FOSS Science Stories Wins Teachers’ ChoiceSM Award

FOSS Science Stories for grades 1–6 received a distinguished Learning® Magazine 2003 Teachers’ Choice Award. The Teachers’ Choice Award is the only educational award judged solely by teachers using the products in the classroom. FOSS Science Stories received the award in the Supplemental Materials category.

Of the 400 products that were submitted and reviewed, FOSS Science Stories was selected as one of 61 winning products. The products went through two rounds of rigorous judging and were reviewed by a panel of more than 60 teachers nationwide. The products are evaluated on quality, instructional value, ease of use, and innovation. Learning® Magazine has earned the reputation of showcasing practical hands-on products for teachers. The magazine first introduced the Teachers’ Choice Awards program in 1994. This year’s winning products were featured in the January issue of the magazine.

FOSS Science Stories is a series of original student books developed to extend the FOSS modules. The books integrate reading and language arts skills in the context of learning science. They enhance and extend life, earth, and physical science concepts, as well as science vocabulary introduced during the hands-on investigations. The books contain a variety of writing styles including expository text, narrative tales, biographies, and technical readings. Each story is accompanied with full-color photographs or illustrations.

If you would like more information about FOSS Science Stories, call your FOSS Regional Sales Manager (see back page) or visit Delta’s website at www.deltaeducation.com.
A Tree Grows in Portland: An Intel® Teach to the Future Project
By Leigh Agler, FOSS Developer, Anacortes, Washington

Many years ago, the Friends of Trees in Portland, Oregon, planted hundreds of trees, including several in the neighborhood of the Dunlavy Elementary School. Now Jan Barkhurst’s kindergartners acknowledge the gift of trees from the Friends of Trees each year with a published booklet describing the life of one of the trees throughout the seasons. The booklets are just one of several technologically enhanced facets Jan has integrated into the FOSS Trees Module as part of an Intel® Teach to the Future class project.

The Intel® Teach to the Future program is a worldwide effort to help teachers integrate technology into instruction and enhance student learning. Already, more than 650,000 teachers residing in 26 countries have completed the program; Intel hopes that one million teachers will complete the program by the end of this year. While Intel has invested millions of dollars’ worth of cash, equipment, and staff, Microsoft, Premio Computers, SmarterKids Foundation, SMART Technologies Inc., and the Texas Telecommunications Infrastructure Fund have contributed substantially to make the program free to teachers and easily accessible.

Participants receive 40 hours of extensive training from other teachers in effective uses of technology in the classroom. Through incorporating the use of the Internet, Web page design, and student projects, participants learn how, when, and where to integrate technology to enhance student learning. Instruction is also given in how to create assessment tools and align lessons with educational learning goals and standards. All that is required by the participating teachers is an Internet-connected computer in the classroom capable of utilizing Microsoft Office XP. Teachers receive a Teach to the Future manual and software for use in developing their projects. In addition, many districts offer a classroom computer or course credit through participating universities.

Jan Barkhurst’s project, entitled Seasoning the School Year is one of several exemplary projects highlighted on Intel’s website, www.intel.com/education/unitplans. In the beginning of each school year, students in Jan’s class carry home a professional-looking “Seasons of the Year” brochure that introduces the year-long module and informs parents of ways they can help participate in their children’s learning. As students get to know their class’s adopted tree and follow it through the seasons, they dictate their observations and add graphics and scanned images to a parent newsletter, including a picture of the tree for that season.

Jan also incorporated computer-generated graphs into their seasonal observations. Working together, students plot high and low temperatures through the year and compare them to temperatures in Australia, provided by a Web search. Another graph records the students’ clothing choices as the seasons change.

Each season has the class creating a Signs of the Season in the Park book. Pages are scanned from each seasonal book into a PowerPoint slide show that eventually holds the year’s selected observations. By the end of the year, groups of students are challenged with the task of contributing one slide for the culminating slide show. They plan what they want to see on the slide, choose the art and sounds, and dictate or write the text. The result can run as part of a year-end program or promotion ceremony or be copied and brought home.

Amy Chua, of Mukilteo, Washington, completed the Intel program last year. “We went for 8 four-hour sessions and one full Saturday. The goal of the class was to design a unit you could teach in your class that would effectively integrate technology. Although we had just started using FOSS, it looked like a natural match.”

Amy’s unit for the New Plants Module has first-grade students recording the growth of their plants and displaying their photos and descriptions on PowerPoint presentations—a perfect venue for summarizing the abundant observations students make during the module.

While Amy was just getting to know the FOSS modules during her Intel project, more often the projects are a way for experienced FOSS users to truly make the
module “their own.” If you have taught a module two or three years, you have probably taken some tucks, made some tweaks, and sprinkled into the module several extensions and connections of your own. You’ve personalized the unit to fit your expertise and changed it as you continue to master new skills. Opportunities like the Teach to the Future training, while enhancing teachers’ skills, can also result in adding one’s own personal touch to a well-worn, familiar FOSS module.

Marge Stembel has led her classes through the FOSS Solar Energy investigations for many years. Planning to teach the module with technology in mind had both practical and academic benefits. Practically speaking, Marge had a year’s worth of curriculum goals in mind, which included several computer skills to be developed. Her Intel project, Plugging Into the Sun, has students creating their own solar cookers at the end of the module. They surf the Web for resources, compare and select a design, then construct and test it out. In the process, they learn to find north by plotting the Sun shadows with a gnomon and take digital photos of their project. Soon, she plans to have students graph the temperature changes in their cookers using Excel software. Students can choose how they will present their project, as a PowerPoint presentation, Web page, or brochure. Their Solar Energy projects in the fall provide a motivating context for introductory lessons in the use of technological tools. The same skills are developed throughout the year and come in handy once more when a similar project takes place in the spring. Having several opportunities to add to the class website or create presentations allows Marge and her students to assess and take pride in their progress.

Plugging Into the Sun also addressed a concern Marge had with the Solar Energy Module. In the process of teaching the module for several years, she noted that her students lacked understanding of Earth’s motion around the Sun. “I could rotate on my axis in front of the class all day and they still weren’t getting it,” she relates. Her fifth-grade students thought the concept was pretty simple and worthy of little effort, but she knew it to be fundamental and really quite difficult to grasp. The solar cooker projects provided a key element. Student-led inquiry and the interactive nature of computer projects had students applying what they had learned in the module as they asked and sought solutions to their own solar cooking challenge. And when it came to locating and positioning their cookers, they wanted to come to terms with that motion around the Sun. As part of her Intel project, Marge developed PowerPoint presentations that helped lead discussion of key concepts and guide student projects, and she developed assessments and an assessment rubric to better track student understanding.

The Intel® Teach to the Future program is a unique opportunity to gain technology skills, enhance student learning, and personalize your FOSS modules. For more information about the Teach to the Future and programs in your area, check www.intel.com/education. You can download the lesson plans for Jan Barkhurst’s Seasoning the School Year and Marge Stembel’s Plugging Into the Sun and view many more exemplary projects.
In September Professor Lawrence Lowery was the honored guest lecturer during the week of Nanjing University’s 100th Anniversary Celebration. The purpose for the lectures was to impart information concerning current research in the United States related to developmental/cognitive science and brain studies. Celebration ceremonies, which included dance, music, and gymnastic performances by former and current students, were held at Nanjing’s new, very modern campus. Tens of thousands of people attended.

Lowery invited a colleague, Lean LaRowe, to join him on the trip. Lean’s background with FOSS is extensive, and she has experience implementing science curricula in the Far East. Following Lowery’s lectures, Lean joined Lowery in involving the participants with hands-on experiences.

Because the People’s Republic of China is currently strategizing its future in science education, some members of a National Committee for Reform in Science Education met with Lowery and attended his lectures. This committee was appointed to recommend and implement reform ideas throughout the country. During his presentations, Lowery used examples from FOSS to show what some research ideas might look like when applied. Impressed by the lectures and examples, the committee, which was in the process of examining various textbook and hands-on programs from other countries, made a proposal that could allow China to translate some FOSS modules and test them in various provinces.

### FOSS in China

![Larry Lowery uses leaves to teach the workshop participants about scientific thinking.](image)

Teachers investigate animals in the FOSS Animals Two by Two Module.

![This is the Chinese version of the FOSS Scope and Sequence Chart.](image)
Created by the Montana State University at Bozeman and funded by the National Science Foundation, the National Teachers Enhancement Network (NTEN) delivers quality teaching resources and professional development opportunities through the Internet directly to K–12 science teachers. Educators access electronic teacher resources, discuss issues with other educators online, and participate in high-quality graduate long-distance learning courses, all from convenient home or work locations via the Internet. University scientists, engineers, mathematicians, and science educators teach NTEN's graduate courses. NTEN also enhances professional networking nationwide among science teachers and active research scientists.

NTEN's latest endeavor has been to offer online courses for elementary teachers who use FOSS and other science kits. The courses expand on the science concepts addressed in the inquiry-based kits, providing participants with adult level science content to enhance understanding and confidence in presenting the FOSS module. Each one-credit course is quite extensive, requiring an average of six to eight hours a week over a short, eight-week period. The first week is a slower-paced “Succeeding On Line” tutorial that eases you gradually into the online format. Although it is recommended, it is not essential that the NTEN course be taken at the same time the particular FOSS module is being taught. In the same way that FOSS students benefit from reading the FOSS Science Stories after they have completed the investigations, the NTEN courses are often most useful sometime after your own questions have bubbled up in the process of teaching a FOSS module.

