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Delta Education, Inc.

FULL • OPTION • SCIENCE • SYSTEM

FOSS™

NEWSLETTER

In this issue:

Fresno Shows Literacy Improvement Through Science

If you're interested in finding a professional development model that has used FOSS to make changes in literacy performance, Fresno, California, is the place to go. The Fresno Unified School District has made giant strides toward using science to bring context to language arts. How did this happen? The right group of people was brought together—a supportive administration, a crew of dedicated (and downright inspired and stubborn) teachers-on-special-assignment, and a group of master teachers.

The program in Fresno was initiated due to the creativity and collaboration of two district administrators, Sandra Carsten (Assistant Superintendent) and Jerry Valadez (K–12 Science Coordinator). Sandra's goal was to improve students' language arts skills. Jerry's goal was to bring more science to classrooms. The product of this joint vision was a summer school program using science as a vehicle to improve language acquisition and help students learn how to access expository text. Virginia Kammer, Mike Lebda, and Elizabeth Andrade-Stiffler were

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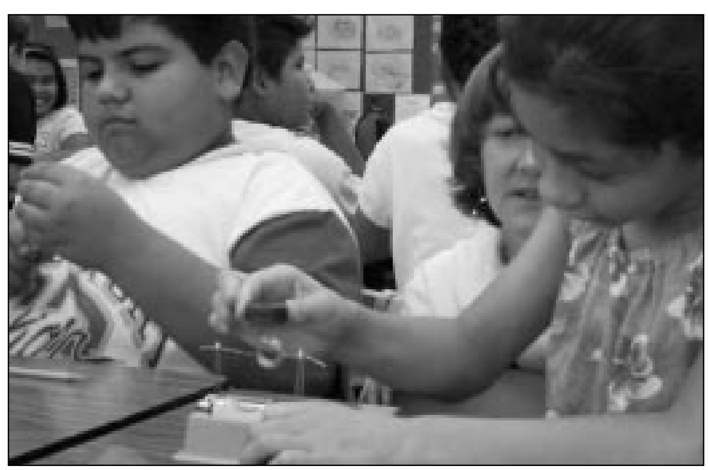

the teachers-on-special-assignment who helped shape the program.

Five staff developers were involved in the project during the first year. (Note: They were all regular elementary teachers.) Each staff developer worked with two classroom teachers who taught in the summer school.

The summer school teachers were well versed in strategies for teaching language, but not as well versed in science instruction. The staff developers started by teaching the science to the students and modeling best practices for science. As the five-week period progressed, the classroom teachers took greater and greater responsibility for teaching science, while the staff developers continued to support and nurture them.

Another aspect of the program that provided teacher support was the development of a resource room with expository literature resources. FOSS modules were analyzed and books were purchased to support each of the modules. The books could be checked out and used with the FOSS materials. Teachers and staff developers looked carefully at how to reinforce language arts skills in the context of science. They embedded shared reading, guided reading, and spelling as part of language arts development. They used the adopted narrative textbook during language periods and expository text during science periods. It is important to note that the expository reading was usually introduced after students had completed the related FOSS activities.

At the end of summer school, a comparison was made between three sites that were focusing on language arts skills. Two very interesting results emerged. Attendance at the science summer school was significantly higher than at the other two schools. There was a significant growth shown from the pre- to the post-language arts assessment for the students in the science-focused summer school. There was minimal or no growth at the two schools where only language arts were emphasized. After reviewing these data the district superintendent found these results so striking that the language arts and science summer school program was expanded the following year. The program became a demonstration summer school for both administrators and teachers.

Based on what happened in the first year, the program was modified somewhat for the second year. A master teacher in language arts and a master science teacher (an elementary teacher) were teamed in the same class. These teams worked with at-risk students as designated by the district. Science lead teachers and their administrators from all elementary sites came on a voluntary basis to the demonstration summer school for two weeks of intensive training in science instruction that supports literacy development. They also worked on leadership skills. The expectation was that they would develop their own classrooms as model sites in the fall. They would then work with other members of their site staffs interested in modifying their own teaching.

In year three, all elementary administrators were required to receive training in either science or math best practices in addition to language arts strategies. A group of administrators and a group of lead teachers attended the summer school program each week. Each group attended separate institutes. Lead teachers continued to work with the master teachers in the summer school classrooms. Administrators were guided in observation techniques to help them look for the components and outcomes that indicated success in both science and language arts.

The rest is history. Fresno continues to show gains in language arts scores from children who experience language arts in the context of science. If you would like more information about the program and how it has evolved, contact Jerry Valadez (jdvscience@aol.com), Virginia Kammer, or Mike Lebda at Fresno Unified School District for more information. Their address is *Fresno Unified School District, 3132 East Fairmont, Fresno, CA 93726, phone 559.248.7167.*

Some Comments about the FOSS Measurement Module

By Mary L. Phillips

The FOSS **Measurement Module** includes everything a teacher needs for a successful step-by-step unit on measurement. The teacher guide is clear, concise, and accurate. The markings on the beakers and cylinders are easy to read and understand. The storage drawers allow the teacher to use materials and then store them in a convenient place for future use.

The teacher preparation video is a valuable asset to the program. It helps me visualize how I would present the lessons to my class. This is great!

The worksheets help the children organize their work in a scientific format. This module is excellent for teaching metric units. The children also learn to measure with nonstandard units, a practical skill for some purposes. The program allows the children to explore, discover, and solve problems individually or in a group.

Looking for and collecting materials can be both costly and time-consuming. The FOSS program cuts out a lot of "legwork." Thank you, FOSS, for making my job easier.

Mary L. Phillips
Fourth-Grade Teacher
Smothers Elementary School
Washington, DC 20019

FOSS in the Middle

FOSS has "graduated" from elementary school and entered middle school! Planetary Science, Human Brain and Senses, Earth History, and Electronics are the first four 9- to 12-week courses which will be available for national distribution starting this summer for classroom implementation nationwide this fall.

The FOSS middle school program is designed to be a logical extension of the elementary program. The three-year curriculum includes three courses in Life Science, three in Physical Science and Technology, and three in Earth and Space Science. The courses continue the same central FOSS philosophy:

- ❍ using direct personal experience and inquiry as the starting point, and
- ❍ employing the productive pedagogies of collaboration and discourse to help students turn data and information into understanding.

