

Here’s a view of the entire evening. From 5 to 6 p.m. the fifth grade sponsored a spaghetti dinner to earn money for an overnight environmental field trip to the Long Beach Aquarium. This allowed families to come straight from work without having to worry about dinner. They also didn’t have to worry about childcare for younger siblings because all activities were designed for toddlers as well as older children. Family Science Night was scheduled from 6 to 7:30 p.m. The event started with a 15-minute welcome in the multipurpose room, then an hour of activities, then a 15-minute closing in the multipurpose room. The grand finale was a drawing for a great number of prizes (donated by parents). Wendy Fountas, fourth-grade team member also made up two estimation jars for each room (eight total), and prize winners for those were announced at the grand finale as well. Anticipation and hope of winning one of the prizes kept almost everyone there for the entire time.

Four classrooms each had four activity tables for a total of 16 activities. All activity tables were set up as centers with very clear, specific direction cards so that participants could do activities independently and move at their own pace. Each room included a grade-specific FOSS module and a related make-and-take activity. Leadership team member, Vanessa Apodaca, and her grade-level buddy, Alma Hernandez, hosted the first-grade room with activities from the Solids and Liquids Module. Their make-and-take was ice cream in a baggie. Buffie Meyers, leadership team member, and her buddy, Fernando Hernandez, hosted the second-grade room and did activities from Balance and Motion. Their make-and-take was a bunny copter. The fourth-grade room focused on Magnetism and Electricity and was hosted by leadership team member, Wendy Fountas. Her make-and-take was called “Uncle Harry or Animal Fur Games” and was an iron fillings/magnet puzzle. Anthony Granados, leadership team member, hosted the fifth-grade room with Mixtures and Solutions and sent participants home with their own clump of gak (cornstarch and water). Anthony also coordinated the spaghetti feed so he had a busy night! All of the showcased FOSS modules were ones currently being used in the classrooms, allowing students to demonstrate for their parents the science they were learning.

Parent comments included, “The energy was so good; everyone was excited about science” and “This Science Night gave me real insights into the science program and its importance for my child.”

Pat Smith has been with the district for many years, coordinating FOSS in-service, helping with kit distribution and refurbishment, and doing whatever else needed to happen to support teachers as they began the implementation of FOSS in their classrooms. She summarized some of the far-reaching effects of this incredible event. “I think this night built an enthusiasm among teachers and
what inspired him to pursue his field of expertise, “... because my teachers allowed me the exhilaration of my own discoveries.” Hands-on, minds-on, science alive and having fun in Whittier!

In some places the importance of science is currently under siege by requirements to displace science time in the school day with skill-building in reading or math. No attention is paid to the fact that student motivation to read, gather data, or do calculations about the fascinating science of the day is an incredibly powerful tool for building reading, writing, and math skills for conceptual understanding. In Whittier, they learned that when children are excited and engaged with rich science, learning across subject areas is seamless. It’s a real-life application of the reason given by Robert Oppenheimer, famous UC Berkeley physicist, when asked what inspired him to pursue his field of expertise, “... because my teachers allowed me the exhilaration of my own discoveries.” Hands-on, minds-on, science alive and having fun in Whittier!

**Kit Management Program Available from Delta Education**

FOSS users can take advantage of a kit scheduling and replenishment service called the Delta Science Resource ServiceSM. Delta Education will pick up your used kits and deliver replenished kits to your school based on a predetermined teaching and rotation schedule. The “teacher-ready” kits will arrive with many materials already prepped, many teacher-provided items included, and living material shipments automatically scheduled. Teachers receive email alerts to notify them of scheduled kit pick-up and delivery dates. To learn more, contact your Delta Education professional or visit www.deltaeducation.com. The Delta Science Resource Service will be featured at a kit refurbishment/material management workshop at the fall area conferences. Join us to learn how DSRS can benefit your science program. See page 15 for details and for a complete list of NSTA workshops.
Eighth-grade students in the Santa Ana Unified School District (SAUSD) are experiencing hands-on inquiry science through the use of FOSS kits, which supplement the approved text-based science curriculum. Last year the Samueli Foundation wanted to help Santa Ana students improve their performance on the science California Standards Test (CST) and increase their desire to learn more science. In February 2008, the foundation paid for a team of teachers, administrators, and a business representative to attend the National Science Resource Center (NSRC) Science Education Strategic Planning Institute in Houston, Texas. Their goal was to develop a three-year strategic plan for initiating and implementing an effective research-based science education program based on best practices for all SAUSD grades 6–8 science classrooms. Part of the plan included selecting researched-based, high interest, hands-on, inquiry science kits that teachers would use in their classrooms to supplement the existing curriculum. They would also modify existing science labs and assessments so they were more inquiry-based, as well as have students document their experiences in science notebooks.
In 2008–2009, through another generous donation from the Samueli Foundation and with the assistance of Sue Neuen of the California Science Center, eighth-grade teachers were selected to form our Leadership & Assistance for Science Education Reform (LASER) cadre to implement the program in their classrooms. The implementation would affect over 1,440 students, including special-needs and honors students. For the first year, teachers decided to use the FOSS Variables Module and the Force and Motion Course because they aligned with California eighth-grade science standards and covered topics that were often difficult for the students to grasp.