**Pilot Courses are Tuition-Free!**

Each course developed by NTEN is offered twice during its pilot phase. Over the past year, the pilot courses have been well received, and participants have provided valuable input for improving the courses. During the pilot phase courses are free to teachers and participants receive one graduate credit from Montana State University. Four pilot courses will be offered during the fall of 2003. This will be the last time that these four courses will be offered without charge:

- Exploring Science Through Food and Nutrition
- Measurement and Motion
- Electricity
- Plant Biology for the Elementary Teacher—Seed to Seed

Four new courses will be developed and piloted during 2004. Tentatively, these will be designed to enhance the FOSS Air and Weather, Landforms, Physics of Sound, and Levers and Pulleys Modules.

Four courses have moved out of the pilot phase and were offered this spring, running from January 11–March 3. These are:

- Learning and Teaching Soil Science from a Kid’s Perspective
- Teaching and Learning Science – Elementary Space Science
- Teaching and Learning about Ecosystems
- The Fascinating Bug: Learning about Insects through Observation and Inquiry

For information about NTEN, upcoming course offerings, evaluation reports on the NTEN Elementary Program, and how to join the network, check NTEN's website at www.scienceteacher.org, or contact Lisa Brown at NTEN, Burns Telecom Center, Montana State University in Bozeman, 406-994-3062, nten_elem@montana.edu.
“Constructivist” science teaching is no longer considered innovative. Still, constructivism resonates with many scientists and science educators. The idea that learning is an active process in which the learner constructs an understanding of the world by interacting with it and by solving problems in fact describes many aspects of scientific inquiry. Constructivist theories of learning and related teaching practices trace their origins to Jean Piaget (Phillips, 1981) and Lev Vygotsky (1986). More recently, Ernst von Glasersfeld (1992) has made important contributions to our understanding of constructivism specific to math and science education. However, it is Jerome Bruner (1980, 1983) to whom we owe the term “scaffolding.”

As is often the case with most educational terminology, scaffolding unfortunately has lost much of its original metaphorical elegance and eloquence. Bruner (1980), picking up where Vygotsky left off, realized the importance of the role that teachers and peers play in learning. In his analysis of mothers playing peek-a-boo with infants, Bruner and Sherwood (1975) noticed that mothers not only helped infants learn the game but also allowed and even encouraged them to take the game in new directions. They described the mothers’ actions as scaffolding, supporting the infants’ growth into what Vygotsky (1986) calls “the zone of proximal development.” Since then, the meaning of scaffolding has been irreversibly stretched to include most actions and structures—even unintentional ones—that support learning (e.g., students on their own exploring the reactions of an organism to stimuli). An important meaning in Bruner’s original use of scaffolding is often overlooked: scaffolds are intentional, temporary, and flexible structures built to match the learner’s development. Scaffolds, however, do allow and encourage learners to take the initiative in their own exploration.

It is no coincidence that Bruner and Sherwood (1975) coined the term scaffolding in a research article about language development. Adults naturally modify their own speech and behavior to communicate with and assist infants as they learn to speak. The same can be said about the behavior of adults and even children toward second language learners (e.g., simplification, slow speech, exaggerated pronunciation, gesturing, modeling, etc.). However, these modifications are not entirely helpful. For instance, simplified speech often is more difficult to understand than redundant speech, precisely

During June 2001 Tomás Galguera worked with staff from the Bay Area Science Project (BASP) at Lawrence Hall of Science in Berkeley, California, in the Science Education and English Development (SEED) Institute. The SEED Institute was funded by the California Professional Development Institute initiative of Governor Gray Davis. The goal of the initiative was to integrate subject matter content with English language development. Life science was the content for this institute. Teachers from four school districts in the San Francisco East Bay participated in this professional development experience. Using the FOSS Structures of Life Module, Galguera presented activities to assist teachers in employing scaffolding strategies to support English learners in their classrooms. The following article addresses the issues and strategies presented at the institute. For more information about the SEED project, contact Claudio Vargas (cvargasb@uclink.berkeley.edu) or Joanna Totino (jtotino@uclink.berkeley.edu) at 510-643-3478.
because it contains fewer meaningful clues. Thus, we cannot leave the scaffolding of language for English learners solely to intuition and good will.

Furthermore, academic and scientific norms that to most of us are logical and feel so natural may be obscure and strange to many students. For instance, a competent scientist is not only able to refer to specific hypotheses, experiments, discoveries, constructs, and theories by their accepted names but also by the name of the scientists who contributed to these advancements. Especially in writing, failure to do so is considered plagiarism. Students coming from non-mainstream schooling backgrounds often fail to understand the seriousness of this infraction not because they are not smart but because, in their cultures, knowledge and the process necessary to build it are far from individualistic and proprietary in nature. Shared knowledge in traditional societies often lives in evolving narratives that include individuals only to the extent that their stories are interesting. An example may be the anecdote of a physician who, motivated by his child’s disease, discovers a revolutionary treatment. In contrast, the scientific record is notoriously lacking in narratives about individual scientists or discoveries. Remarkably few physics college majors know much about Einstein the person or how he arrived at the widely-known \( E=mc^2 \).

What can science teachers do to ensure that their English learning students not only learn English and science but actually do so optimally? Before addressing the question of scaffolding for English learners in science, we need to consider who English learners are. Using the Limited English Proficient definition in the No Child Left Behind Education Act (2002), one finds over 1.5 million such students in California classrooms (California Department of Education, 2003). However, the term “English learner” needs to be more inclusive in order to address important issues facing most science teachers. It should include students who regularly use languages that are significantly different from what counts as academic English. This is especially true in science, a discipline in which academic English is further specialized.

Scaffolding for English learners in “Sheltered Instruction: Doing it Right,” Aida Walqui (1995) recommends six types of scaffolding for sheltered classrooms. These are modeling, bridging, contextualization, schema-building, text re-presentation, and metacognitive development (See Table 1). In this article, I borrow Walqui’s taxonomy to suggest six possible ways to scaffold science instruction for English learners.

I also stress the need to (1) continuously assess students, (2) adjust the scaffolding to match their strengths and needs, and (3) pay attention to their language development and cultural backgrounds in order to (4) ensure that they become autonomous and successful learners.

Table 1  Scaffolding for English Learners

<table>
<thead>
<tr>
<th>Scaffold</th>
<th>Why Use It</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Modeling</td>
<td>• Imitation is an early stage in learning</td>
<td>• Devoting a lesson to introduce routines, procedures, tasks, products, or skills</td>
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<td></td>
<td>• Provides explicit guidelines and standards for student work</td>
<td>• Using work from past students</td>
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<td></td>
<td>• Provides a text for analysis and learning</td>
<td>• Using a finished product when giving directions for a project</td>
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<tr>
<td>Bridging</td>
<td>• Learning is linking new to old knowledge</td>
<td>• Think-Pair-Share</td>
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<td></td>
<td>• Establishes a personal link between students and the material taught</td>
<td>• 3-step interview</td>
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<td></td>
<td>• Makes language more comprehensible</td>
<td>• Anticipatory guides</td>
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<td></td>
<td>• Enhances recall through the creation of complex memories</td>
<td>• KWLS charts</td>
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<td></td>
<td>• Reduces cognitive demands</td>
<td>• Brainstorming</td>
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<tr>
<td>Contextualization</td>
<td>• Provides students with a conceptual “map”</td>
<td>• Demonstrations</td>
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<td></td>
<td>• Top-down information processing</td>
<td>• Labs</td>
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<td></td>
<td>• Helps students distinguish between central and peripheral information</td>
<td>• Hands-on activities</td>
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<td></td>
<td>• Encourages higher order thinking</td>
<td>• Using analogies and metaphors derived from the students’ experiences</td>
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<tr>
<td>Metacognitive Development</td>
<td>• Makes genres explicit</td>
<td>• Framing questions</td>
</tr>
<tr>
<td></td>
<td>• Helps students think about the audience</td>
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classroom (e.g., “warm-ups” and “problem-of-the-day”), especially when students are not familiar with such routines. Broadly, teachers must also model norms of behavior and thinking as well as values shared by scientists. The scientific process itself embodies a core set of norms and principles that must be explicitly modeled, especially for students whose cultural backgrounds may favor conflicting norms. As mentioned, students from cultures that favor group membership over individualism may have difficulties understanding the importance of acknowledging individual contributions to the scientific knowledge base. Even if students understand the logic behind naming scientific theories and discoveries by their known names and the names of their respective scientists, they may still feel disinclined to claim ownership over their own contributions because of deeply held beliefs and values. This may result in a lack of participation in classroom discussions and a bias against naming specific theories, discoveries, and scientists.

Explicit modeling is an element of cognitive apprenticeship (Rogoff, 1990) in which expert teachers invite, guide, and support apprenticing students into academic discourse communities. Teaching in this manner relies on being able to assess the needs and abilities of students and tailor the modeling accordingly. In doing so, we must keep in mind that English learners devote much attention to understanding directions. Therefore, if instead of always having to follow directions for new procedures in a classroom, they are familiar with a set of procedures or interaction routines, English learners are better able to devote attention to content. Finally, there are practical advantages for teachers in explicitly modeling participation routines. Rather than having to provide detailed directions to students, especially for small group or pair work, teachers can efficiently organize students by simply referring to a routine by name (e.g., “Think-Pair-Share”).