The design of the middle school courses, however, is more sophisticated. The courses address inferential subjects, including ideas like planet formation, Moon phase, optics, nerve function, geologic time, interpretation of prehistoric environments, electrical resistance, and voltage drop. These are difficult ideas and concepts for students to master and require extensive experience and plenty of time to develop.

The FOSS middle school program is consistent with the spirit and intent of the National Science Education Standards concerning inquiry and depth of understanding. This approach to middle school science may, however, create a measure of tension in school systems that feel an obligation to cover a large number of topics each year. The FOSS approach promotes thorough understanding of carefully selected NSES topics. In addition to deeper content acquisition, FOSS courses provide students the opportunity to develop logical thinking and critical decision-making skills. FOSS students learn science by doing science that has relevance to their lives and that relates to issues in the adult world they are entering.

The complete FOSS middle school resource includes:

- ❍ Kits of student materials and classroom resources such as laboratory equipment, books, videos, charts, overhead transparencies, and maps, packaged for five classes of up to 32 students each.
- ❍ A thorough Teacher Guide in three-ring binder format, including science background, lesson plans, assessments, and resource lists.
- ❍ Student Lab Notebooks with student sheets and organizers for investigations.
- ❍ Resources Books with data charts and tables, readings, and homework suggestions.
- ❍ A multimedia CD-ROM for use as a whole-class demonstration tool as well as an individual or small-group interactive instructional tool.

Kits ready for implementation in the fall of the year 2000 include:

Human Brain and Senses. Students investigate how the brain and senses acquire, interpret, and respond to information. An emphasis on vision and touch leads to investigations concerning the structure and function of the sensory organs, receptors, and the brain itself. Imaging techniques (MRI and EEG) are used to reveal brain anatomy and activity. Students also explore learning, memory, and sensory dysfunction. Concepts: senses, brain, structure/function, perception, stimulus/response, receptor, neuron, neurotransmitter, learning.

Planetary Science. Students study the Earth as a celestial object before progressing to lunar science and lunar exploration and then the solar system. Activities explore the origin of the Moon, celestial motions, Moon phases, lunar geology, cratering processes, imaging technologies, scaling, and space exploration. Concepts: solar system, planet, satellite, crater, atmosphere, scale, orbit, revolution, rotation, day and night, interaction, change.

Earth History. Students investigate rocks and fossils to discover clues that reveal Earth's history. They explore sedimentary rocks and fossils from the Grand Canyon, consider the processes that created them, and compare evidence discovered in the rocks to present-day geologic processes and contemporary life forms. The students use these data to make inferences about organisms, environments, and events that occurred on Earth over its history. Concepts: weathering, erosion, deposition, sedimentation, lithifaction, index fossil, sedimentary, igneous, and metamorphic rock formation, rock cycle, lithosphere, landform, prehistoric environment, evidence.

Electronics. Students learn fundamental electrical circuitry and basic electronic principles. They make simple and complex circuits, quantify electric interactions and properties (current, voltage, resistance), and discover how different components affect circuits (resistors, diodes, LEDs, capacitors, transistors). They make and read schematics, and construct solid-state devices. Concepts: circuit, voltage, voltage drop, Ohm's law, component, meter, digital, energy potential, current, resistance.

For information about purchasing FOSS for Middle School, call Delta Education, toll free at 800.258.1302

For information about the development of FOSS for Middle School, contact:

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A Well-Planned FOSS Adoption in Kenosha

By Lynne Bleeker, FOSS Consultant

As a FOSS consultant, I have had the opportunity to work with the Kenosha Unified School District on its recent science adoption. Their adoption included primarily FOSS units. The district managed a very smooth transition to its new hands-on science curriculum with careful planning and anticipation of challenges by the district's administrators and lead teachers.

The Kenosha Unified School District is the third largest school district in the state of Wisconsin. There are approximately 10,000 students in its 24 elementary schools. Their approach to education shows the care and attention I've found to be typical of Wisconsin schools. A particularly wise move was the recruitment of five full-time science specialists (science resource teachers) to lead the pilot and adoption process and to be responsible for ongoing teacher training in science. The teachers were Jay Simonsen, Cori Mueller, Melody Orban, Barry Thomas, and Jodi Goocher. They team-taught with teachers throughout the piloting and adoption process, were available for trouble-shooting, planned inservice training, and led the science reform process in ways too numerous to mention. Most importantly, they KNOW the teachers, secretaries, custodians, and principals in the schools they are working with. This has built a good level of trust and terrific accountability.

Kenosha piloted kits from FOSS, STC, Lego Dacta, BSCS TRACS, and Insights. They adopted a curriculum composed primarily of FOSS kits. The science resource teachers advocated a gradual phase-in. Physical Science, Earth Science, and Scientific Reasoning and Technology strand kits were implemented during the 1999–2000 school year. The Life Science strand kits were saved for the 2000–2001 school year. Their idea was to let the teachers get used to hands-on, kit-based instruction before adding in the additional challenges of acquiring, and maintaining living materials. Teachers have appreciated not having the whole new curriculum introduced in one year.

FOSS was designed to be flexible so that local and regional needs could be considered in the implementation. The Kenosha science resource teachers took advantage of this feature and arranged with Delta Education for custom packaging of their FOSS kits. The science resource teachers also decided to supply kits with extra and optional materials to save teachers the time and trouble of acquiring the materials themselves. Because they had piloted nearly all of the kits, the science resource teachers knew EXACTLY what was needed!

The science resource teachers offered multiple types of in service training to prepare teachers to use the new kits with their students. They planned an optional June training day for teachers who wanted to get a jump on planning. The training was well attended. Jay Simonsen organized a weeklong Chiwaukee Academy in math and science during which the hands-on materials were used. The teachers lobbied for and got four early-dismissal days to be dedicated to science inservice. On these days, kit-specific training was offered for kits that teachers were just about to receive in their buildings. Teachers who had attended summer training were offered a chance to attend other sessions on literature and technology integration with science. Some were also recruited as trainers for the half-days!

