The latest and most comprehensive edition of FOSS has just been released—FOSS Next Generation for grades K–5. The FOSS Project staff and Delta Education are eager to partner with new and experienced users of FOSS to plan a smooth transition to the new curriculum.

When the Full Option Science System (FOSS) began in the early 1990s, the founders envisioned an elementary science curriculum that was enjoyable, logical, and intuitive for teachers, and stimulating, provocative, and informative for students. But the developers never envisioned FOSS as a static curriculum, and now the Full Option Science System has evolved into a fully realized 21st-century science program with authentic connection to the Next Generation Science Standards (NGSS).

FOSS Next Generation is a comprehensive school science program, featuring instructional guidance, student equipment, integrated student reading materials, and digital resources, and a fully integrated assessment system. FOSS has always utilized an inquiry approach to teaching and learning, but the Framework for K–12 Science Education, on which the NGSS are based, has provided a new way for the FOSS developers to design learning experiences and frame focus questions for learners. Guided by the Framework, FOSS has sacrificed some flexibility in order to provide a school science curriculum with a cohesive approach at each grade level and articulated learning progressions within and between grade levels. The FOSS instructional design now strives to:

a. communicate the disciplinary core ideas (content) of science, while

b. facilitating student engagement in science and engineering practices (inquiry methods) to develop knowledge of the disciplinary core ideas, and

c. help students apprehend the crosscutting concepts (overarching concepts) that connect the learning experiences within a discipline and bridge meaningfully across disciplines as students gain more and more knowledge of the natural world.

In FOSS First Edition K–6, we developed the multisensory approach to active learning of science and in the Second Edition, we refined and enriched that approach by integrating quality reading materials. FOSS Third Edition K–6 fully integrated the use of science notebooks, outdoor applications, and formative assessment with strong conceptual frameworks through the science strands; and in the new FOSS Next Generation K–5, we built upon the previous editions, strengthening and making more explicit the connections to the three dimensions of science AND engineering (core ideas, practices, crosscutting concepts) and to the

Continued on page 2
Next Generation continued

Common Core State Standards (CCSS) for English Language Arts at each grade level. FOSS Next Generation engaged the gears between the different pedagogies so they are seamlessly integrated to optimize the science experiences for all students and their teachers. With active investigation at its core, the use of 1) formative assessment, 2) notebooks, 3) science-centered language development, 4) informational text, 5) technology, and 6) outdoor experiences makes FOSS the most effective teaching and learning tool available to prepare students to meet the performance expectations of the NGSS.

The NGSS describe the knowledge and skills we expect our students to be able to demonstrate after completing their science instruction experience. The expectations are demanding and include no small measure of ability to communicate scientific knowledge. The ability to communicate complex ideas assumes that students have had a significant amount of experience and practice building coherent explanations, defending claims, and organizing and presenting reasoned arguments in the context of their science curriculum. FOSS Next Generation experiences will prepare your students to meet these expectations.

FOSS remains strongly grounded in the realities of the classroom and the interests and experiences of the learner. The Next Generation program consists of three modules at each grade level K–5 for a curriculum of 18 modules.

FOSS Next Generation is crafted with a teaching philosophy that embraces the 21st-century skills; collaborative teamwork, critical thinking, and problem solving that applies the content of science—engineering. FOSS Next Generation curriculum design promotes a classroom culture that allows both teachers and students to assume prominent roles in the management of and responsibility for the learning experience. The content in FOSS is teachable and learnable over multiple grade levels as students increase in their abilities to reason about and integrate complex ideas within and between disciplines. Science notebooks are a learning tool for students to share and clarify understanding.

The FOSS Next Generation assessment system embraces the three dimensions of the Framework and NGSS and makes the connections explicit for teachers (for details on how NGSS is incorporated into the assessment system, read Kathy Long’s article on page 16 of this newsletter). FOSS formative assessment creates a community of reflective practice.

Teachers and students make up the community and establish norms of mutual support, trust, respect, and collaboration. The goal of the community is that everyone will demonstrate progress and will learn and grow.