Our LASER cadre teachers began the year with Variables, focusing on the first two investigations in the module. In the Swingers investigation, students made pendulums and experimented with different variables (e.g., mass, length, and starting position) to determine which one affected the number of swings for a specified time period. They had hands-on experiences with independent and dependent variables. Students graphed the results using the actual pendulums before making two-coordinate graphs in their science notebooks to analyze the data.

Students then did the Lifeboats investigation, which reinforced their measuring skills as well as what they had learned about dependent and independent variables in the Swingers investigation. The Lifeboats investigation was also used to introduce density, an abstract concept that students better understood after sinking their lifeboats of different capacities.

Teacher Johann Appell commented, “The Variables Module seemed to work well for me because I didn’t have labs [already] to cover that material.” Stephanie Collins noted that, “Using these hands-on activities really allowed our students with special needs to shine! They were able to participate equally with the other students who did not have a learning disability.” The LASER cadre teachers agreed, “The Variables Module has engaged our students who otherwise were hyperactive and off-task. Doing the inquiry activities, measuring, and identifying variables and then writing summaries to document the experience really helped student learning.”

The FOSS Variables Module investigations set the stage for the use of science notebooks in the classroom. Students used their notebooks for experiments, vocabulary, and note-taking. Evaluating notebooks and comparing strategies for using them were a hot topic at the monthly cadre meetings. Teacher James O’Roark commented that, “Notebooking was very useful for integrating writing into the curriculum and reinforcing data analysis and graphing.” Mark Brinks noted, “The notebooks

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are an excellent tool to use to evaluate students and it could also be used as a progress monitoring tool, especially as RTI [response to intervention] is staring us straight in the face!"

In previous years, students had difficulty understanding the concepts of speed, velocity, acceleration, and force. Teachers selected the FOSS Force and Motion Course to give students hands-on lab experiences to introduce and reinforce these concepts. Larry Malone and Linda De Lucchi of the Lawrence Hall of Science conducted a two-day training in January 2009, during which teachers experienced all of the investigations in the course to prepare them to use the investigations with their students during the second semester.

Most of the classes were able to complete seven of the eight activities in the kit. At the end of eight weeks the Force and Motion kits were returned to the SAUSD Science Resource Center where they will be refurbished for next year when all SAUSD eighth-grade teachers will be involved in the program.

LASER cadre teachers reflected on their first year at the end of the second semester. Melissa Donovan found, “The labs really engaged the students. They were able to use the hands-on activities to learn the required science content. The students look forward to doing labs.”

Johann Appell added, “I feel these kits help teachers find more ways to convert [seemingly] intangible concepts of science to a more concrete and palpable format.”

Matt Holte stated, “The most valuable part of LASER for me was the collaboration with other eighth-grade teachers. I supplemented many of my own ideas with those of others. It was nice to have the lab materials provided in the FOSS kits. My overall experience with LASER has been positive, and I’m looking forward to improving on the work that we’ve done this year.”

Janet Kleinschmidt noted, “All the equipment needed in the Force and Motion kit is there, and it was surprisingly durable!”

Amy Holte said, “I’m looking forward to the CST results. I’m sure they should look much better this year.”

Stephanie Collins is “looking forward to the Chemical Interactions kit, which will be adding to our program next year.”