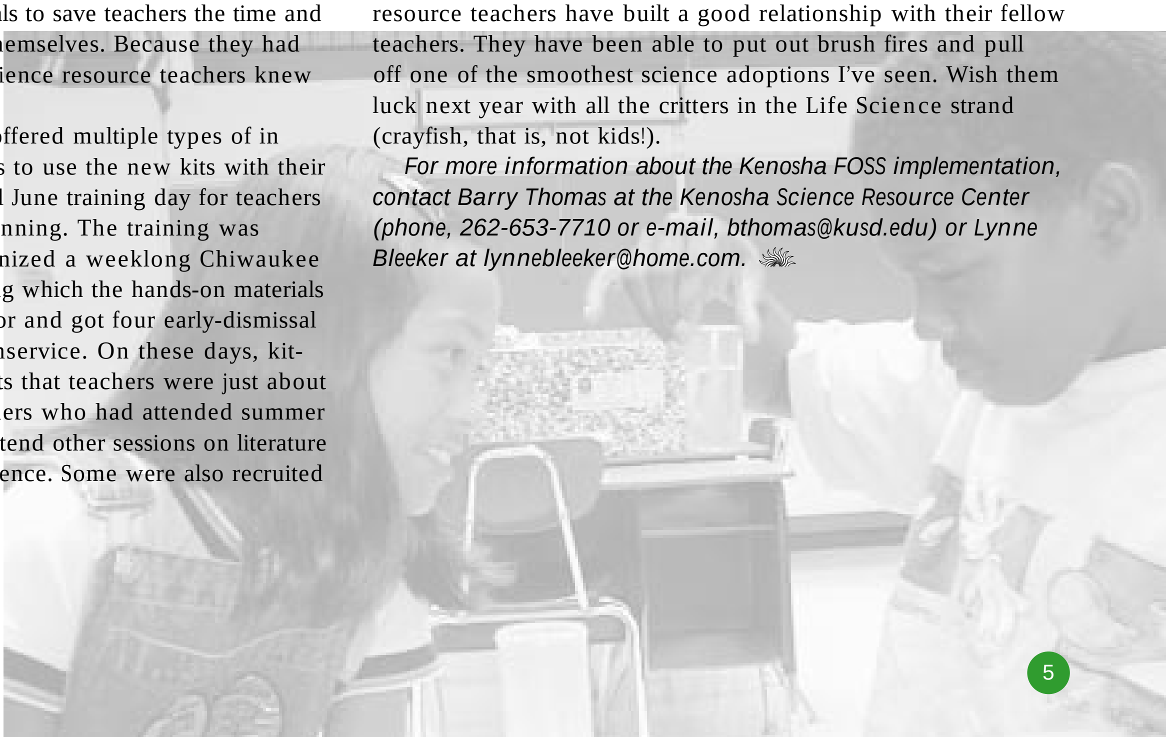
Barry Thomas agreed to run the materials warehouse and be responsible for inventory, replenishment, and shipping. Two educational assistants and the other science resource teachers help him out. (The educational assistants also work with the math program.) To prepare for the job, Barry talked with other large districts to find out how they managed the inventory process. Kenosha decided to purchase replenishment kits as part of their initial order to save time once the school year was underway. They figured it would be easier to restock all of the consumables at one time rather than count and measure everything.

To date the science resource teachers and two assistants have managed a phenomenal two-day turn-around on kits between schools. (I've never been anywhere else that has managed a similar feat on such a large scale.) One of Barry's great ideas is to have teachers place damaged items in a large, labeled zip bag. The warehouse staff then knows to check these items to determine if they are repairable or need replacement. Another Kenosha innovation is a system to get the kit automatically back to the warehouse for replenishment. The warehouse address is permanently affixed to the outside of the kit with a clear plastic envelope taped over it. When the kit is ready to go out, they insert a card with the name of the teacher and school where the kit is heading. When the teacher is ready to send the kit back, he or she removes the card and the kit is sent back to the warehouse for replenishment.

Kenosha has also shown a commitment to the science/literature connection by providing appropriate books to go with the science kits. Melody Orban led this process, assisted by science resource teachers, reading specialists, and others. The books are packed in plastic tubs that travel to classrooms one week after the kits. There is not room in the warehouse for all of the books and the kits at the same time. Melody has also organized optional after-school workshops on the literature connection to science. Since Kenosha adopted FOSS 2000©, they have also incorporated FOSS Science Stories into their program.

Whenever we make major changes in education, there are bound to be challenges and surprises. The Kenosha science resource teachers have built a good relationship with their fellow teachers. They have been able to put out brush fires and pull off one of the smoothest science adoptions I've seen. Wish them luck next year with all the critters in the Life Science strand (crayfish, that is, not kids!).

For more information about the Kenosha FOSS implementation, contact Barry Thomas at the Kenosha Science Resource Center (phone, 262-653-7710 or e-mail, bthomas@kusd.edu) or Lynne Bleeker at lynnebleeker@home.com.



So...Where's the Content? Let Assessment Be Your Guide!

By Kathy Long, PhD

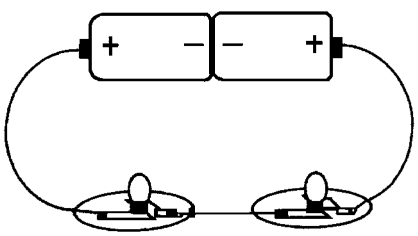
"Let assessment be my guide? I don't think so!" you may be saying to yourself. But what you're probably imagining are those standardized tests we subject our students to on a yearly basis. When we talk about assessment in the FOSS 2000© edition for grades three through six, we're talking about something completely different. We're talking about an assessment system that gives you diagnostic information throughout the module. The new assessment system provides a window for you to see more deeply into each student's thinking as well as for you to reflect on your own teaching.

The new FOSS assessments have been reorganized into "assessment" or "progress variables." Specifically, we are looking for students' achievement in three areas: content knowledge, conducting investigations, and building explanations.

- Content knowledge is the facts and concepts of science that students learn throughout the module.
- Conducting investigations is the ability to successfully engage in science inquiry.
- Building explanations refers to the relationships students are building among the content and inquiry they are experiencing. In other words, we want to know what sense students are making of activities and discussions that changes their ideas about how the world works from naive intuitions to scientific understandings.

For example in the Magnetism and Electricity Module, students learn the *content knowledge* that when an electric current is supplied to an insulated wire wrapped around an iron core, a magnet is produced. This magnet can be turned on and off. Guided by the teacher, students *conduct investigations* to discover ways to develop their skills by setting up their own tests to find ways to change the strength of the electromagnetism. Students then *build explanations* about why the strength of the electromagnet changed, given the materials they used, previous content knowledge, and the results of their own inquiry.