FOSS Next Generation is built on the assumptions that understanding of core scientific knowledge and how science functions is essential for citizenship, that all teachers can teach science, and that all students can learn science.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Physical Science</th>
<th>Earth Science</th>
<th>Life Science</th>
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<tbody>
<tr>
<td></td>
<td>Core Ideas of Science</td>
<td>Matter Energy and Change</td>
<td>Dynamic Atmosphere</td>
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<tr>
<td>K</td>
<td>Materials and Motion</td>
<td>Trees and Weather</td>
<td>Insects and Plants</td>
</tr>
<tr>
<td>1</td>
<td>Sound and Light</td>
<td>Air and Weather</td>
<td>Plants and Animals</td>
</tr>
<tr>
<td>2</td>
<td>Solids and Liquids</td>
<td>Pebbles, Sand, and Silt</td>
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<tr>
<td>3</td>
<td>Motion and Matter</td>
<td>Water and Climate</td>
<td>Structures of Life</td>
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<tr>
<td>4</td>
<td>Energy</td>
<td>Soils, Rocks, and Landforms</td>
<td>Environments</td>
</tr>
<tr>
<td>5</td>
<td>Mixtures and Solutions</td>
<td>Earth and Sun</td>
<td>Living Systems</td>
</tr>
</tbody>
</table>
The Interactive eInvestigations Guide (eIG) for FOSS Next Generation K–5

The electronic version of the FOSS Next Generation Investigations Guide has been reworked for FOSS Next Generation Edition modules on FOSSweb. This new version is called the Interactive eInvestigations Guide (eIG). Similar to the PDF-based Investigations Guide currently found on FOSSweb, the eIG has the same content, word for word, image for image, as the print Investigations Guide.

One main feature of the eIG is the ability to easily navigate through the Guide. Every bit of the Guide is accessible through a few taps rather than scrolling through pages. Using this format, users can navigate to specific sections, such as bringing up a digital copy of the notebook sheets for a particular part for easy printing. Links to student videos, multimedia, digital FOSS Science Resources articles, and teacher preparation videos allow users to fully access components of the program at a level not available in the print Investigations Guide.

In the eIG Guiding the Investigation sections, there are three different ways to view the step-by-step lessons. The expanded view, which is the default view, is the recommended way to view when preparing and guiding the investigation the first few times. This view provides the exact same information as the traditional Guide. The collapsed view is useful in navigating to a particular step. The third view, the summary view, is meant for the experienced FOSS teacher as it provides a condensed version of the text. This version would be useful for teachers in their third or fourth time through the experience, particularly those that are teaching the same part in a rotation. These views allow for users to see the information they want, when they want it, through their tablet. Users can also collapse all in other sections, which helps in finding certain sections in the Background for the Teacher.

Since the beginning of FOSS, teachers have been doing two things, either writing in their Guides or on sticky notes and carrying their Guides around the room with them during science. The eIG allows you to do both.

When teachers want to remember something, they type a note next to that step and the note is saved. No more lost sticky notes. The eIG is saved through a FOSSweb account and is unique to each teacher.

New to FOSS! Here’s How to Get Started on FOSSweb

In order to gain access to the full suite of module resources, we recommend registering for an account on FOSSweb. Click on the “Get Started Now” link on the bottom of the FOSSweb homepage. Follow the steps to complete your registration using your school email address. We encourage our users to register with an organization (your school or district), if applicable. Registration requires your school email address, district or school address information, and a password that is at least eight characters in length. A confirmation email will be sent to your email address, and you must click on the link to complete your registration. Check your spam folder if you don’t receive it right away.

How Do I Activate Access to My Purchased Modules?

Once you log in to FOSSweb, you will be brought to your Teacher Page. Select the “Activate a New Module” button in the My FOSS Modules header. If you have purchased a FOSS Next Generation Edition or Third Edition Module, or a Middle School Second Edition Course, you will find a FOSSweb access code inside the cover of your Investigations Guide. For these editions, each code is module specific and will provide you with full access to FOSSweb teacher resources for that module after online activation.

If you use editions published before Fall 2011— Elementary Second Edition, Middle School First Edition, or California Edition (2007)—you will need to use the access codes provided on page 19 of this newsletter.

Once you have your code, enter it into the first page of the “Activate a New Module” dialog box. On the second page, select which module(s) you want to appear in My FOSS Modules. We suggest you select only the modules you use most. You can always add or remove modules from this area later. Note that a module must be in My FOSS Modules in order to assign it to a class. If you have a premium access code, you can enter it on this page. Click Submit and wait for your Teacher Page to reload.