Bridging

Bridging consists of helping students make personal connections between their individual experiences and science content. Piaget and Vygotsky view the relationship between academic content and individual experiences differently. Regardless of whether we subscribe to Piaget’s, Vygotsky’s, or to any other perspective, we must keep bridging in mind when teaching English learners. As we are painfully aware, most students fail to see the relevance of science in their lives. This is especially true for English learners who, for multiple reasons, may have limited exposure to science in and out of school.

Another reason to use bridging as a scaffold is to make the learning experience positive for English learners and enhance their learning. It is not uncommon for English learners to latch onto a text or curriculum with which they have a direct connection and expertise in, such as agricultural and animal husbandry practices, natural phenomena, or animal and plant species. Such connections turn abstract and distant academic knowledge into concrete, personalized, and tangible understandings that are memorable to students.

Just as with modeling, teachers must also be explicit in bridging. A common mistake made by inexperienced teachers of English learners is to assign a text that seems directly related both to the students’ cultural background and to specific content. An example might be reading Lynne Cherry and Mark Plotkin’s The Shaman’s Apprentice: A Tale of the Amazon Rain Forest (1998) as part of a unit on the rainforest in a classroom with a majority of Latino students. Without framing questions or an appropriate introduction, students may focus their attention on the relationship between the child and the shaman or on religious questions in the story rather than on the great loss associated with the destruction of the rainforest. An even more troubling issue rests on stereotypical notions that often inform teacher’s choice of content they believe to be relevant to students from different cultural, ethnic, and linguistic groups. In this example, it is likely that, even for students who grew up in a rural setting in Latin America, the story has little significance or relevance. Consequently, a text that might have offered powerful jumping-off points for discussion may go unnoticed by students, much to the frustration of the teacher.

Science teachers need not only to know their students’ individual stories but also develop relationships with them in order for scaffolding to be effective. This is particularly true of bridging. Similarly, teachers must be able to assess students’ needs and development in order to use bridging that is not only relevant and engaging but also developmentally appropriate. Examples of strategies that combine elements of assessment together with scaffolding include KWL charts, anticipatory guides, brainstorming, and framing questions, among others. In all of these, the student is asked to focus on their experience before they encounter new material. It is important that English learners are not left to make connections on their own. It is true that arriving at epiphanies on our own can be especially rewarding. Yet, nothing can be more frustrating and defeating than not “getting” these connections, especially for students whose schooling experience may be fraught with negative experiences.

Teachers participating in the SEED workshop apply the “Think-Pair-Share” strategy to the germination investigations in the FOSS Structures of Life Module.
**Contextualization**

A third type of scaffolding in Walqui’s classification is that of providing a meaningful context for both the content and the language being taught. This is particularly appropriate for science, a discipline that strives toward objectivity and precision both in its practices and language. Whereas a major goal of most science teachers is that students use appropriate, precise, context-free language (e.g., “My prediction is that the reaction will be exothermic.”), science, particularly hands-on science, provides rich contexts for students to use language. Jim Cummins and Merrill Swain (1986) make a distinction between everyday language and academic language. The former is concrete, contextualized, and made up of a relatively limited vocabulary; the latter is abstract, decontextualized, and thick with specialized terms. Consider the differences between a student’s description of a physics experiment to a teacher at a lab and a physicist’s description of an experiment to colleagues at a conference. At the lab, the student is likely to give a less than linear chronology of events, use non-precise rather than precise language (e.g., “that way” instead of “perpendicular”), point to the apparatus and related objects, and use hand gestures and even sounds for added emphasis. In contrast, the physicist will prepare a presentation that will follow established norms, such as describing the purpose, methods, findings, and implications. Furthermore, the physicist will be careful to use precise and appropriate terminology, striving toward an objective and somewhat detached tone.

In keeping with Bruner’s (1980) observation that scaffolds allow the learner to take over, any context we provide for English learners must not remain a permanent fixture. Rather, students must be encouraged and supported as they gain proficiency in using the variety of English language and academic language. The former is concrete, contextualized, and made up of a relatively limited vocabulary; the latter is abstract, decontextualized, and thick with specialized terms. Consider the differences between a student’s description of a physics experiment to a teacher at a lab and a physicist’s description of an experiment to colleagues at a conference. The extent to which these expectations will be fulfilled depends on whether we have schemas for (1) chemistry courses, (2) chemistry labs, and (3) lab reports and whether these schemas match the actual course, the lab, and the report requirements. For students with no experiences in chemistry or even science, their expectations may be entirely based on popular culture stereotypes. Even English learners with excellent schooling in their native countries may experience confusion because the particular course and lab requirements are not what they were used to. For these reasons, scaffolding that helps English learners organize knowledge into recognizable patterns is essential in K–12 science classrooms, where both procedures and skills as well as content knowledge follow established norms.

Explicitly organizing content knowledge into structures commonly used in science such as cycles, taxonomies, systems, processes, definitions, principles, and rules and providing students with structured opportunities to do the same will enhance their understanding of science concepts. English learners’ preoccupation with understanding vocabulary and detailed information hampers their ability to understand and remember information.

Continued on page 10
Scaffolding continued

Therefore, we must teach them to look for particular organizations of knowledge. Doing so will help them understand the details and distinguish between essential and peripheral information. Examples of schema-building scaffolding include the use of graphic organizers, charts, matrices, and word webs. However, in order for these scaffolds to work, we need to be explicit about the reasons behind them. We also need to make sure that the schemas we expect students to build are appropriate for them, and, eventually, ask them to construct their own.

Text re-presentation

Learning a second language demands that we learn to recognize the language’s unique patterns, norms, and rules. This is especially true when learning the variety of academic English needed to succeed in problem statements, logical arguments, and descriptions of phenomena, theories, and procedures tend to be the norm, not stories.

Apprenticing English learners into science has to include teaching them to recognize and use the preferred “genres” in each discipline. One way to scaffold this process is by asking students to represent texts or change information from one set of conventions to another. For instance, as part of an assignment in a laboratory, students may present their lab reports as a news story. Similarly, students may be asked to translate a chemical reaction into a story with molecules as the characters. Another form of text re-presentation may include students writing and performing a play based on a process, cycle, or system. Yet another example is to have them create their own

Metacognitive Development

I have left metacognitive development for last, but not because it is the least important. Rather, metacognitive development is scaffolding that must be included in all the previous five types in order for them to be effective. We need to be explicit with students about the ways in which modeling, bridging, contextualization, schema-building, and text re-presentation help them learn science. We also need to be explicit about the strategies that are behind these types of scaffolding and the need for them to be aware of their own learning. In our efforts to apprentice English learners into the knowledge and thinking ways of science, we must be explicit about skills and strategies successful science students use. One also needs to help students develop self-assessment skills and a self-understanding as a learner in order for them to take full advantage of their own abilities and knowledge. Students also need to be aware of what they know and how they learn best to know how and where to focus their attention for future learning. Though these skills and strategies may seem as “normal study skills” to many, they often are not apparent to English learners with less than adequate schooling experience. Talk about what one knows, how one knows it, and how one learns must figure in the daily conversations of science classrooms in order for English learners to learn about themselves as learners. English learners from non-English-speaking backgrounds, whose bilingualism often makes them aware of how they use language, may exhibit a predisposition toward metacognition. Still, we must be explicit about the preferred ways to think, talk, and write about science, and how one self-assess and chooses learning strategies.

Some of the ways to foster metacognitive development include using and discussing learning logs and KWL charts as well as assessment rubrics, particularly when students are involved in their creation and development. In reading, a modified version of Anne Brown and Annemarie Palincsar’s (1984) Reciprocal Teaching lends itself to metacognitive development, particularly when teachers model summarizing and asking questions by thinking aloud throughout the process. An essential component of metacognitive development includes the opportunity and expectation

Science. Native-English-speaking scientists typically have difficulties noticing the language they use, beyond specific technical terms. Teachers unfortunately have contributed to the difficulties of students by using “story” to describe a range of student-produced, written and spoken texts, regardless of whether these are in fact narratives. This is especially problematic in science, a field in which students creating posters and writing letters to an elected representative voicing their concern for habitat destruction. Text re-presentation is a particularly effective scaffold for English learners with creative and artistic tendencies. However, for this scaffold to achieve its language development potential, teachers must be explicit about the norms and conventions associated with each form.

As part of The Sprouting Seed investigation, these teachers work with a home group to describe all five stages of the germination sequence. Having everyone in the group copy the text describing each stage is a strategy that supports English learners.
for students to devise their own learning strategies. One way to accomplish this is to ask students to brainstorm graphic organizers and then choose the one best suited for a particular task. Especially with English learners who may be used to relatively passive student roles, it is imperative that we support them as they begin to assume responsibility and autonomy as learners and budding scientists.