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Observations . . . By Larry

Questioning Brought into Focus

Late in the water-cooler conversation around the staff offices at LHS has focused on . . . focus questions. What is a focus question? And what makes a question a good focus question? A little background. In the first half of this decade we mounted a major effort to design an assessment system to complement the modules for grades 3–6. That work, the Assessing Science Knowledge (ASK) project, revealed a dimension of the FOSS curriculum that needed attention. The objectives of the activities (lessons) were clear to us, the developers, but they were not always well communicated to our audience, teachers delivering the message and students receiving the message. The objectives were implicit in the larger context of the investigations, stated in the At-A-Glance chart for each investigation as Inquiry Questions, but they needed to be explicit in the flow of instruction.

After considerable rumination we decided on the focus question as our device for amplifying and communicating the objective of a lesson. It fit nicely with the philosophy of guided inquiry: use a question to ignite the imagination and suggest a path of activity. And it served to make explicit the expected outcome of the activity . . . an answer to the question.

Hence the questions from staff, particularly those who had assumed responsibility for articulating our science notebook philosophy and approach: what exactly is a focus question, and what makes for a good one?

A focus question is a concise expression of the objective of the lesson, presented as a question. In most cases, a part of a FOSS investigation (a lesson) is framed and guided by one idea, usually a concept or a major element of a concept. The focus question points the student in the direction of that concept or element. Also, the focus question is intended to create a desire “to find out” in students—to stimulate a little intellectual itch in student’s mind and provoke the motivation to figure out the answer. By launching the lesson with a question, a student soon realizes that he or she is responsible for acquiring the data and generating the knowledge needed to cobble together an answer to the question.

The focus question is also an assistive device for teachers—it makes explicit to him or her what the student is supposed to learn. At a critical juncture in the instructional sequence (usually at or near the beginning), the focus question is presented to the class as a challenge, it is written on the board, and students transcribe it into their science notebooks. Once the focus question has been made public, the objective of the lesson is hanging in the air to be referred to and fussed over by both teacher and student as the lesson progresses. The teacher is continually reminded where the lesson is headed and can guide the instructional experience more thoughtfully.

A good focus question constrains and clarifies the options for moving forward. That is, the focus question limits the latitude teachers and students have for straying from the learning path (conceptual flow) and discourages the temptation to abbreviate, modify, or “enrich” the lesson. The focus question brings forward the most important part of the FOSS experience—it’s not the activity itself, rather it’s the intellectual products that are synthesized out of the activity. The focus question should not be trivial (how many legs do isopods have?) nor too large (what is an ecosystem?).

Good focus questions ask students to describe sequences, generate statements of causation, develop methodologies, create solutions, produce explanatory models, describe relationships, and so on. Questions can take a form that asks for a yes/no answer (are all salt solutions the same?), with the caveat that the “yes” or “no” must be followed up with “because . . . .” An example is the popular claims-and-evidence form. In the main, a focus question is asking students to figure out something about the natural world through their own actions, discoveries, and reasoning (with guidance, interpretation, and input from the teacher) and communicate it.

As we re-imagine FOSS, the focus question is emerging as a kind of glue that gives the curriculum coherence. As formative assessment assumes a more prominent role in instruction, student work related to the focus question is gold. If the focus question successfully represents the learning objective, a student’s answer to that question communicates the success with which that objective has been achieved. Based on student responses to the focus question, the teacher can take immediate action to remedy flaws in understanding or move on with confidence.

The focus question also assumes a central role in the student science notebook. The table of contents of the notebook is the series of focus questions. The focus questions considered together describe the conceptual flow of the curriculum. The answer to each successive question builds, in part, on the answers that preceded it and anticipates the next focus question. The rhythm of the inquiry into a science topic (FOSS module) is observable in the written record of student engagement: the staccato introduction of the focus question, followed by written evidence of the harmonic interplay of scientific observation, data processing, discourse, and reasoning, culminating in a crescendo of insight communicated in the answer to the question. The theme is played out again and again as each new focus question is entered into the notebook. (For more information about the FOSS approach to science notebooks, go to FOSSweb.com and click on Info for Teachers and Parents.)