We have made an important distinction between formative and summative assessment. Formative assessment is used for diagnostic purposes. You don't wait until the end of a unit to find out if students have developed the concepts you intended. The end of the unit is too late. Formative assessment focuses on learning throughout the module so you can make changes along the way. It also gives you a chance to reflect on your teaching practices. Experience has shown that sometimes we think we have taught something well when in fact it's been clear to us, but not to students.



When I was working on the revision of the FOSS Grades 3–6 program, I taught simple circuits. The students often created short circuits. I pointed out as often as I could that they had constructed a "short" circuit. Later, many students defined a circuit in which two batteries were positioned negative terminal to negative terminal as a short circuit. In this case, there was no flow of electricity, but it was not a short circuit. What I realized was that I had been pointing out short circuits along the way, but had never really defined what it was. The students on their own had defined it as a circuit that just doesn't work. The definition they needed was that a short circuit is an unintentional circuit that lets current flow past and around the intended circuit. There actually is electricity flowing through the circuit, just *not* the way the builder had intended. When I recognized this gap, I was able to go back to the students and embed more information into the activities and discussion.

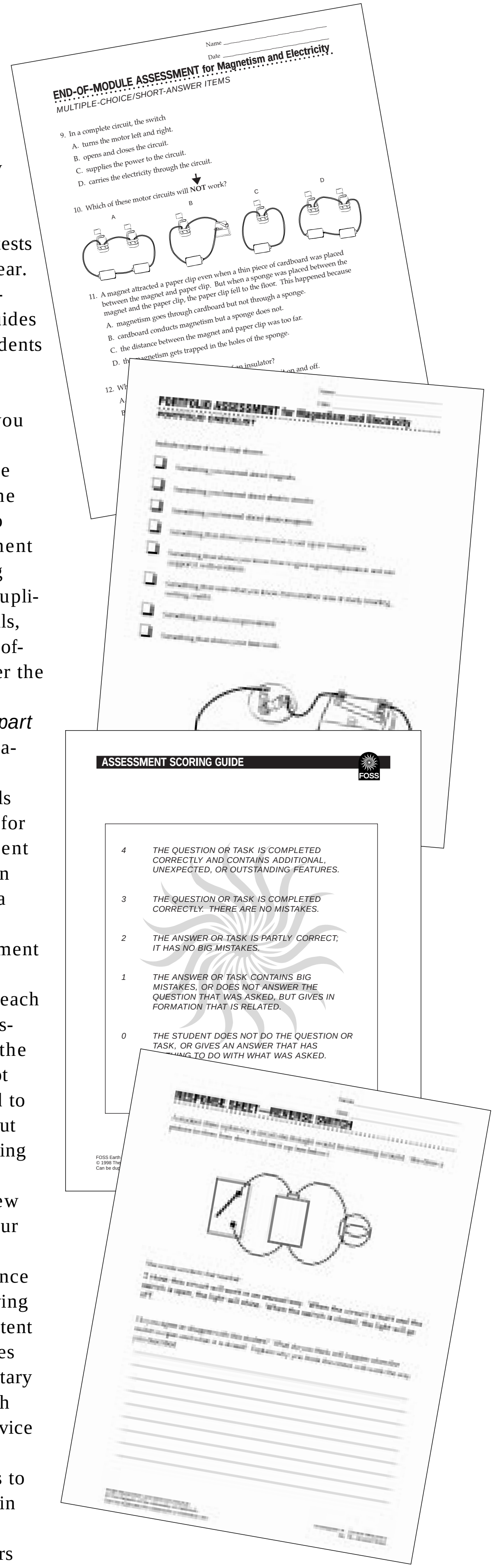
Summative assessment has a different purpose, one that is more evaluative. In this case we're going to make a *judgment* about whether the students have mastered the objectives or not. FOSS now includes an end-of-module test that includes performance items, multiple-choice/short answer, and narrative items. Portfolio assessment is also suggested to help students reflect on their learning and to provide information that can be shared with parents. This is not to say that summative assessments do not have formative implications as well. Teachers can use the end-of-module tests to help them plan for the following year. Both formative and summative assessments are accompanied by scoring guides and suggestions for things to do if students are still struggling with a particular concept or skill.

Down to practicalities. Where do you find assessment in the teacher guide? You'll find general information in the Assessment folio, located just after the student duplication masters. The folio provides an overview of the assessment system and includes all of the scoring guides for the assessments as well. Duplication masters for assessment materials, such as recording charts and the end-of-module exam, are in a section just after the Assessment folio.

A summary of assessment for *each part* of an investigation is found in the At-a-Glance Chart (page two and three of each investigation folio). The Materials section lists the materials you'll need for assessment. Any hard-to-get assessment items are included in the kit. Step 2 in each Getting Ready section suggests a strategy for assessment in that part.

And you will find assessment steps in the Guiding the Investigation section for each part. Watch for the assessment icon to show you the way. As you can see, there's been a lot of information about assessment added to the teacher materials. You can't help but think about assessment as you're teaching each module!

We hope that you will find the new assessment system a useful tool in your teaching. You often hear people say about hands-on or activity-based science programs, "Well, the students are having fun, but where's the content?" The content has always been there—just sometimes hard to identify especially for elementary teachers who haven't received enough training in science during their preservice preparation. We think the assessment component, along with a few changes to the presentation of the investigations in the teacher guide, will help point out where the content is and help teachers better focus their students to develop a deeper understanding of science.



Assessment Forum and FAQs

A few teachers working with Gail Gerdemann in Corvallis, Oregon, and Judy Ball in Elgin, Illinois, have been trying out the new FOSS assessments and helping the FOSS development team look at issues of implementation and practical use in the classroom. As more people begin to use the FOSS 2000©, we are sure more implementation issues will arise. We hope that the FOSS newsletter will provide a forum for discussion about this important component of the program.

Concern: It takes a lot of time to incorporate the new assessments!

Implementation Tip: That's true, especially for the first few modules you try when you are learning to use the assessment system. As you become familiar with the different strategies, you will find it takes less time. The assessment becomes an integral part of your teaching.

The first step in implementing FOSS is to become familiar with the content and management of a module. The first year teaching FOSS, you may want to try a few of the assessments, but not fully implement the system until the following year. In the Getting Ready section of each part in the investigation, Step 2 suggests how you might assess what is going on. Feedback we received from teachers during the revision process convinced us to include assessment for every part. It is probably best to think about all of the assessment strategies given in the teacher guide as models or possibilities. You should try as many of them as you can, then decide which give you the most information about your students. Then the next time you teach the module you can customize the assessment to meet your needs. Our purpose was not to overwhelm teachers, but to give them choices and opportunities to find out more about their students' thinking.