Conclusion

Scaffolding for English learners in science can take many forms. However, we must keep several concerns in mind to be effective in apprenticing students into science, a community with its own language, values, beliefs, and norms. First, we must know our students as individuals, beyond the test scores and official designations that schools give them. Second, we must find ways of constantly assessing not only their needs but especially their strengths; scaffolding has to reflect and be sensitive to student strengths and needs. Third, English learners must be able to use and practice language authentically in its multiple forms, which translates to students often and regularly working in pairs and small groups. Fourth, we need to attend to the linguistic, cognitive, and socio-affective dimensions of scaffolding. Though language is obviously the defining variable in the scaffolding types I have discussed, we must keep in mind the whole student. Finally, you probably noticed that there were crossovers between the six types of scaffolding that Walqui (1995) proposes. This is because hers is a useful classification, a schema if you will. However, scaffolding is holistic and must permeate all aspects of science teaching if we are to answer the challenge of teaching increasingly greater numbers of English learners. This represents for us not only a serious obligation but also the potential to become better science teachers in the process.

References


Notes from the Field...

Tucson Rotarians Create Audiotapes of FOSS Science Stories
By Sharyn Chesser, Science Resource Center, Tucson Unified SD

Getting the community involved in local schools is recommended in many education journals as a way to increase student success. It isn’t always easy, but it is truly amazing what happens when it works!

Rotary International is a worldwide organization of business and professional leaders who provide humanitarian service, encourage high ethical standards in all vocations, and help build goodwill and peace in the world. Rotary International encourages community projects and literacy in its 164 countries. In November 2002 Rotarians from District 5500 (49 clubs in Southern Arizona) created a literacy service project to benefit children in grades K–2 who are emerging or non-readers, as well as children who speak limited English. Rotarians were asked to borrow short, grade-appropriate books from teachers and record themselves reading the books. Students could listen to the recording and follow along in the book, employing a common reading intervention strategy.

Tucson Unified School District has used FOSS as its adopted science curriculum since the early 1990s. The David T. Smith Science Resource Center includes FOSS Science Stories in the kits provided to teachers. Teachers love receiving the nonfiction materials, but they know some children struggle to read them. The opportunity to have recorded FOSS Science Stories available for students was timely. Students would be ready to take the fifth-grade state test, teachers needed assessments in all grades that correlated to the state standards known as EALRs (Essential Academic Learning Requirements).

The FOSS Project at the University of California gave permission to have the stories read and recorded by Rotarians for this special project, and Fabric, New Plants, and Air and Weather were chosen for the pilots. In the Arizona AIMS (Arizona’s Instrument to Measure Standards) test, reading nonfiction is tested in third grade, so focusing on grades K–2 seemed like the perfect fit.

Rotarians and their families were thrilled to record the stories. Not only did they enjoy the opportunity to serve, but they also learned about the local science curriculum. Knowing this effort would help children put large smiles on their faces. One Rotarian said she had fun picturing the children’s faces as they listened. An attorney exclaimed it felt good to do something meaningful for children and teachers.

At first the tapes were used in classrooms where teachers had identified the need during grade-level conversations, part of the DESERT Project (NSF systemic change grant). The teachers realized community members made the recordings and appreciated the support. Mary Bies, a first-grade teacher at Reynolds Elementary who used a New Plants Science Stories tape, offered, “I loved it! It made a great independent activity for a listening center. I felt it was very effective for follow-up and reinforcement.” Librarians also became interested. One librarian was thrilled to share the tapes with first- and second-grade students who were emerging readers.

Rotarians have expressed the desire to continue the effort in Tucson on an as-needed basis. TUSD Science Resource Center will expand the recordings to include Pebbles, Sand and Silt; Balance and Motion; and Solids and Liquids Science Stories. Just consider the greater conceptual understanding students will gain from the hands-on science investigations when they can read and talk about the nonfiction books. The beauty of this project is that it is simple and sustainable. Community leaders gain insight into the local science curriculum and have the opportunity to support education in their community.

Sharyn Chesser
cdresort@qwest.net

First Ten Washington Edition Assessment Folios Now Available

For the past two plus years, staff members from LHS/FOSS have been working with teachers in Washington State to create a Washington edition of the assessment folios for each of the elementary FOSS modules. Anne Kennedy at ESD 112 in Vancouver, Washington, initiated this project with the idea that, if elementary teachers wanted to make sure that their students would be ready to take the fifth-grade state test, teachers needed assessments in all grades that correlated to the state standards known as EALRs (Essential Academic Learning Requirements).

At first, project staff thought perhaps a “mini-WASL” would be appropriate (the WASL is the state science test), but, as discussion continued, it was decided that formative assessment should be the focus. Formative assessment is defined as any assessment that is used for diagnostic purposes to make instructional decisions. It was felt that this was the right place to focus because teachers need to have a clear view into student learning as it is developing. Science learning generally builds from simpler ideas to more complex. Students will surely stumble on the more complex ideas if they have not grasped the simpler ones. If teachers wait until all the investigations in a module have been taught, give a test, and then find out there are concepts that the students are still confused about, it’s too late because it’s time to move on to the next module.

The project began three summers ago when a group of about 40 FOSS-
experienced teachers met at PacForest Conference Center for a three-day retreat. In those three days, teachers went through each 2000 Edition teacher guide to identify which EALRs were being taught in each module. Because the focus was on formative assessment, they then went through each module investigation by investigation and noted which EALRs were assessed in each investigation. In most modules there was high correlation between EALRs taught in the module and items that already existed in the FOSS assessment program. But in some cases new assessments were needed. Teachers created these assessments based on their expert knowledge of students and how they deal with the various FOSS investigations.

Of course, you never know how an assessment is really going to work until you try it out with your students! Teachers were able to do that when they went back to school in the fall. They then met in December with the project staff to share the results of all the assessments. In some cases the assessments worked exactly as planned; in other cases revisions needed to be made. A second trial took place in the spring when another group of teachers tested the revised assessments. Following that final trial, the assessments went through one more revision and are now published as the Washington editions of the module and items that already existed in the FOSS assessment program. The only requirement for receiving the CD-ROM is that the district or school needs some of the masters used for assessment sheets are the same as the 2000 Edition, some of them have been modified, and others are brand new. Teachers thought it would be easier if the blackline masters were included in the folio, so they would not have to flip back and forth to figure out when to use original FOSS sheets, modified sheets, or new sheets. There is a scoring guide for each assessment suggested as well. The scoring guides always describe the EALR being assessed at the top of the guide.

Another feature in the Washington edition assessment folio is the inquiry project. The purpose of the inquiry project is to help students learn the processes for conducting science. At the end of each module, students complete an inquiry project. They ask a question about something they have been studying, plan and conduct an investigation, collect and organize data, and draw conclusions. These are then presented to the class for scrutiny. Scoring guides and suggestions for how to develop the projects throughout the grades are provided in the assessment folio.

You can get the CD-ROM with the first ten modules by contacting Gloria Ferguson at 360-750-7500 x 301 or e-mail Gloria at gloria.ferguson@esd112.org. The only requirement for receiving the CD-ROM is that the district or school needs to have purchased the 2000 Edition FOSS modules.

Special thanks to all the teachers and other folks who helped make this project possible.

The Washington edition was made possible by the generous support of the following organizations: Delta Education; Educational Service District 112; Eisenhower Funding; Hewlett-Packard; Intel; Lawrence Hall of Science at the University of California, Berkeley; Washington State School Districts; and Washington State University, Vancouver.
This issue’s Wordsmiths includes a variety of selections from the books that have recently come to the FOSS staff’s attention. If you have a book you’d like to recommend to other FOSS users, please send the book’s title, ISBN number, other vital statistics, and annotation to Sue Jagoda, either at the LHS snail address on the back of this newsletter or via e-mail to skjagoda@uclink4.berkeley.edu. For more reading resources, check the resources section of your FOSS teacher guide. Online resources for each module are available at http://www.fossweb.com. An online searchable database for all modules will be available in mid-April 2003 at http://lhsfoss.org/fossweb/teachers/resources.

**In a Nutshell**


An acorn grows into a mighty oak tree, helps sustain other life, and eventually dies and continues to give life to others. *(Trees, Structures of Life)*

**Salmon Stream**


The story unfolds the scientific cycle of a salmon and the multiple threats to its survival. It engages children, showing how they can help keep salmon with us. *(Animals Two by Two, Structures of Life)*

**Under One Rock**


A story that combines scientific fact and rhythmic cumulative verse to teach young children about the critters that can be found living under rocks. Rich language and earthy illustrations. *(Insects, Animals Two by Two Modules)*

**One Small Square: Cave**


Readers explore a pictured square that depicts cave life. Moving from the ferns, owls, bats, wood rats, and crayfish found in the half light near a cave’s entrance to the fungi, salamanders, isopods, and fish deep within. The author presents a typical cave’s geological formations. Safety tips for spelunkers and some simple experiments demonstrating how caves are formed. *(Environments Module)*

**One Small Square: The Night Sky**


In one small square of night sky children use their eyes, binoculars, the position of the moon, and even their fingers as guides to locate Orion and other constellations and even stars and planets, while they learn amazing facts about the heavenly bodies. Activities are included for northern and southern hemispheres. *(Solar Energy Module, Planetary Science Course)*
or naturalized in the region so students might find them in the local environment. While the land snail, *Helix aspersa*, is still recommended for those states where the organism is already naturalized, we recommend use of the bess beetle—formally known as *Odontotaenius disjunctus*—for other states.