Need More Help?

For more information, you can watch the FOSS Registration Walkthrough videos by following this link: http://tinyurl.com/pp2bw3v. See page 19 of this issue for contact information and access codes.
By the time this newsletter reaches you, the FOSS Populations and Ecosystems Course, Second Edition, will be getting ready to ship. This means that the FOSS Middle School NGSS-aligned Second Edition courses are nearing completion!

Here is the current course availability and recommended sequence.

### FOSS Earth Science Strand—Available Now

<table>
<thead>
<tr>
<th>Grade</th>
<th>Course</th>
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<tbody>
<tr>
<td>8th</td>
<td>Planetary Science, Second Edition</td>
</tr>
<tr>
<td>7th</td>
<td>Earth History, Second Edition</td>
</tr>
<tr>
<td>6th</td>
<td>Weather and Water, Second Edition</td>
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</tbody>
</table>

### FOSS Life Science Strand—Partially Available Now

<table>
<thead>
<tr>
<th>Grade</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th</td>
<td>(New titles coming soon!)</td>
</tr>
<tr>
<td>7th</td>
<td>Populations and Ecosystems, Second Edition (available early 2016)</td>
</tr>
<tr>
<td>6th</td>
<td>Diversity of Life, Second Edition</td>
</tr>
</tbody>
</table>

### FOSS Physical Science Strand—Coming Soon

<table>
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<tr>
<th>Grade</th>
<th>Course</th>
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<tbody>
<tr>
<td>8th</td>
<td>(New titles coming soon!)</td>
</tr>
<tr>
<td>7th</td>
<td>Chemical Interactions, Second Edition (available 2016)</td>
</tr>
<tr>
<td>6th</td>
<td>(New titles coming soon!)</td>
</tr>
</tbody>
</table>

For existing First Edition users, it will be a smooth conversion to update your program. And for those looking for new resources to connect with the National Research Council’s A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Disciplinary Core Ideas (2012) and the Next Generation Science Standards (NGSS) performance expectations, these courses will meet your needs. Some of the revised pedagogical features in the Second Edition courses include:

- Teaching strategies that support content, practices, and crosscutting concepts as described in the Next Generation Science Standards;
- Science notebooking embedded in the revised course, including focus questions and information processing (sensemaking) practices;
- Formative assessment aligned with the FOSS K–5 Program based on findings from the NSF-funded ASK research;
- New and improved multimedia features embedded in each investigation, homework suggestions for each part; and
- FOSS Science Resources literacy improvements that reflect Common Core State Standards in English Language Arts.

### New Titles in the Middle School Sequence

You probably are curious to learn about the new titles in the tables. As we have worked with FOSS middle school First Edition courses to revise them and prepare for the Second Edition, we’ve reminded ourselves to think outside of the box. Carefully working with the Disciplinary Core Ideas in the Framework and the Performance Expectations in the NGSS, we have tested a number of new configurations and conceptual flows in our classroom development. We’ve been busy in local classrooms over the last couple of years, and we are getting ready to announce these new titles soon.

Unlike the previously-released Second Edition courses, these titles are new courses; however, you will see some familiar investigations, parts, and materials reintroduced and polished to fit into their new homes.

### A Change in Format

The rumors are true—for the new titles, we have also experimentated and experienced success with a change in format. Instead of 10–12 week courses, the new titles represent smaller pieces of the middle school curriculum puzzle. Each new title is scheduled for 5–6 weeks. Two new titles comprise the length of a traditional FOSS middle school course.

These shorter courses allow us to delve into topics in a different way, completing a shorter conceptual arc around one particular topic in depth. This wouldn’t work for an intricately-connected topic like Earth History, but it does work well for a more discrete topic like Waves. The teachers we worked with in testing found the shorter format to be a refreshing change.

When you put all the courses together, it looks like the scope and sequence you see on the next page.

As you can see, the FOSS Middle School program is still modular, allowing you to mix and match courses by grade level to meet your local needs. Our recommended sequence takes into account some developmental considerations by placing introductory content at the lower grades and moving more abstract content to higher grades.