So that’s one dimension of the continual evolution of FOSS. It can be wrapped up in two sentences. A good focus question provides . . . focus. It helps the teacher keep her eye on the prize, helps the student bring purpose to the inquiry, and helps the curriculum developer design the experience with intention and vision.
Challenges Using Multimedia Integrated within a Science Curriculum Using a Classroom-Centered Design Approach
By Dr. Rebecca Deutscher, Ph.D., Research Associate Specialist, Lawrence Hall of Science

In April of 2009, I presented a poster at the National Association of Research in Science Teaching (NARST) Conference in Garden Grove, California. NARST is a worldwide organization of professionals committed to the improvement of science teaching and learning through research. My poster described aspects of an evaluation study designed to gather information to improve the use of multimedia in the nine FOSS Middle School Courses—Chemical Interactions, Diversity of Life, Earth History, Electronics, Force and Motion, Human Brain and Senses, Planetary Science, Populations and Ecosystems, and Weather and Water.

The evaluation tool used in the study was an online survey that covered logistics of using technology in the middle school classroom as well as the quality of the multimedia in the FOSS courses. Two groups of participants took the online survey: 539 FOSS middle school teachers and 22 FOSS professional developers. The teachers were asked about their backgrounds, the technology at their schools, and their impressions of the FOSS multimedia. The FOSS professional developers answered questions about their backgrounds as PD providers and their experiences with the multimedia when conducting FOSS workshops. As a result of the study, many challenges and issues connected with using the multimedia were identified. These challenges included technical issues, location of computers in the school, ways to present the multimedia in the classroom, training, and quality of the multimedia itself.

**Challenge 1: Technical issues surrounding using multimedia**

Technical problems are major challenges for classroom teachers in using multimedia. A difficulty with addressing this challenge is that it is not always known whether the technical issues reside at the development end or at the school. Often the curriculum/multimedia developers do not hear or learn about the problems and the variety of hardware configurations and operating systems makes it difficult to provide generic solutions. In the study, teachers were asked to describe their specific technology issues related to individual courses. This information helped the multimedia developers to appropriately address the issues for ongoing upgrades and future revisions.

The age of the computers used by the teachers can have a large impact on how well the multimedia works. The multimedia will be slower or may not work well on older computer systems, or the graphics software that is needed to run multimedia may not work. As a result, teachers who have older machines may have a less positive view of the multimedia since the programs will not run as well as on newer computers.

Historically, FOSS multimedia was accessed only through CDs. Since 2006, the multimedia has been accessible online through FOSSweb. It is possible that many of the teachers who use only the CDs do so because they don’t realize the multimedia is available online. It is also possible that many teachers have limited online access. Making the multimedia available through both CDs and the Internet has allowed more and easier access for both teachers and students.

In schools with better technology support, teachers are more likely to incorporate the multimedia in the FOSS course and can deal more successfully with any problems they encounter. The technology support staff at the school site can help determine what the problem is and how to figure out solutions. They can also help decide if the problem is at the development end and then communicate that information to the FOSS developers. Easily accessible technical support from FOSS is also important. With good information from the field, the FOSS team can determine the source of a problem and suggest modifications that would increase the likelihood that the multimedia will work in that school’s environment.

Learning more about teachers’ access to different kinds of technology allows the FOSS team to find new, creative ways to design the multimedia so it is accessible by a wider variety of school technology.

**Challenge 2: Location of the computers**

Based on the data, schools have different situations with regard to their computer access. Understanding the physical settings where students and teachers use computers with FOSS will make it easier to design the multimedia to accommodate the various settings. In many schools teachers take their classes into computer labs or only have access to limited computers in their classrooms. Many teachers described how difficult it was to use the lab because they were required to sign up ahead of time. There is also the difficulty of transitioning the whole class to another location.

Another important issue is how many teachers or classrooms share the same computer resources. Often computer labs, libraries, media centers, and laptop carts are shared by the whole school. Teachers said it was difficult to have access to the lab because it is in high demand.

Another issue is the student-to-teacher ratio in various settings. It seems that many students have the opportunity to work individually or in pairs with computers, but generally not in the classroom. An out-of-classroom setting is where students get more individual opportunity to work with computers. Because there are
fewer computers in many classrooms, teachers and the multimedia designers need to think of creative ways to provide opportunities for students to use the multimedia in the classroom.

**Challenge 3: Teaching practices**

Teachers described a wide range of ways they used each of the resources in the FOSS multimedia. After examining the range of resources, it seems that some of the multimedia animations and simulations work better as demonstrations while others work better as hands-on experiences for the students. For some of the multimedia, students do not gain much benefit by viewing a demonstration. Students need the direct experience provided in a small group. This technique needs to be clearly described in the multimedia guide.