**Introduction to Beetles**

Insects make up about 60 percent of the known animals. At least a third of those insects are in the order Coleoptera, the beetles, including some 350,000 different beetle species. One out of every five animal species known on Earth is a beetle. Lady bird beetles, fireflies, whirligig beetles, and darkling beetles (the mealworm adult stage) are all in this order. Like other insects, beetles wear their skeletons on the outsides of their bodies instead of inside like people. This outside skeleton is called an exoskeleton. All insects have three pairs of legs. Their bodies are divided into three parts—head, thorax, and abdomen. Most insects have two pairs of wings, and their heads have two eyes and two antennae.

The most important characteristics that all beetles share is their short, hard front wings called elytra. When a beetle folds its wings, the elytra cover its entire abdomen. This forms a protective shell that gives a beetle its “armored” appearance. When a beetle flies (and not all beetles do), it lifts its elytra so that its back wings can beat.

Beetles go through several stages of development called metamorphoses. Life starts as an egg. The wormlike larva emerges from the egg. The larva is the stage in which the insect eats and grows. Next the larva enters a resting stage, the pupa. Finally the pupa changes into the hard-shelled adult.

Beetles occupy a wide range of environments all over the world. They are found almost everywhere on Earth—in rain forests, deserts, mountain lakes, and even sewers. They live in every environ-
Bess Beetle continued

ment except the oceans. They eat almost everything, too. Some of them are herbivores, others are parasites and live in or on other animals, and many are scavengers, living on dead animals and dung. Some beetles are helpful to humans, eating other insect pests or breaking down material for decomposition. Other beetles can be harmful when they eat crops and human foods.

**Bess Beetle Natural History**

Bess beetles go by many names—bess bug (although they are not true bugs), betsy beetles, patent leather beetles, or palladid beetles. There are two species of bess beetle in the United States; over 500 related species are found in the tropics. They are fairly common in the Eastern United States, found in decaying logs from Texas to Florida and as far north as Canada. They are considered beneficial organisms, important in the recycling of dead wood.

Adult beetles are up to 4 cm long (about 1.5 inches), shining black with a series of grooves running the length of the elytra. Students will observe the adult bess beetle’s six legs, but they may count four, rather than three, body parts. Students will discover that beetles have two thoracic segments, allowing its hard body to move more freely. Students will find a tiny, gold-colored fringe on the legs and edges of the beetle’s body. The exact function of the fringe is unclear, but it may help to keep the beetle clean.

Protruding from the beetle’s head between the eyes is a short horn. Most noticeable to students are the beetle’s strong mouthparts (mandibles) and feathery antennae. The mouthparts allow the beetle to chew through decaying hardwood that serves as both food and shelter. (Although they look vicious, the beetle doesn’t chew on anything other than decaying wood so there is no potential harm to small fingers.) The antennae “drive” the beetle. Students will observe the beetle using the antennae to explore the air. It is assumed that they use their antennae to sense odors in the environment—decaying wood or other beetles of the same species—but this has not been well-studied.

Bess beetles are somewhat social insects, living in colonies in decaying stumps and logs. They prefer hardwood—oak, elm, and other deciduous trees—that is well-decayed and falls apart easily. The beetles will chew their way through the wood, making tunnels, or galleries, as they go. In the classroom, a layer of decayed wood in a clear basin and a daily spray of water are all they need.

Bess beetles live in pairs within the colony and share housekeeping and larval care duties over long time periods. Eggs are carried through the tunnels delicately in the mandibles. Larvae are fed on a well-chewed mixture of beetle feces and wood. When the larvae pupate, which may take up to a year, they are then moved to a separate chamber for their protection. All this keeps the beetles very busy for the 14–16 months of their adult life.

**Bess Beetle Communication**

When adult bess beetles are disturbed, they produce a squeaking sound by rubbing their elytra against their abdomens. Students will be able to hear this stridulating. Stridulating is apparently used for communication between members of their colony and it is especially effective since most of the beetle’s life is spent in darkness. Studies suggest that the sounds for defense are different than the sounds for courtship.

**Bess Beetle Food**

Bess beetles chew wood, and it is considered a food source but only indirectly. Unlike termites, bess beetles don’t have symbiotic bacteria in their gut that help them digest the cellulose in the decaying wood they ingest. Bess beetles processes the wood through their digestive system and then a fungus grows on the beetles feces. It is this fungus that beetles eat as a food source.

**Bess Beetle Mites**

Eating fungus that grows on decaying wood, providing care for larvae, communicating through sounds—these are all fascinating features of the bess beetle. But they have another interesting feature—they have co-evolved with at least one kind of mite. Mites care for at least one kind of mite. Mites care for larvae, the body of the bess beetle. Some of these mites are only found on bess beetles, suggesting a relationship that has evolved along with the organisms. It’s not clear that the beetles benefit from the mites, but because of their exoskeleton, they aren’t harmed in any way. It may be that the mites live on secretions given off by the beetle or they may just share the decaying wood. The mites are not known to damage the beetles, don’t bite or harm students, and do not leave the classroom habitat basins. Should they get on a student’s hand the mites are easily brushed off.

**Bess Beetle Investigation Summary**

In Meet the Bess Beetle, Part 1: Bess Beetles at Home, students observe the beetles and learn how to handle them carefully. They become familiar with the structures of the beetle and make labeled drawings of those structures. Students set up an appropriate habitat that will provide for the needs of the beetle in the classroom. They maintain a care-and-feeding routine for two colonies of bess bugs, each in a clear basin with a cover. Students record observations over time and share them with other students.

In Part 2: Comparing Crayfish and Beetles, students observe more closely and record the beetle’s structures and behaviors. Using a Venn diagram, they compare crayfish and beetles structures (both are in the phylum Arthropoda, one is an insect and other a crustacean). They discuss the functions of the various structures they observe.

In the previous sessions, students have observed how well the bess beetle can cling to a surface with their strong legs and claw-like feet. In optional Part 3: The Beetle Pull, students find out just how strong their beetles are. Using dental floss for a simple harness and paper clips for “cargo,” they discover the beetles can readily pull many times their own mass. This leads to a discussion of what function such strength may serve in the beetles’ survival.

**Bess Beetles in the Classroom**

Everything needed to conduct the new Structures of Life investigation is in the 2000 Edition FOSS kit with the exception of the beetles and the decaying wood. The beetles are available from Delta Education by calling 1-800-258-1302 and asking for them by name along with a copy of the new investigation folio and student sheets. The decaying hardwood is not in the kit; it must be supplied by the teacher.

Hardy, easy to maintain, harmless, and fascinating, bess beetles have all the characteristics for a successful FOSS classroom critter. 🦗
In the News:
Sound Waves Kill the Smell of Manure
This article may be of interest to students working with the FOSS Physics of Sound Module or the Ideas and Inventions Module.

The long wait may be over for live-stock producers who have been looking for an affordable manure treatment process that would leave manure storage facilities as odor-free as city sewage treatment plants.

A process developed by University of Iowa biochemist David Soll might be the answer. He subjects liquid manure to intense sound waves using titanium probes. The probes vibrate at 20,000 times per second, creating ultrasound waves, which are too high for the human ear to hear. The rapid vibration actually shakes apart the molecules in the liquid manure. As this happens, a tiny implosion occurs, which releases a miniscule amount of heat that causes a pressure build-up at the molecular level.

This creates a chemical reaction that produces hydrogen peroxide and other powerful oxidizers. As the oxidizers are released, they tie up the ammonia and hydrogen sulfide in the manure, which are the main cause of manure odor.

Additionally, the solids in the manure that pass through the treatment chamber are pulverized so they become suspended in the liquid and do not settle out in storage.

Major funding for Soll’s research came from Heartland Pork Enterprises, Iowa Falls, Iowa. The large hog producer pitched in after officials learned the effect that Soll’s process had on waste materials. As a result, while the University of Iowa owns the patent for the process, it will be licensed to a technology division of Heartland Technology in Alden, Iowa. Kent Krause, a spokesman for the company, says they are in the process of developing and testing farm-size Sonicators, the name given to the treatment chambers. They have had one system in place on a 1,350-head finishing building for six months.

Because the procedure is simple and requires no chemicals or aeration, Heartland officials expect it to have applications beyond agriculture, such as in sewage treatment plants. Because it’s still in the development stage, the price has not yet been determined. However, Krause says it will be affordable even when pork prices are as low as they were in the fall.

For more information, contact:
Kent Krause
FARM SHOW Follow-up
Heartland Technology
1549 State Hwy 941
Alden, Iowa 50006
kkrause@heartlandpork.com
(Reprinted with permission from Farm Show magazine http://www.farmshow.com)

Make Friends with a Science Materials Center Near You

Is your district thinking of starting up a science materials center? Do you already have a center and would like to share ideas with others? In the Fall 2002 newsletter we shared the experience of FOSS educators who gathered in Boulder, CO, for a FOSS Materials Management Symposium (“The FOSS Materials Management Symposium: Keeping the Investment Robust”). The districts represented at the symposium were just the tip of the iceberg. Across the country, districts and consortiums are grappling with the challenge of how to efficiently refurbish and share inquiry-based science kits. As a result, science materials centers are popping up everywhere.

Every material center enters into the challenge with its own set of unique local policies, funding strategies, resource availability, and partnerships that converge to create the solutions best suited to their needs. The Center for Math and Science in South Dakota is one of several centers, for example, that sends out refurbishment materials to many of their schools rather than bring the kits into the center. In Texas, the Tyler School District chose to weave the materials center into their Life Skills program. Students in the program learn valuable job skills in the process of managing the refurbishment and tracking of science kits. They have also established a partnership with Coca Cola®, which now delivers and picks up science kits in addition to delivering beverages. Several materials centers have developed systems for attracting and utilizing volunteers. One exemplary program is at ESD 112 in Washington where volunteers take care of inventorying all the kits for the Evergreen district.