Within this sequence, there is flexibility. As an example, if your school or district chooses to focus on the crosscutting concept of energy at 7th grade, you might choose to place the FOSS Weather and Water Course, Second Edition at 7th grade and move the FOSS Earth History Course, Second Edition to 6th grade. The FOSS curriculum developers and Delta Education Sales Managers are always happy to talk with you about your school’s or district’s situation to figure out the best arrangement to meet your needs.

### A Focus on Engineering

You may have noticed that the physical science courses are the last in development. We are taking time with these courses to fully integrate the engineering standards in...
meaningful ways. You will also see some of the engineering standards in life and earth science courses, but they are more thoroughly developed in the physical sciences. Students will be engaging with the engineering design cycle to apply the physical science content they’ve learned and engage with the content in a different, deeper way. This development takes time, but we think you will find it to be worth the wait!

**Rolling Adoptions**
What to do if you’re ready to adopt the new courses, but they aren’t all available now! FOSS recommends introducing one to two courses per grade level per year, using the FOSS curriculum materials that are available at the time. This will also give teachers time to work thoughtfully with the NGSS as they come to understand how the new FOSS curriculum supports their classroom work. The Delta Education Sales Managers will work very closely with the FOSS Middle School Program development team at the Lawrence Hall of Science to design a rollout plan that works for your district and school.

Teaching the new FOSS middle school courses will address the performance expectations for the disciplinary core ideas, crosscutting concepts, and scientific and engineering practices described in NRC’s Framework and the NGSS. For each revised course, we provide an NGSS-connections document that is posted on FOSSweb (www.FOSSweb.com) under the “Module Information” tab for the course.

**FOSS at NSTA Conferences**
Revised FOSS middle school courses will be featured in workshops at the NSTA fall conferences and the national conference in Nashville next spring (see the calendar at the end of this newsletter). Look for other announcements about professional development opportunities on the FOSSweb PD calendar, including the summer 2016 FOSS Middle School Institutes!
Science Refurbishment Warehouse:
Supporting FOSS Implementation through Management and Organization in McMinnville, Oregon

By Erica Beck Spencer, FOSS Curriculum Specialist, The Lawrence Hall of Science, and Michelle Barff, FOSS Science Secretary, McMinnville School District, McMinnville, Oregon

Let's be honest, a FOSS adoption is more complicated than a textbook adoption. Textbooks don't take up much space, are easy to distribute, and have pretty pictures. However, the initial “oohh” and “aahh” textbook enthusiasm will soon wane because children don't learn science by reading about it. If you're reading this article, you probably already believe in the benefits of an active-learning science curriculum and accept the need to order replacement parts, refill consumables, and deal with living organisms. The materials management required with FOSS is part of the work needed to bring out the glow in children’s eyes as they experience the power of FOSS science investigations and engineering design challenges. Children regularly get so engaged in science that they may ask if they can stay in from recess to continue the exploration. This excitement about learning is worth the extra effort in materials management.

Some large districts are able to establish refurbishment centers and to keep modules rotating and refilled regularly—it's a big job that requires a warehouse and employees. Oakland Unified School District in Oakland, California, got creative and established an internship and leadership program for high school students to help with the process. (See “Teen Interns Refurbish FOSS Modules in Oakland,” FOSS Newsletter, Spring 2015). There are also refurbishment centers around the country that support multiple districts. For example, S.M.E.R.C. (Science & Math Education Resource Center) ESD 112 in Vancouver, Washington, supports 30 school districts, two state schools, and numerous private schools; the East Bay Education Collaborative (EBEC) in Warren, Rhode Island, refurbishes modules for schools and districts in Rhode Island and Connecticut; and the Van Allan Science Teaching Center (VAST) in Cedar Rapids, Iowa, supports much of the eastern half of the state. There are many ways to successfully support the
refurbishment process, but one that doesn’t work very well is just having teachers fend for themselves.

McMinnville School District (MSD) in Oregon is an example of a smaller district that created a refurbishment center when they adopted FOSS. District-level leadership believed that in order for the implementation to be successful, they needed to support teachers with materials management. In 1992, Connie Dickman, the Director of Curriculum, chose Larry Fischer, a longtime biology teacher from McMinnville High School, to develop the program. Larry, reassigned as a Teacher on Special Assignment (TOSA), along with Mary Fender a college student who graduated from McMinnville High School, designed the “backbone” that would support the adoption. They focused on scheduling, distribution, replenishment, replacements, materials for enrichment activities, and the storage of kits and supplies. Mary was responsible for management of the FOSS program along with art literacy and the Teacher Resource Center Library. They started with roughly 60 grade 3–5 FOSS modules that were housed in an area the size of a conference room. The program grew quickly to include other grade levels. As more FOSS modules were purchased, the center had to upgrade to two attached modular trailers with a combined area of about 1,800 square feet. This space provided room to meet the increased demand for the next few years. With steady growth in 2005, the refurbishment center moved again to its current larger home.