Teachers also need alternative ways of using the multimedia if they do not have access to enough computers. Having students access the multimedia online outside of class (at home or from a library) is one possible solution. A few years ago, some experimental programs allowed students to check out computers so that a multimedia activity could be assigned as homework. Presently, some schools and states are purchasing a laptop computer for every student to use both at home and at school. Teachers need to be aware of their students' computer situations at home before assigning a piece of the multimedia as homework.

**Challenge 4: Professional development**

Many teachers' first exposure to a FOSS Middle School Course is during professional development. Teachers’ exposure to the multimedia during a workshop may have an influence on how they incorporate the multimedia in the course and whether they use it at all. During professional development, teachers are introduced to the teacher guide and student print materials, experience several investigations, and learn how to conduct the investigations with students. Many of the trainers provided an overview of the multimedia during PD workshops but didn’t model how to use the resources with students. During professional development, if teachers experience the multimedia in the way it would be best implemented in the classroom (i.e., small groups, individual use, etc.), teachers will be more likely to present it to their students in that engaging format.

**Challenge 5: Quality of the multimedia**

When designing multimedia resources for the FOSS investigations, it is important to get feedback about the quality from teachers and students using it in the field. In this evaluation, a large group of teachers was surveyed about all the multimedia in the FOSS courses. All these data were written up and discussed with the FOSS staff. This feedback from the teachers is being used to help redesign the multimedia. As a result of these changes, the quality of the multimedia will improve, and more schools will likely utilize the multimedia in their classrooms.

By examining the challenges, developers can improve professional development, teacher guides, and multimedia associated with science curricula to make them more useful for teachers, administrators, and other educators. In future studies, the FOSS team can then examine the impact that a richer multimedia can have on enhancing students’ learning experiences in science.


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n created these chants to use as whole body activities for the FOSS Structures of Life Module to support English language learners and reinforce content knowledge for all students.

**Crayfish**

To the rhyme of *Brown Bear, Brown Bear, What Do You See?*

Crayfish, crayfish, what do you see?
I see a habitat looking at me.
Habitat, habitat, what do you need?
We need water, shelter, and air to breathe,
Elodea, potatoes, and meat to eat.
We are omnivores and that can’t be beat.

Crayfish, crayfish, what do you see?
I see structures looking at me.
Structures, structures, what could you be?
Carapace, pincers, and eye stalks too,
Antennae, swimmerets to name a few.

Crayfish, crayfish what do you see?
I see other crustaceans looking at me.
Crustaceans, crustaceans, who are you?
Crab, lobster, shrimp, and prawns,
We are all aquatic and don’t live on lawns.

Crayfish, crayfish what do you see?
I see behavior looking at me.
Behavior, behavior, how do you act?
We defend our territory and watch our back.
Territory, territory, part of a habitat,
It’s a place we call our own cause we know where it’s at.

Aggressive or passive crayfish can be.
Those are the crayfish that we will see!

**I Know a Seed**

I know a seed
A dormant, resting seed
That has an embryo ready to grow.

I know a seed
A germinating, growing seed
That has a seed coat and a cotyledon for food.

I know a seed
A growing, thriving seedling
That has become a seedling.

I know a seedling
A growing, thriving seedling
That has a strong stem.

I know a seedling
A growing, thriving seedling
That has flat, green leaves.

I know a plant
A strong green plant
That has a fruit full of new seeds.

**Plant Life**

**Marine Corps Cadence**

We just know what we’ve been told,
Plants are worth their weight in gold.
They give us food that we can eat,
And oxygen so we can breathe.

Sound Off—leaves and stems!
Sound Off—flowers too!
Sound Off! 1-2-3-4! Plant life!

Plants need light and water too,
Nutrients come through the roots.
Inside the fruit you find the seeds,
To grow new plants and even trees.

Sound Off—water and light!
Sound Off—soil too!
Sound Off! 1-2-3-4! Plant life!
Mary Beth Meggett
Stiles Point Elementary School, Charleston County, South Carolina

Mary Beth Meggett, a fourth-grade teacher at Stiles Point Elementary School in Charleston County, South Carolina, has been described as “one of those teachers who understands when students are learning and does something about it when they’re not.”