Concern: There is no way I can write informal notes about all the students in my class. I'm too busy helping them with the activities.

Implementation Tip: There seems to be a common misconception that when FOSS suggests *informal notes* as an assessment strategy that the teacher must write something for *every* student in the class during a particular activity. That certainly would be a daunting task, especially since informal notes appears many times throughout any module! In fact, informal notes are suggested when new concepts are just being introduced or a new investigation skill is first being learned. You probably won't want to do a whole lot of in-depth assessing at that point. We did want to provide the opportunity, however, for you to make notes about the *few* students who you may notice are struggling with a particular skill or concept, so you can remember to check specifically on the progress of that student in later parts. Or you may want to write a note about a student who has shown some particular insight that you found remarkable. In any case, you should *not* feel obligated to write something for each student.

Concern: My students didn't do very well on the response sheet. Does that mean they aren't learning anything?

Implementation Tip: The response sheets are meant to get into the very heart of students' thinking and show how they are building the relationships between the activities, class discussion, and what they already know (or at least think they know). We think this is a very important window into the process of students' conceptual development. No child's mind works like a duplication machine—somehow copying the information you give them, then spitting it back as proper scientific understanding. Research has shown time and again that children have very strong intuitive ideas about how the world works. (See *Making Sense of Secondary Science: Research into Children's Ideas* by Rosalind Driver, *et al** for an informative look at children's ideas about many science topics.) It also shows that it is often difficult to change children's intuitive ideas to more scientific understandings. But if you at least have a hint as to what those intuitive ideas are and how students have arrived at them, you have a place to start.

Response sheets often, but not always, portray a student who expresses a misconception. Our intent is to get at students' concept development. Interestingly, we have also found that most students are not very good at reading something from a critical point of view. They expect materials a teacher gives them to be correct. My own experience and that of Corvallis and Elgin teachers is that it can take a long time for children to become critical about the materials they are given.

For years, I taught the Magnetism and Electricity Module thinking students "got it" until I started using response sheets. Then I found out all the things I thought they knew but really didn't. At first I was disappointed and thought that I had taught many "perfect" lessons which students were apparently not "getting!" But as I began to really focus on my new insights as far as children's concept development, their achievement began to soar. I was better able to see where they were stumbling, and I was able to look back at the things we had discussed in class and see where they were getting some of the misconceptions. (See the article on page six for an example about short circuits.)

So if you're feeling like the students aren't doing well on the response sheets, remember two things.

❍ First, it takes some time for them to develop the skills of being critical readers and to respond from the evidence they have been gathering in the activities.

❍ Second, response sheets are purposely given during the development of concepts. You should not expect mastery at that point. However you should gain insight into how children's ideas are progressing and can focus more succinctly on the areas that need the most work in subsequent activities.

If you have questions or comments about the new FOSS assessment system or assessment in general, we invite you to be a part of this ongoing forum. Assessment is an intricate business and will require discussion among the FOSS community of practioners to make it a useful and valuable tool. Please e-mail Kathy Long at klong@uclink4.berkeley.edu if you would like to contribute to this discussion.

** Driver, R., Squires, A., Rushworth, P., and Woods Robinson, V. (1994). Making Sense of Secondary Science: Research into Children's Ideas. Londong/New York: Routledge.*

The First FOSS Colony

By Mary Lou Klinkhammer (retired), Mary Ott,
and Kathy Hagen, teachers, Roseville Area Schools, Minnesota

When you hear the word pioneer, you might think of wagon trains and the westward movement. When we hear the word pioneer, we think of the FOSS pioneers who settled the Roseville Area Schools. This school district consists of seven elementary schools, one middle school and one high school located in a suburban area north of St. Paul. Way back in early 1991, when only drafts were available of some modules, Roseville Area Schools became the first school district in the nation to fully adopt the FOSS program.

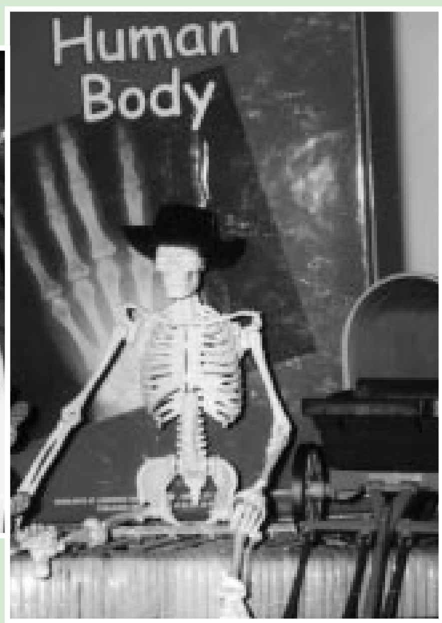
Leading the way through uncharted territory were grade level teacher trainers guided by FOSS facilitators from the Lawrence Hall of Science. These trainers blazed trail and offered FOSS survival training to their fellow elementary teachers who joined the movement. Every teacher in the district received training for each of his or her modules. Early in the movement, school board members and district administrators were corralled at an open house, and they wholeheartedly offered their support to the program.

To insure success with FOSS, extra supplies and equipment were purchased and organized for the journey. A trading post, better known as a science materials center, was set up to keep the pioneers well supplied. Although the road to implementation was rocky at times, the pioneers never whined or complained to their leaders, not even to the curriculum coordinator.

After a few years the pioneers settled comfortably into using the FOSS program and many new settlers arrived in the area. Roseville Area Schools trainers assisted in the planning and implementation of the first FOSS User Convention. Nearly 150 early settlers came together to share experiences and learn from each other. This led to the formation of a support group for trading post paraprofessionals, who help solve problems related to the organization and delivery of the supplies needed for a hands-on science program. Some trainers have also provided workshops for others who have adopted FOSS.

What are the pioneers doing today? FOSS is still being taught in kindergarten through sixth-grade classrooms in Roseville Area Schools. With experience and support, teachers have been able to raise their science teaching skills to a higher level. Due to the design of the lessons, students are enthusiastic about science! Since they experience this comprehensive science program for seven years, students acquire a wealth of science knowledge and skills. Most recently the pioneers journeyed into new territory by aligning FOSS with the Minnesota Graduation Standards. Assessments related to the FOSS modules are documented in a science portfolio for each elementary student.