Whenever materials center folks meet, there is plenty to talk about and plenty to be learned from each other. Look for “Nuts and Bolts” sessions held in conjunction with regional NSTA conferences, where representatives from centers in the area can come together to discuss innovations, solutions, and possible collaboration. Or, consider hosting your own “Nuts and Bolts” sessions in your area.

We’ve included a partial list of science centers that support FOSS educators across the country to help you locate others in your area, and other centers similar to your own. If you’d like to have your center added to the list, please contact Sue Jagoda at skjagoda@uclink4.berkeley.edu.

There will be a FOSS Materials Management workshop at the NSTA National Convention in Philadelphia, Pennsylvania, on Saturday, March 29, 2003, from 8:00–11:00 a.m. There will also be a summer Materials Management Symposium hosted by a FOSS materials center. For more information on these events, contact Alev Burton (see information on page 23 of this newsletter).
# A Sampling of Science Materials Centers

For a more complete list of Science Materials Centers organized by state, go to [http://www.fossweb.com](http://www.fossweb.com) (Info for Teachers and Parents link).

<table>
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<tr>
<th>Location</th>
<th>Contact</th>
<th>Email</th>
<th>Phone</th>
<th># of Kits</th>
<th>Publishers</th>
<th>Services</th>
<th>Kit Storage</th>
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<tr>
<td>Tucson Unified School District, AZ</td>
<td>Marleen Kotelman</td>
<td><a href="mailto:MarleenKotelman@cusd.k12.az.us">MarleenKotelman@cusd.k12.az.us</a></td>
<td>520-225-4935</td>
<td>1450</td>
<td>FOSS, GEMS, Insights</td>
<td>Kit materials, Training</td>
<td>Center</td>
</tr>
<tr>
<td>Fresno Unified School District, CA</td>
<td>Mike Labda</td>
<td><a href="mailto:mjalabda@fresno.k12.ca.us">mjalabda@fresno.k12.ca.us</a></td>
<td>559-248-7997</td>
<td>640</td>
<td>FOSS</td>
<td>Materials, Animal coupons, Teacher training</td>
<td>Center - Center has critters sent directly to schools</td>
</tr>
<tr>
<td>Newport-Mesa USD, Costa, CA</td>
<td>Marcias Encinas</td>
<td><a href="mailto:mencinas@nmsd.k12.ca.us">mencinas@nmsd.k12.ca.us</a></td>
<td>714-424-7570</td>
<td>630</td>
<td>FOSS, Insights, STC</td>
<td>Kit materials, Animal coupons, Literature, Trainings</td>
<td>Schools and center</td>
</tr>
<tr>
<td>Boulder Valley SD, CO</td>
<td>John Delmonico</td>
<td><a href="mailto:john.delmonico@bvsd.k12.co.us">john.delmonico@bvsd.k12.co.us</a></td>
<td>303-447-5106</td>
<td>Over 1000</td>
<td>FOSS, K-B</td>
<td>All materials, Coupons, and some organisms, Trainings</td>
<td>Center</td>
</tr>
<tr>
<td>Poudre SD, Ft. Collins, CO</td>
<td>Leza Graber</td>
<td><a href="mailto:lgraber@psd.k12.co.us">lgraber@psd.k12.co.us</a></td>
<td>970-490-3686</td>
<td>600</td>
<td>FOSS</td>
<td>Materials, Live organisms and coupons, Literature, Trainings</td>
<td>Center</td>
</tr>
<tr>
<td>Pueblo School District #60, Pueblo, CO</td>
<td>Orla Gil</td>
<td><a href="mailto:ogil@pueblo60.k12.co.us">ogil@pueblo60.k12.co.us</a></td>
<td>719-595-4281</td>
<td>562</td>
<td>FOSS, SEPUP, STC</td>
<td>Materials, Trainings, Reference books</td>
<td>Center</td>
</tr>
<tr>
<td>Van Allen Science Teaching Center, Cedar Rapids, IA</td>
<td>Joanne Bancroft</td>
<td><a href="mailto:bancroft@sea10.k12.ia.us">bancroft@sea10.k12.ia.us</a></td>
<td>319-399-6560</td>
<td>Serve 24 districts</td>
<td>FOSS</td>
<td>Materials, Live organisms or coupons, Trainings</td>
<td>Center</td>
</tr>
<tr>
<td>Kansas City SD 500, Kansas, KS</td>
<td>Jennifer French</td>
<td><a href="mailto:jfrench@kcps.org">jfrench@kcps.org</a></td>
<td>913-551-3645</td>
<td>Over 400</td>
<td>FOSS, STC, Optical Data</td>
<td>Materials, Trainings, Animal coupons</td>
<td>Center</td>
</tr>
<tr>
<td>Educational Development Center Fairview Community Center, Roseville, MN</td>
<td>Michelle Kruzel</td>
<td><a href="mailto:michelle.kruzel@k12.mn.us">michelle.kruzel@k12.mn.us</a></td>
<td>651-604-3736</td>
<td>3500</td>
<td>FOSS</td>
<td>Kit materials, Literature, some training, Live organisms</td>
<td>Schools and Center</td>
</tr>
<tr>
<td>Fargo SD 1, Fargo, ND</td>
<td>Vicki Bauman Rachael Agra</td>
<td><a href="mailto:agrer@fargo.k12.nd.us">agrer@fargo.k12.nd.us</a></td>
<td>701-241-4858</td>
<td>125</td>
<td>FOSS</td>
<td>Materials, Trainings</td>
<td>Center - Will soon change to school</td>
</tr>
<tr>
<td>RI Science Material Resource Center at EASY Bay Educational Collaborative, Warren, RI</td>
<td>Anta Hennessy</td>
<td><a href="mailto:hennessaa@ride.ri.net">hennessaa@ride.ri.net</a></td>
<td>401-245-4998 ext. 1</td>
<td>3700</td>
<td>FOSS, Insights, STC, locally created</td>
<td>Kit materials, Teacher-provided materials, Customizing kits, Training, Coupons, Live organisms (student-run business), writing connections</td>
<td>Center</td>
</tr>
<tr>
<td>Center for the Advancement of Math and Science, Black Hills State University, Spearfish, SD</td>
<td>Kathy Quinn</td>
<td><a href="mailto:kathyquinn@bhsu.edu">kathyquinn@bhsu.edu</a> <a href="http://www.camse.org">www.camse.org</a></td>
<td>605-642-6872</td>
<td>Center owned=120 School owned=326</td>
<td>FOSS, GEMS, Insights, BICS, TRACS, SEPUP, Delta Modules</td>
<td>Materials, Organisms, Literature, Trainings</td>
<td>Schools and center</td>
</tr>
<tr>
<td>Brownsville ISD, TX</td>
<td>Mike Baldwin</td>
<td><a href="mailto:meb58@k12.bisccx.net">meb58@k12.bisccx.net</a></td>
<td>956-548-8246</td>
<td>4500</td>
<td>FOSS</td>
<td>Kit materials, Training, some live organisms - returned to Carolina after use</td>
<td>Schools</td>
</tr>
<tr>
<td>New Braunfels ISD, New Braunfels, TX</td>
<td>Lisa Crider</td>
<td><a href="mailto:lcrunder@newbraunfels.bisd.net">lcrunder@newbraunfels.bisd.net</a></td>
<td>830-627-6991</td>
<td>217</td>
<td>FOSS, Insight, STC, etc.</td>
<td>Kit materials, Animal coupons, Trainings</td>
<td>Center</td>
</tr>
<tr>
<td>Spring Branch ISD, TX</td>
<td>Mary Hobbs</td>
<td><a href="mailto:hobbms@springbranchisd.com">hobbms@springbranchisd.com</a></td>
<td>713-365-4175</td>
<td>550+</td>
<td>FOSS</td>
<td>Kit materials, LOTs of training</td>
<td>Schools, additional at center</td>
</tr>
<tr>
<td>Tyler ISD, Tyler, TX</td>
<td>Terri Herbert</td>
<td><a href="mailto:heberrtt@tyler.sprnet.org">heberrtt@tyler.sprnet.org</a> Web page expected ‘03</td>
<td>903-531-3584</td>
<td>800</td>
<td>FOSS</td>
<td>Materials, Trainings, Live organisms</td>
<td>Center</td>
</tr>
<tr>
<td>Battelle SRC, Kennewick, WA</td>
<td>Nancy Sauer</td>
<td><a href="mailto:sauna@kbsd.org">sauna@kbsd.org</a></td>
<td>509-585-3471</td>
<td>300</td>
<td>FOSS, GEMS, STC</td>
<td>Materials, Trainings, Animal coupons - will raise organisms</td>
<td>Center</td>
</tr>
<tr>
<td>ESD 112, Vancouver, WA</td>
<td>Bo Haldeman</td>
<td><a href="mailto:bo.haldeman@esd112.org">bo.haldeman@esd112.org</a> <a href="http://www.smerc.org">www.smerc.org</a></td>
<td>360-750-7513</td>
<td>1.628</td>
<td>FOSS, GEMS</td>
<td>All materials, Organisms, Literature, Trainings</td>
<td>Center</td>
</tr>
<tr>
<td>Mukilteo SD, WA</td>
<td>Lloy Schaaf</td>
<td><a href="mailto:SchaalfM@mukilteo.wednet.edu">SchaalfM@mukilteo.wednet.edu</a></td>
<td>425-356-1233</td>
<td>320</td>
<td>FOSS</td>
<td>All materials, Trainings</td>
<td>Center</td>
</tr>
<tr>
<td>Olympic Educational Service District - Science Kit Center, Silverdale, WA</td>
<td>Eileen Chapman</td>
<td><a href="mailto:echapman@oesd.wednet.edu">echapman@oesd.wednet.edu</a></td>
<td>360-692-3239</td>
<td>925</td>
<td>FOSS</td>
<td>All materials, Live organisms or coupons, Copies</td>
<td>Center</td>
</tr>
<tr>
<td>Seattle Public Schools, WA</td>
<td>Cj Tomlinson</td>
<td><a href="mailto:cjtomlinson@seattleschools.org">cjtomlinson@seattleschools.org</a></td>
<td>206-545-7024</td>
<td>Over 3000</td>
<td>FOSS, STC, Insights, SEPUP It's About Time</td>
<td>Kit materials, Trainings, Animal coupons, Literature, Community resources</td>
<td>Center</td>
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<tr>
<td>Kenosha USD, Kenosha, WI</td>
<td>Barry Thomas</td>
<td><a href="mailto:bthomas@kusd.edu">bthomas@kusd.edu</a></td>
<td>262-859-2960</td>
<td>648</td>
<td>FOSS, STC, District created</td>
<td>All materials, Organisms, Copies, Literature, Trainings</td>
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The National Science Foundation has awarded a three-year grant to Arthur Camins (Hudson Public Schools), Kathy Long (FOSS/LHS), and Marco Molinaro (ScienceVIEW/LHS). The FAST project is researching, developing, and evaluating the effectiveness of a technology-based, formative-assessment system designed to collect classroom observational data, improve elementary teachers’ analysis of written student work, and provide diagnostic suggestions to increase students’ understanding of science concepts and processes. The system will link sets of instructional maps that represent key concepts and the typical development in student thinking connected to specific units of study. These maps will provide teachers with a window into the progression of students’ conceptual development. Software for handheld and desktop computers will enable teachers to collect, organize, and analyze data to determine next-step instructional decisions and provide detailed reports about student achievement.