Ellen Mintz, a FOSS consultant from South Carolina, began her relationship with Mary Beth nearly 10 years ago through a National Science Foundation grant that created training programs for teachers to increase student achievement in science. Ellen has described Mary Beth as “a terrific teacher who has become better over time.” In response to the training program, Mary Beth began using the suggested strategies to determine whether students were learning and opened up her classroom for evaluation. She has been using the FOSS program for the past six years and continues to implement and improve on the teaching strategies. She adapts her lessons based on the ability of each child, and she builds trust with her students so they can take risks, make mistakes, and learn from them.

Ellen nominated Mary Beth for the Presidential Award for Excellence in Mathematics and Science Teaching this past year. The award is the highest recognition a K–12 math or science teacher can receive. The award program was established in 1983 by Congress and aims to expand and exemplify the definition of excellent science and mathematics teaching. Mary Beth was required to submit an hour-long video of her teaching, a 20-page analysis of what takes place in her classroom, proof that her children succeed in science, samples of her students’ work, and videos of her training other teachers in the county.

One math and one science teacher from each state can win the award. South Carolina nominated five teachers this year, and Mary Beth won the state’s award in science. Mary Beth will be honored at a White House ceremony in the fall. She will receive $10,000 from the National Science Foundation and a presidential citation. She will also participate in a series of recognition events, information exchange programs, and visits with members of Congress and science agency leaders.

Stephen Burger, principal of Stiles Point Elementary, says Mary Beth’s students often can be found working together in small groups in a sometimes noisy classroom, but students are engaged in well-planned lessons that force them to think at higher levels. “She’s just a dynamic person and a hard worker,” he said.

Mary Beth will be the first person to acknowledge that using science notebooks in her classroom and having the opportunity to participate in the NSF-funded Assessing Science Knowledge (ASK) project made a significant impact on her as a teacher. The strategies she learned have carried over into all aspects of her teaching.

The entire FOSS team would like to offer their congratulations to Mary Beth on her award and continued success with the teaching of FOSS for her and her students.

Quotes and excerpts from:
“National honor for Charleston teacher,” By Diette Courrégé, July 14, 2009
The Post and Courier, Charleston, South Carolina

Another award-winning FOSS teacher will be featured in the Spring issue of the FOSS Newsletter.
As a child growing up in urban and suburban settings, I never really gave thought to where the food I ate came from, at least not beyond the grocery store. At the occasional county fair or road trip, I would be exposed to farm land or farm life and had developed a concept of “farm” that included a family working some land with a tractor or two, rising early to gather the eggs, tend the fields, and so on.

It wasn’t until recent years, with our news headlines dominated by the most recent salmonella outbreak, food recalls, and tainted imports, as well as an increasing public awareness of organic and local foods, that I began to wonder, “where does my food really come from?”

This is why Michael Pollan’s book, *The Omnivore’s Dilemma*, is so timely. Pollan spent time thoroughly researching how farming takes place in America, and it’s often not the quaint family farm scene I had imagined while growing up. The family farm tending a variety of crops and animals does still exist to a small extent, but like much of America, farming has been redesigned for efficiency, for getting the most bang out of your man-hours and your buck. The problem is that we are dealing with living organisms and ecosystems, not a typical factory setting—though that is precisely how many farms now deal with their livestock and crops.

“Raising animals on old-fashioned mixed farms such as the Naylor’s used to make simple biological sense: You can feed them the waste product of your crops, and you can feed their waste products to your crops... a closed ecological loop.” Pollan provides a number of examples of mixed farms that still use these ecological principals. My favorite example is the “Eggmobile” conceived of by farmer Joel Salatin, who rotates his cows through various grass pastures and follows them with his home-built portable hen house. Waiting three days after the cows have left allows grubs a chance to fatten up in the cow feces. Hens “pick insect larvae and parasites out of the animal’s droppings, breaking the cycle of infestation and disease.” And let’s not forget the free, high-protein meal for the hens. The hen droppings? Natural fertilizer for the grass in the pasture, which prepares the fields for the return of the cows.

As a scientist, the beauty of using nature’s complex food web to one’s advantage on a farm seems logical and a bit genius in the way it solves countless problems. What is the alternative? It’s the CAFO, Concentrated Animal Feeding Operation. Most of the meat Americans typically eat three times a day comes from feedlots such as these. The following is a scene from one of the cattle CAFOs Pollan visits.