Looking off to the horizon, the pioneers see new opportunities to enrich and improve their science instruction, thanks to the continuing support and leadership of the FOSS developers and staff.



A Snapshot of FOSS Implementation

This article plus supporting materials can be found by visiting the FOSS website at *http://www.fossweb.com/.*

The Full Option Science System (FOSS), developed at the Lawrence Hall of Science, has been adopted by hundreds of school districts across the United States. FOSS districts range in size from a single, K–6 elementary school to huge, urban-centered districts serving thousands of students. Even so, the differences among FOSS users are greatly overshadowed by the characteristics common to the successful district implementations. Feedback received from a group of “case study” sites indicates that there are four dimensions of the implementation process that were deemed critical: staff development, materials management, administrative support, and communication.

Staff Development

Implementation of the FOSS program, a research-based, materials-oriented curriculum, requires a thoughtful staff development plan. The involvement of the classroom teachers in the early stages of program selection and implementation planning is a strategy utilized by all of the case study schools/districts.

Often a group of elementary teachers (the science leadership team representing all schools and all grades) is selected to receive initial training once the FOSS curriculum has been selected for a pilot. Following a successful pilot testing phase conducted by these teachers (usually six months to a year in duration), they become the core group of teachers (site science facilitators) responsible for implementing the FOSS adoption at their own schools.

The implementation process, ranging from one to three school calendar years, utilizes district staff development funds (Eisenhower funds and others) to conduct module orientation sessions for teachers. Typically, these half-day sessions are set up to focus on one strand (e.g., Physical Science) per semester. Teachers from one grade level are prepared to use the module they will be teaching in their classrooms. That way, teachers are given an opportunity to work with the materials with their peers prior to classroom use with their students.

Most of the case study districts implemented the Physical Science and Earth Science strands during the first year, followed by the Life Science strand the second or third year of implementation. This phase-in strategy allows teachers to develop a comfort level with one module at a time. The teachers are not overwhelmed by the perception of too much to learn all at once. This insures a higher level of usage of the materials on the part of neophyte teachers.

Materials Management

Materials management is a key element that often makes or breaks a district’s success at implementing a hands-on, materials-based program. The case study districts all use some type of materials management system that is well-designed, planned as part of the comprehensive adoption strategy, teacher-friendly, and operated by an individual or team (depending on the size of the system) whose sole responsibility is to stock, distribute, and replenish the FOSS kits. Computer inventory and routing systems are often used.

The most successful materials management systems rotate the kits, usually every eight to nine weeks, allowing one week of turnaround time prior to shipping the kits out to the next scheduled site. Kits are often transported to and from a central kit refurbishment center. During that time, the materials manager inventories the incoming kit, restocks it with any needed consumables, replaces any worn or broken non-consumables, then tags it for the next shipping location.

There are some districts that maintain their own “crops” of live organisms for the FOSS Life Science modules, while others rely on the teachers to use the Live Organism Coupons to order the critters as needed or purchase them locally. Some districts set up accounts at local pet shops that provide the needed organisms. Some districts use the refill packages (available from Delta) to make the replenishment job hassle-free, especially for small districts and for districts just starting the process of implementation. The majority of the case study districts purchase consumables in bulk from Delta and from local suppliers to replenish their kits.

Administrative Support

The case study districts enjoy harmonious working relationships at all levels based on trust and support. District administrators engage teachers in the curriculum decision-making process and respect their findings. The districts provide staff and money to coordinate planning, staff development, and materials support. Site administrators enter the process at the early stages, setting a tone of expectation that there will be a successful implementation. They display an enthusiastic attitude for the implementation. Site administrators support the staff development plan and encourage teachers to be courageous and creative. Districts that clearly communicate the implementation plan in writing, including the goals, district and teacher responsibilities, schedule, and materials management, have good success following through with their plan.

Communication

Communication about the FOSS program continues to be an important aspect of successful implementations. Many of the case study districts have developed partnerships with local business (Hewlett-Packard, Dow, Merck) to help subsidize the costs of maintaining a high-quality science program like FOSS and to provide in-kind services and expertise. Money from these businesses support additional teacher training programs, costs of materials management, technology hardware, etc. These partnerships with local business have enhanced the FOSS science programs of these districts. Some additional communication strategies utilized by the case study sites include:

- School newsletters to parents highlighting FOSS
- Monthly science calendars for families listing home and community activities to enrich the modules (museum exhibits, outings, library resources)
- Establishing Home Pages on the Internet that detail the FOSS curriculum

Continued on page 12

New from the Wordsmiths

We're focusing on books to complement the FOSS Magnetism and Electricity Module in this issue of the FOSS newsletter. The books annotated here are some of the discoveries made during the revision of the Magnetism and Electricity Module for FOSS 2000©. For a more complete listing, check the Resource lists in the FOSS 2000© teacher guides or the FOSS website at *http://www.fossweb.com.*

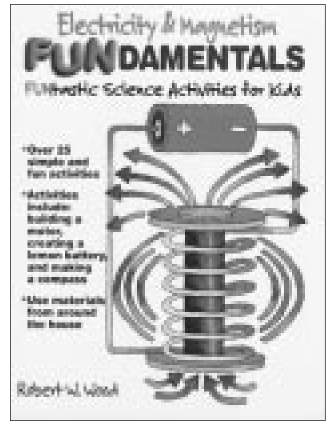
STUDENT READING
Nonfiction

Batteries, Bulbs, and Wires
By David Glover. Kingfisher Books, New York, 1993. ISBN 1856979334. Grades 3–6.

Uses activities and projects to introduce how electricity and magnets work at home and in the everyday world.

Benjamin Franklin's Adventures with Electricity
By Beverly Birch and Robin Bell Corfield. Barron's Educational Series, Inc. New York, 1996. ISBN 0812066227. Grades 3–6.

The story of how Ben Franklin found a way to protect people from the dangers of lightning and opened the way for later generations to harness electrical energy.



Electricity & Magnetism Fundamentals
By Robert W. Wood. Learning Triangle Press, McGraw-Hill, 1997. Illustrated by Bill Wright. ISBN 0791048411. Grades 4–6.