Prior to preparing the grant proposal, it was recognized that several independent forces were placing increasing demands on teachers and school systems to make use of assessment data to improve student achievement. An initial realization was that most teachers lacked the tools and strategies with the precision necessary to respond to these demands. Recent research in cognitive development highlighted the importance of instruction that builds on students’ prior knowledge. This implies that teachers need to increase their content and pedagogical content knowledge and become more skilled at capturing and understanding students’ developing ideas.

Public pressure for accountability has increased the need for better diagnostic assessments. Fortunately, research strategies for exploring student thinking and technological tools to more effectively collect and represent this information for teachers are now available. Building on the ongoing successful work of Dr. James Minstrell with secondary students (and a consulting partner on the FAST project), FAST is conducting research activities to respond to the instructional and assessment needs at the elementary level by addressing the following questions.

- What are the typical conceptual linkages, pre-conceptions, confusions, and developmental hierarchies of young students (elementary age) for specific science content and investigative processes?
- How can these be represented in a formative assessment system that uses technology to make the system accessible and useful to elementary school teachers?
- How can teachers use this assessment system to gain more insight into student thinking, their own content knowledge, and their instructional practices?
- How is student achievement impacted when teachers use a formative assessment system in conjunction with exemplary elementary science curriculum?

In academic year 2002–03, the FAST project staff are creating the instructional maps, developing some of the next-step strategies, and looking for the right hardware that will make data gathering in the classroom a reasonable task. The plan for fall 2003 is to have a working system to pilot with the FOSS Magnetism and Electricity Module that will include the instructional maps, hardware to gather the data, desktop software to compile the data in usable ways, and next-step strategies for teachers to test. The same components for the Mixtures and Solutions Module will be developed beginning next year.

Given that this is a proof-of-concept study, work will be limited to these two modules. But if all goes well, the project staff is hoping to include other modules in the future. Watch for progress reports of the FAST project in future FOSS newsletters.
If you will for a moment, think back to when you first heard about FOSS. Perhaps FOSS modules were introduced to you by a colleague or lead teacher in your district or by a consultant for FOSS. Maybe you attended a FOSS session at a regional or national NSTA convention. Perhaps you used the video from your kit as you planned to teach the activities to your students, refreshing your memory of how the activities were planned and assessed. Remember the early conversations you had with other science teachers in your building or district, about the modules and how great they were to use.

Now imagine how powerful an experience it would be to attend a week-long FOSS workshop on a single middle-school course, a workshop that combined all these elements of the FOSS middle program within the most appropriate natural arena, one both huge in scale and very grand. The course? FOSS Earth History. The place? Grand Canyon.

Angela and I were among a group of 35 teachers and administrators lucky enough to participate in such an experience for an entire week during the summer of 2002. Imagine a collection of middle-school science teachers with varied backgrounds and content expertise, gathered in one place from across the country, with the curriculum developer from FOSS who wrote the course and with an experienced FOSS teacher consultant who conducts workshops for FOSS. What if Grand Canyon itself became your classroom? And if, at every turn, talented and knowledgeable park rangers hiked the trails with you and talked with you about your observations? That was our experience. You might understand how empowered we felt at the end of the week.

For some of us this experience opened the doors to the beauty and wonder of the Earth that we had never experienced. It also allowed us the unique opportunity to experience geology and have a strong desire to share it with our students. We wanted to return to our schools and take a piece of Grand Canyon with us. We plotted how we might be able to bring all of our students to Grand Canyon and allow them to have the same experience that we did. Every one of us was inspired and ready to return to our classroom and help our students understand and appreciate the rocks of the Earth and the majesty of Grand Canyon.

Over the course of the week we worked through investigations in the Earth History Course at the Albright Training Center. We viewed segments from the FOSS Earth History CD with virtual reality tours of the Canyon rim, a raft trip down the Colorado River, and close-up looks at rocks and landforms in Grand Canyon and on the Colorado Plateau. We took in an IMAX show in nearby Tusayan about the canyon, swooping through narrow canyons on the wings of a bird, viewing scenes of the early habitation of the canyon by the Anasazi Indians and the travels of Spanish explorers and the American adventurer Major John Wesley Powell. We learned about the traveling trunks the Grand Canyon Association and the park service have developed, which teachers can borrow to bring Grand Canyon closer to their students. We shared rock
samples we had brought from home and connected the geology of Grand Canyon to the geology of our own backyards where our students can begin their geological investigations through field trips and hikes of our own.

We do admit that all work halted the afternoon a very large elk buck walked past the classroom windows, calmly watching us admire him, grazing a bit, and then moving on through the trees out of sight.

Angela and I are sure the other participants would agree with us, however, that the most important time we spent in northern Arizona was spent out on the Canyon trails. We learned to read the story preserved in the rocks, hiking down the steep trails in the early morning light, cutting back and forth in switchbacks for a mile or more, knowing we would have to hike back out all too soon. For some of us, it was a time to step out of our “comfort zone” and really enjoy the beauty of one of the greatest wonders of the world with the unique understanding of how it was created.

We learned to appreciate the rocks of the Colorado Plateau and Grand Canyon, and we developed an intimate understanding of the four layers on top in the Canyon in particular as we hiked down through them and more slowly climbed back up past them. We learned about the processes that created the canyon and why Grand Canyon is so unique. We knew that our week would prepare us to be far better teachers of geology and earth science and better stewards of our land as well.

Our week came to a close at an elegant barbecue that we packed in to Shoshone Point, a secluded place meant for solitude and peace, a place where we shared one last sacred moment with a view to die for and an incredible sunset. We both agree: Sunset over the Canyon is not to be missed! 🌆

Mary Lightbody
Westerville, Ohio
lightbody.1@osu.edu

Angela Maas
El Centro, California
amaas@ecsd.k12.ca.us

FOSS Summer 2003 Workshops

Weather and Water Workshop
June 19–21, 2003
Lawrence Hall of Science

Join us for a 2.5-day workshop introducing the new FOSS Weather and Water Course for Middle School. The workshop is intended for professional developers and lead teachers who will be implementing the course or are considering purchase. Transportation and lodging must be covered by participant. For more information contact Alev Burton (see page 23 for contact information).

Populations and Ecosystems Workshop
July 13–15, 2003
Lawrence Hall of Science

Join us for a 2.5-day workshop introducing the new FOSS Populations and Ecosystems Course for Middle School. This workshop is also intended for professional developers and lead teachers who will be implementing the course or are considering purchase. An application will be available soon. Transportation and lodging must be covered by participant. For more information contact Alev Burton (see page 23 for contact information).

Earth History Workshop at Grand Canyon (to be confirmed)
July 19–26, 2003
Albright Training Center, South Rim, Grand Canyon, AZ

Get a truly hands-on, up close and personal geological experience at Grand Canyon this summer as we explore the FOSS Earth History Course for Middle School at the Albright Training Center at the South Rim. For more information as it becomes available, contact Sue Jagoda at 510-642-8941 or skjagoda@uclink4.berkeley.edu

Summer FOSS Materials Management Symposium (second annual)
Date and Location TBA

The symposium is designed for educators involved in implementation of FOSS K-6 or K-8. We will discuss all aspects of setting up and maintaining a materials management system for a district of a school. Teams of educators from districts who are experienced in materials management as well as those about to initiate a process will be there to share their ideas and questions. For more information, contact Alev Burton (see page 23 for contact information).