The decision to invest in FOSS was made by seasoned educators who knew that if there wasn’t a central location to support teachers, modules would end up “pirated” and neglected in school closets. The goal of establishing a materials management center was to bear the maintenance responsibility for teachers and make it as easy as possible for them to concentrate on science instruction instead of hunting down supplies on their own. Initially, the refurbishment center supported McMinnville’s six elementary schools, two middle schools, and two other smaller districts in neighboring communities. Currently, the refurbishment warehouse is dedicated to McMinnville schools.

How Does It Work?
The district has tried a couple of different ways to rotate FOSS modules. Originally, sets were rotated between schools and at each grade level. The modules were taught and then sent back to the warehouse for refurbishment three times a year. This approach has advantages, but it also had drawbacks. Teachers were finding it difficult to use the modules within the set time frame while meeting their other obligations. As the 2011–12 school year approached, the curriculum department team decided to send one complete set of FOSS modules to each of the six elementary schools and let them remain there for the entire school year. Teachers provided immediate feedback that they were happy and that the new system worked better with all of their teaching obligations. Each school and teaching team could now plan out the science units without a return deadline.

So how did the refurbishment warehouse make it possible for several teachers in the same school to teach the same module at the same time? The refurbishment center ordered extra materials. For example, for the FOSS Insects Module, extra butterfly cages were ordered, and for the FOSS New Plants Module, extra lamp fixtures and lamp frames were ordered. In the warehouse, there are enough materials stocked so that if several teachers want to teach the same unit at the same time, they can do so. Teachers voiced their needs and requests, and the district did its best to cover everyone’s needs.

The ease of having the materials and animals delivered, along with timely replenishing of consumable supplies and food, is critical. The ability to work with living organisms and participate in hands-on science activities is so engaging for students. It takes their learning to a much higher level. With all of the other responsibilities we have as teachers, it is such a valuable asset to have our ready-made kits and support from the science warehouse. I am always confident that I will have the materials I need to teach high-quality science lessons that my students will love!

—Kori Zinda, fourth-grade teacher, Memorial Elementary School

Teacher Ready
McMinnville teachers have great success with FOSS in part because the refurbishment center prepares “teacher ready” modules. For

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example, in the **FOSS Levers and Pulleys Module**, the cording for the pendulums is measured, cut, and taped in advance, and for the **FOSS Solids and Liquids Module**, the liquids are measured into the 120 mL bottles. Patton Middle School Principal Brian Crain, a former secondary science and math teacher, commented that having the FOSS kits arrive in the school “teacher ready” saves a lot of time in teacher preparation. FOSS kits allow consistency between classrooms and are supportive to teachers who might not have a strong science background.

Teachers receive a set of copy masters so that the original black line masters are not misplaced, posters and calendars are laminated to extend their lives, and when possible, items are packaged according to the investigation and small items are packaged in a large zip bag and labeled. All of this work is done at the refurbishment center to save teachers time and to improve the impact on student learning.

**Living Organisms**

The center also provides all living organisms. Crickets, mealworms, earthworms, and goldfish are purchased locally. Other living organisms are ordered through a biological supply company: crayfish, red wigglers, pond snails, and hissing roaches, to name a few. Several of these living organisms are also maintained throughout the year in the refurbishment center: darkling beetles quickly reproduce, earthworms and red wigglers live quietly in worm bins creating compost, idle crayfish lounge in large aerated tubs of water, and hissing roaches always provide a source of conversation with visitors.

Land snails cannot be shipped into Oregon, but that has not been a problem. There are several neighborhoods where snails can be found locally. Arrangements are made to drop off empty habitats with MSD students and their families, who are more than willing to supply the needed snails from their yards. MSD is also sensitive to the evasive species laws in Oregon. Classroom organisms are not released back into the wild, which explains why so many end up finding a home at the center. There has not been a need to order crayfish or hissing roaches in years.