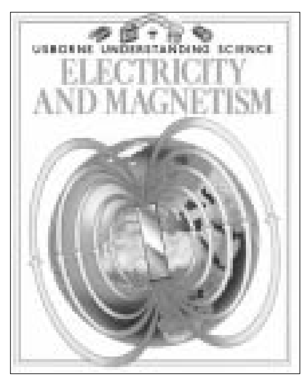
Provides instructions for a variety of experiments to demonstrate the nature of electricity and magnetism and the relationship between them.

Playing With Magnets
By Gary Gibson. Copper Beech Books, Brookfield, CT, 1995. Illustrated by Tony Kenyon. ISBN 1562946153. Grades 3–6.

Contains a selection of exciting hands-on projects to help explain some of the fascinating properties of magnets.

The Usborne Book of Batteries and Magnets
By Paula Borton and Vicky Cave. Usborne Publishing Ltd., London, England, 1994. ISBN 0881107573. Grades 3–6.

Shows many amazing things that can be made with batteries and magnets.



Electricity and Magnetism
By Peter Adamczyk and Paul-Francis Law. Usborne Publishing Ltd., London, England, 1993. ISBN 0746009941. Grades 4–6.

Explains the properties of magnets and examines what electricity really is. Discusses historical breakthroughs as well as developments that will affect our lives in the 21st century.

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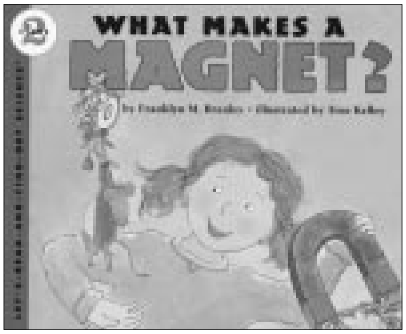
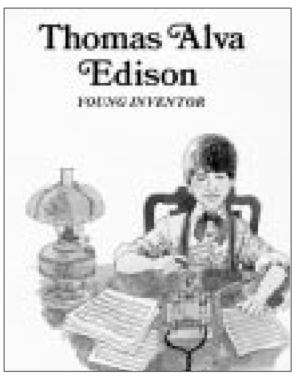


What Makes a Magnet?
By Franklyn M. Branley. HarperCollins, New York, 1996. Illustrated by True Kelly. ISBN 0060264411. Grades 3–4.

Describes activities that show what a magnet can pick up, including instructions about how to make a magnet and how a magnet works.



Thomas Alva Edison Young Inventor
By Claire Nemes. Troll Associates, Mahwah, NJ, 1996. Illustrated by John Himmelman. ISBN 0816737762. Grades 2–4.

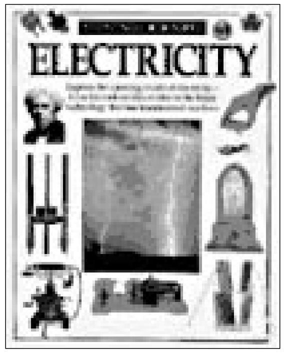
A short biography of the famous inventor who created more than 1,000 inventions and became known as “The Wizard of Menlo Park.”

Fiction

Marta’s Magnets
By Wendy Pfeffer. Silver Press, Parsippany, NJ, 1995. Grades 3–6. Illustrated by Gail Piazza. ISBN 0382249305. Grades K–3.

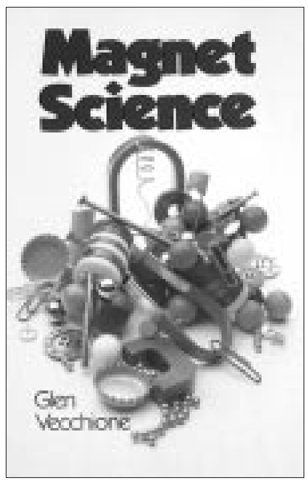
Marta’s magnets help her make friends in her new home and help her retrieve a lost key for her sister’s new friend.

TEACHER RESOURCES



Electricity (Eyewitness Science)
By Steve Parker. Dorling Kindersley, New York, 1992. ISBN 1879431823.

Discusses the properties of electricity and describes how it is made and used.



Magnet Science
By Glen Vecchione. Sterling Publishing Co., Inc., New York, 1995. ISBN 0806908882.

Relates the discovery of magnetism, discusses the principles behind it, and suggests experiments that offer an explanation of how it works.

- Highlighting FOSS in the schools using videotaped spots for local cable broadcasting
- Coordinating Family Science Nights to introduce parents to the FOSS curriculum used in the schools
- Providing opportunities for parents and volunteers from the community to participate in the classroom science activities and serve as resources to students and teachers

Watch for case studies of implementation plans in future FOSS newsletters.

Don’t miss the wonder of

June

the FOSS Middle School

26-30

Earth History Workshop

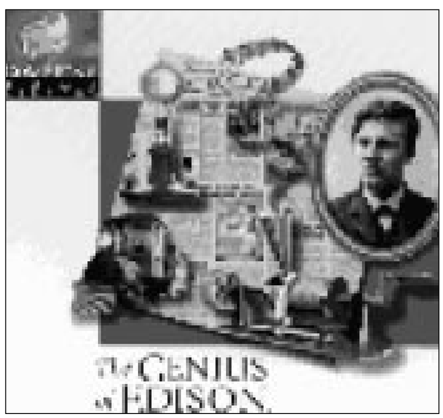
2000

at the Grand Canyon!!!!!!

For more information about the Earth History Workshop, please contact Sue Jagoda at 510.642.8941 or via e-mail at skjagoda@uclink4.berkeley.edu

Software and Video Reviews

SOFTWARE



The Genius of Edison
Compton's NewMedia, Inc. (800-227-5609). For Windows and Macintosh. Grades 4–8.

Through 3D animation, historic film footage, narrated passages, rare original photographs, period music, hyperlinks, and more, students relive the life and times of one of the world's most important inventors. Thirteen of Edison's greatest inventions are highlighted and students see their impact on the world today.

Zap!
Edmark (800-691-2988). For Windows and Macintosh. Grades 3–6.

Students are guest directors for a concert by the Zap! Stars—Blaze, Riff, and Surge. Students join the Stars backstage at the Wonder Dome, an amazing world of science fun and discovery. With the Stars leading the way, students conduct scientific experiments and solve science challenges. This program focuses on science concepts having to do with light, sound, and electricity.