FOSS Middle School Institute
August 6–7, 2003
Seattle area, site TBA

This workshop will cover the same topics as the FOSS K-6 workshop, August 4–5, focusing on the FOSS Middle School courses. For more information, contact Alev Burton (see page 23 for contact information).
Everybody talks about the weather... but nobody does anything about it. Well, FOSS has done something about it. The much anticipated FOSS Weather and Water Course for Middle School is now available from Delta Education.

Weather is not a trivial subject—it’s a lot more than looking at clouds and measuring precipitation. Weather is complex, involving content drawn from several different science disciplines, including atmospheric science, hydrology, and several branches of physics. The concepts developed in this course include atmospheric composition, physical properties of gases, density, pressure, heat, temperature, energy transfer, convection, evaporation, and condensation. These fundamental properties and processes that govern actions in the natural environment conspire to produce what we recognize as weather—fog, rain, snow, wind, heat, cold, drought, and all the extremes of these conditions called severe weather.

The conceptual sequence of the course unfolds, investigation by investigation, like this.

1. **What is Weather?** (2 sessions)
   Students start their study of weather by watching a video of severe weather. Following small group discussions, the class reaches a consensus of the factors that constitute weather, the amount of moisture, movement, and heat in the air. Students begin monitoring local weather conditions using weather tools.

2. **Where’s the Air?** (3–4 sessions)
   Students study the atmosphere, a mixture of gases, using diagrams, photos, and a reading. They then work with syringes and tubing to discover that air takes up space and is compressible. They work in small groups to design demonstrations to show that air has mass.

3. **Seasons and Sun** (5 sessions)
   Students investigate how the shape of Earth and its relationship to the Sun affect Earth’s weather around the world. They use multimedia simulations and light sources and globes to model the length of the day throughout the year, which leads to an awareness of seasonal variations in insolation.

4. **Heat Transfer** (5 sessions)
   Students investigate energy transfer from the Sun to Earth’s surface and the atmosphere. They learn the two mechanisms of heat transfer in solids, liquids, and gases: radiation and conduction.

5. **Convection** (4–5 sessions)
   Students investigate density of fluids on their way to understanding convection as a process of mass movement of fluids and a mechanism for energy transportation. They observe interactions of liquids of different densities and gases of different densities.

6. **Water in the Air** (8 sessions)
   Students explore the forms that water takes in the atmosphere. They investigate how water gets into the air (evaporation) and how it condenses out of air (dew point and condensation).

7. **The Water Planet** (4 sessions)
   Students identify the elements of the water cycle and the distribution of water on Earth. Through a game and a multimedia simulation, they follow the path a water molecule might take as it travels between locations in the water cycle.

8. **Air Pressure and Wind** (7 sessions)
   Students investigate the relationship between differential air pressure and wind. They assemble and explore a pressure indicator and learn about barometers. Using knowledge developed in previous investigations, they build explanations for the phenomenon of wind. They build a wind meter to measure local wind and use pressure maps to make weather predictions.

9. **Weather and Climate** (4 sessions)
   Students study severe weather and consider it in relation to air masses and fronts. Climate is introduced and climate regions are discussed. Students revisit the water-cycle multimedia simulation with the global-warming variation, in which Earth’s average temperature has increased 2–5°C, and analyze the results.

The **Weather and Water Course** has the full complement of resources you have come to expect.

- Weather and Water Teacher Guide
- Kit of laboratory equipment and learning materials
- Weather and Water Lab Notebook
- Weather and Water Resources book
- Weather and Water Multimedia CD-ROM

Don’t get left out in the cold. For more information about the course content or availability, contact your local FOSS regional sales manager. (See the last page of this newsletter to find your regional manager.)

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**Coming Soon!**

**Populations and Ecosystems for Middle School.**
To order now for fall delivery, please contact your FOSS Regional Manager (see back page).
FOSS Institutes and Workshops

Delta Education will host one-day Informational Institutes this academic year in conjunction with the NSTA Area and National Conventions. There will be an elementary institute (grades K–6) and a middle-school institute (grades 6–8). These Institutes are designed for all educators—lead teachers, administrators, curriculum coordinators, university methods instructors, science committee members, and school board members—who are interested in finding out what FOSS is, who developed it, what philosophy of education it supports, and to begin networking with other FOSS users. A lot of time at these Institutes is spent with the program materials, doing activities and engaging in inquiry.

The Institutes are led by FOSS development staff. There is no charge, but participants must register in advance to attend. Times and locations are listed in the calendar. To secure your spot at the Institute of your choice, call, write, fax, or e-mail:

Pam Frisoni
Delta Education
80 Northwest Boulevard
Nashua, NH 03063
pfrisoni@delta-edu.com
Phone: 1.800.258.1302 ext. 503
Fax: 603.579.3504

Alev Burton
Lawrence Hall of Science
University of California
1 Centennial Drive
Berkeley, CA 94720-5200
aburton@uclink.berkeley.edu
Phone: 1.510.542.8941
Fax: 1.510.642.7387

NSSTA NATIONAL CONVENTION
March 27–30 Philadelphia, PA
Leaves Philadelphia Hotel
March 25–26 FOSS Advanced Institute:
Research into Practice (by invitation only)
March 26 FOSS K–6 Introductory Institute
FOSS Middle School Introductory Institute
Pennsylvania Convention Center
March 27 8:00–11:15 Weather and Water Course Overview
March 28 8:00–11:30 Using Science Notebooks with FOSS
8:00–9:15 FOSS Assessment for Grades 3–6
10:00–11:15 FOSS for Grades K–2:
Revised K Modules
12:00–1:15 Integrating Math with FOSS
2:00–3:15 Diversity of Life Course Introduction
4:00–5:15 Earth History Course Introduction
March 29 8:00–11:00 FOSS Materials Management
1:00–4:15 Electronics Course Overview

SUMMER WORKSHOPS (see p. 21 for more information)
June 19–21 Weather and Water
Lawrence Hall of Science, Berkeley, CA
July 13–15 Populations and Ecosystems
Lawrence Hall of Science, Berkeley, CA
July 19–26 Earth History
Albright Training Center, Grand Canyon, AZ
August 4–5 FOSS K–6 Institute, Seattle, WA
August 6–7 FOSS Middle School Institute, Seattle, WA
TBD 2nd Annual FOSS Materials Management Symposium
TBD FOSS K-2

FALL NSTA REGIONAL CONFERENCES
Oct. 30–Nov. 1 Minneapolis, MN
Nov. 13–15 Kansas City, MO
Dec. 4–6 Reno, NV

2004 NSTA NATIONAL CONVENTION
April 1–4 Atlanta, GA

Yes! I’m interested in attending a FOSS Elementary Introductory Institute.
Yes! I’m interested in attending a FOSS Middle School Introductory Institute.

Please send me registration information for the ___________________________ Institute.
(Date, location)

Name

School District

Title

Address

City State Zip Day Phone

I did not receive this newsletter in the mail. Please add my name to the FOSS mailing list.
About This Newsletter . . .
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 World Wide Web with FOSS. Send your contributions to:

Sue Jagoda, Editor
FOSS Newsletter
Lawrence Hall of Science
University of California
Berkeley, CA 94720-5200

The deadline for submissions to the next issue is June 23, 2003. We’re waiting to hear from you.

Delta FOSS Sales and Marketing Division
800.258.1302
603.889.8899
fax 603.579.3504

Tom Guetting
Vice President Sales & Marketing
tguetting@delta-edu.com

Pam Frisoni
Institute Coordinator
pfrisoni@delta-edu.com

Dana Koch
Director of Sales
dkoch@delta-edu.com

Karen Stevens
FOSS Product Manager
kstevens@delta-edu.com

FOSS Regional Sales Managers
All Regional Managers have toll-free voice mail at 800.338.5270

Bill Corbett
ID, KS, MT, ND, NE, SD, UT, WY
603.579.3541
bcorbett@delta-edu.com

Jane Degory
West NY, East OH, PA, VA, WV
412.257.1903
jdegory@delta-edu.com

Harold Edwards
DC, DE, MD, NJ, NY City
609.646.0478
bedwards@delta-edu.com

Knansie Beth Griffing
CT, MA, ME, NH, East NY, RI, VT
603.315.1220
kgriffing@delta-edu.com

Verne Isbell
AR, LA, OK, TX
817.379.2013
visbell@delta-edu.com

Comer Johnson
AK, CA, HI, OR, WA
530.672.1233
cjohnson@delta-edu.com

Steve Jones
AL, FL, GA, MS, NC, SC
904.810.4132
sjones@delta-edu.com

Adrienne Maughan
IN, KY, MI, West OH, TN
513.936.8074
amaughan@delta-edu.com

Tom Pence
IA, IL, MN, MO, WI
630.215.3017
tpence@delta-edu.com

Dean Taylor
AZ, So. CA, CO, NM, NV
928.527.8717
dtaylor@delta-edu.com

Watch www.fossweb.com for exciting new developments later this spring!