*Tanker trucks back up to silo-shaped tanks into which they pump thousands of gallons of liquefied fat and supplements. In a shed sit vats of liquid vitamins and synthetic estrogen beside pallets stacked with fifty-pound sacks of antibiotics.*

Pollan spends a large amount of time going into the numerous ecological effects of CAFOs, but the one that jumps out the most to me has to do with another recent headline—the news about swine flu. Creating monocultures of single species within close confines creates a breeding ground for diseases to thrive and evolve. The current swine flu scare has brought some of these concerns to the foreground.

What are the implications of this book when teaching science? For any science teacher who incorporates current events in the class, this is a good opportunity to learn more about the science behind a number of those headlines and to generate better classroom discussions and understanding with your students. Teachers of life sciences or ecology will appreciate the way Pollan details the ecological complexity of systems (such as the grass, chickens, larvae, parasites, and cattle), inspiring an awe for the balance found in nature. Chemistry teachers can draw connections with the synthetic substances used in processed food. But the biggest messages are important for any teacher of science: the health of a farming ecosystem affects the health of the larger ecosystem we live in, and we all share this planet.

If you have found a book that you think other FOSS users should know about, please send the reference to foss@berkeley.edu, including author, title, ISBN, and a short annotation.

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**New from the Wordsmiths**

**The Omnivore’s Dilemma: A Natural History of Four Meals**


Reviewed by Jessica Penchos, FOSS Developer, Lawrence Hall of Science

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FOSS Institute

Delta Education will host a one-day FOSS Institute before the 2010 NSTA National Conference in Philadelphia, Pennsylvania (March 18–21, 2010). This Institute will be for educators from districts that have implemented FOSS for at least a year. The topic will be using formative assessment to improve teaching and learning. The focus will be on new assessment tools and strategies designed specifically for FOSS modules grades 3–6. This Institute is designed for FOSS experienced educators—lead teachers, administrators, curriculum coordinators, professional developers, and university methods instructors.

The Institute is free, but you must register in advance to attend.

To secure your spot at the Institute, please call, write, fax, or e-mail: Pam Frisoni
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NSTA 2009 FALL AREA CONFERENCES

Minneapolis, MN  October 29–31
Fort Lauderdale, FL  November 12–14
Phoenix, AZ  December 3–5

THURSDAY (Oct. 29, Nov. 12, Dec. 3)

8:00–11:00  Using Science Notebooks with FOSS Middle School
11:30–1:00  Taking Science Outdoors with FOSS K–8
2:00–4:00  FOSS Assessment—Valuing Academic Progress in Grades 3–6

FRIDAY (Oct. 30, Nov. 13, Dec. 4)

8:00–10:00  Introducing Science Notebooks with FOSS K–6
11:00–1:00  FOSS Chemical Interactions for Middle School Students
2:00–3:30  FOSS and DSM Kit Refurbishment/Material Management
2:00–4:30  Making Sense of Science Notebooks with FOSS 3–6 (for experienced users)

For more information about these workshops and other professional development opportunities, visit the FOSS Professional Development calendar at http://www.fossweb.com/news/calendar.php.

FOSS Newsletter

Would you like to receive the FOSS Newsletter electronically? Simply sign-up at www.deltaeducation.com/science/foss/newsletter.aspx or send your request to tisaacs@delta-edu.com. Include your name, title, school, and e-mail address. You can also view both the recent and previous issues of the FOSS Newsletter, as well as archived articles, at www.lhsfoss.org/newsletters.

If you’d like to be added to the mailing list to receive this newsletter by mail, please send your name and address to:

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The intent of the FOSS Newsletter is to help FOSS users develop a network of support across the country. Delta Education and LHS will work together to bring you news two times per year, including articles regarding the latest development of modules, tips about management from teachers and administrators, ways to make connections with other teachers and districts, extensions and reading materials to add to modules you are already using, and informative articles about good educational practices.

So, we need your help. If you have a tip that enhances the teaching of FOSS or would like to submit an article (with photos) about exciting activities or school programs, management, implementation projects, etc., please send them in. We would also like to hear from your students, whether they have questions about the content, projects they have done, photos or other images they have created, or insights into how they use the Internet with FOSS. Send your contributions to:

Sue Jagoda, Editor (skjagoda@berkeley.edu)
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The deadline for submissions to the next issue is December 14, 2009. We’re waiting to hear from you.

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See you at the NSTA National Conferences this fall!

New Middle School Teacher Resources now available at www.FOSSweb.com