VIDEOS

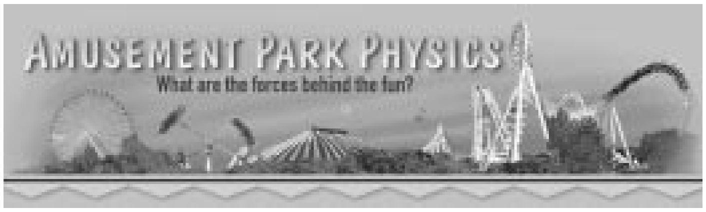
Benjamin Franklin: Scientist and Inventor

Thomas Edison and the Electric Light
By Nest Entertainment, Inc.® (800-452-4485) Animated Hero Classics, 1993.

Both of these 30-minute animated videos present the inventor in the context of the historical period and introduce inventions.

Online Connections for FOSS Modules

The following websites have caught the FOSS staff's attention since the last newsletter. A more comprehensive list of websites organized by FOSS module is located at FOSSweb (*http://www.fossweb.com*).



Amusement Park Physics
http://www.learner.org/exhibits/parkphysics/
How do physics laws affect amusement park ride design? At this website, you'll find out by designing your own roller coaster and experimenting with bumper car collisions. (Variables Module)

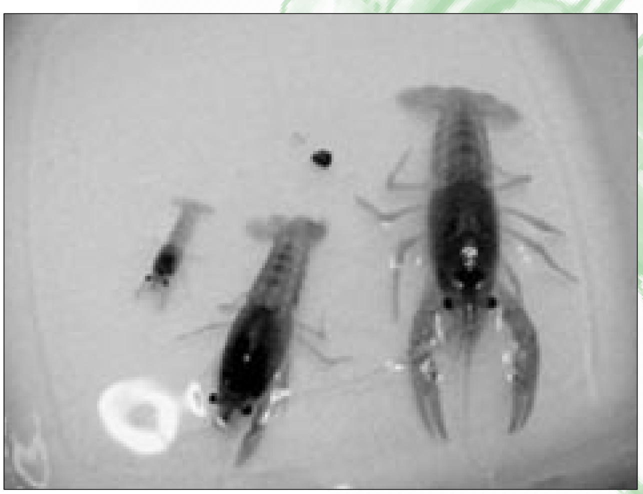
The Butterfly Website
http://www.butterflywebsite.com/
Learn about the fascinating world of butterflies. You can tour our photo gallery, learn how to plant a butterfly garden, take a field trip, find a penpal, chat with other butterfly-lovers, and much more! (Life Science strand)

How Stuff Works
http://www.howstuffworks.com/
How Stuff Works is a great place to learn about the way all kinds of things function in the world. Learn about everything from guitars, to cruise missiles, to the cells in your own body! (General)

PlayMusic.Org
http://www.playmusic.org/
The American Symphony Orchestra League presents this site that includes Shockwave games that explore different sections in the orchestra. You can also listen to several musical selections that feature different musical instruments. (Physics of Sound Module)

Simple Machines
http://www.fi.edu/qa97/spotlight3/spotlight3.html
The Franklin Institute in Philadelphia maintains this simple machines page that includes images and text describing the various simple machines, plus links to other related sites. (Levers and Pulleys Module)

Timeline of Technologies
http://www.lucent.com/minds/discoveries/
Timeline of technologies pioneered at AT&Ts Bell Laboratories, beginning with the telephone in 1876 and continuing through 1993. Covers such innovations as electronic recording, sound motion pictures, transatlantic telephone services, stereo recording, transistor, the solar cell, cellular phones, and many others. (Physical Science strand)



FOSS Penpal Update

There are some new folks on the FOSS penpal list that we'd like you to know about.

Judy Fryberg (fryberg@povn.com) teaches at Priest River Elementary School in Priest River, Idaho. She has been studying and raising crayfish with her classes in the Structures of Life Module for the past three years and would like to share crayfish experiences. You can also reach Judy via "snail (crayfish?) mail" at P.O. Box 489, Priest River, ID 83856, (phone) 208.448.1181.

Maurieva Lykken (mlykken@bmtc.net) is a 5th–6th grade science teacher using FOSS at Beresford Elementary School in South Dakota.

If you are interested in finding FOSS penpals for your students, check out the FOSS web pages, either at *http://www.fossweb.com* or *http://www.lhs.berkeley.edu/FOSS/FOSS.PenPals.html.* Or contact Sue Jagoda (skjagoda@uclink4.berkeley.edu).

FOSS Institutes

Delta Education will host 2-day Informational Institutes next academic year in conjunction with the NSTA Area and National Conventions. 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.

During the summer Delta hosts Implementation/Leadership Institutes. These meetings are designed for educators who have adopted FOSS and are into their implementation process. Some time will be spent working with the FOSS materials, but a greater proportion of time will be spent delving into issues of management, teacher preparation, materials maintenance, and a host of other subjects.

Most 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:

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Delta Education, Inc.
80 Northwest Boulevard
Nashua, NH 03063
pfrisoni@delta-edu.com

Phone: 1.800.258.1302 ext. 503
Fax: 603.579.3504

FOSS NSTA Pre-Convention Informational Institutes

NSTA BOISE REGIONAL CONVENTION
October 3–4, 2000
Tues.–Wed.
Boise, ID

NSTA MILWAUKEE REGIONAL CONVENTION
October 17–18, 2000
Tues.–Wed.
Milwaukee, WI

NSTA BALTIMORE REGIONAL CONVENTION
November 14–15, 2000
Tues.–Wed.
Baltimore, MD

NSTA PHOENIX REGIONAL CONVENTION
December 5–6, 2000
Tues.–Wed.
Phoenix, AZ

NSTA ST. LOUIS NATIONAL CONVENTION
March 20–21, 2001
Tues.–Wed.
St. Louis, MO

FOSS K–8 LEADERSHIP WORKSHOP
June 22–23, 2000
Thur.–Fri.
Lawrence Hall of Science
Berkeley, CA

GRAND CANYON EARTH HISTORY WORKSHOP
June 26–30, 2000
Mon.–Fri.
Grand Canyon National Park, AZ

❑ **Yes! I'm interested in attending a FOSS Informational Institute being held in conjunction with the ________________ NSTA Convention.**
(Location)

❑ **Yes! I'm interested in attending a FOSS Implementation/Leadership Institute being held during the summer.**

Please send me registration information.

Name

School District

Title

Address

City State Zip Daytime Phone Fax

❑ I did **not** receive this FOSS newsletter in the mail. Please add my name to the 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:

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

The deadline for submissions to the next issue is June 12, 2000. We're waiting to hear from you.

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