**Taking Inventory**

Once a teacher has finished teaching a FOSS module, she or he must fill out an inventory sheet. The inventory sheet helps keep track of what is still in the box as well as what needs to be replaced. Teachers can then e-mail the sheets to let the refurbishment center know what materials need to be restocked. These “orders” are then filled and the kit restocked. Each FOSS module is hand checked in the

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The FOSS warehouse at Patton is the main reason why my students love science. All the lessons are prepared and ready to go. I only need to spend a few minutes to grab the specific materials and my class is ready to go for a fun, engaging, and thought-provoking lesson.

The live organisms are always a hit in the room. I normally teach the **Insects Module** during the first few months of the year. That way, parents and grandparents can be led around the room by my budding entomologists. Students also tell me that the highlight is being able to have their very own mealworm at their desk to observe. This would not be possible without the FOSS warehouse and the organization of Michelle. She is vital to its success.

—Brian Bixler, second-grade teacher, Newby Elementary
The Center’s Major Tasks for Each Month of the Year

AUGUST
- Approximately 135 FOSS modules are cleaned, restocked, and returned to schools
- Materials are prepared for fall science experiences outside of the classroom

SEPTEMBER
- FOSS courses delivered to middle schools
- Live materials transported to classrooms
- Science at the local soil and water conservation area begins, fourth grade

OCTOBER
- Science at the local water municipality, LEGO engineering unit begins, third grade

NOVEMBER AND DECEMBER
- Lever and friction studies being at Evergreen Museum, fifth grade
- Warehouse cleaning, maintenance, and FOSS replacement orders

JANUARY AND FEBRUARY
- Preparation begins for spring science experiences outside of the classroom

MARCH
- Chick-rearing materials are prepared for upcoming requests
- Insect habitats are prepped in advance

APRIL AND MAY
- Insect and chick requests are filled and delivered
- Plant and live habitat delivery and support
- Science outside of the classroom, kindergarten, first grade, second grade

JUNE
- All FOSS, DSM, LEGO, and science warehouse materials are returned and stored for the next year (ready for it all to begin again in August)

school in which it is housed twice a year, during winter and spring breaks. Inventory sheets are checked, items are restocked, and a report is sent to building principals and the curriculum director letting them know which modules have been or are currently being used. This report also shows which classes and what grade levels have participated in science activities outside of the classroom.

Items listed in the *Investigations Guide* as “teacher supplied” are provided by the center to make things easier for teachers, so the center created a new inventory sheet to replace the one FOSS provides. For example in the *FOSS Insects Module* the additional items of sugar, oat cereal, wax paper, transparent tape, egg cartons, ant farm, insect house, measuring cups, and measuring spoons are provided. In addition, suggested reading materials and any additional supplemental materials are also included. In the *FOSS Insects Module*, insect life cycle models have been inserted. Adding additional resources changes how the FOSS boxes need to be packed in order for everything to fit. The center sends most sets of FOSS boxes with an additional tub that holds bulky or heavy items.

One person manages the warehouse. While there are no downtimes in the warehouse, there are quiet periods that are used for prepping materials that will be used in the future. There are always items that need to be hand delivered to teachers, science experience field trips to schedule busing for, data to keep track of, and purchasing to complete. District couriers need to be coordinated to move complete sets of modules back and forth between the schools and the refurbishment center. School custodians need to be alerted to help with the in-building sorting process. Approximately 135 circulating FOSS modules are returned to the warehouse in the spring. The warehouse stores over 250 assorted science kits. In addition to all this work, effort is made to repair items instead of replacing them; it stretches the science budget farther.

It has been almost 25 years since FOSS was adopted by the McMinnville School District and the forethought in creating a staff position and establishing a refurbishing center has made it possible to reach the level of success they experience. Michelle Barff, the current FOSS Science Secretary, is now the solo employee for the center and continues to seek feedback from teachers and refine things as necessary to improve the ability of teachers to teach science.

The FOSS staff wishes to thank Michelle, for going above and beyond the call of duty, and other unsung heroes like her for all that they do to help make the work teachers do easier and ultimately for impacting the lives of thousands of children. For more on FOSS use in the McMinnville School District, see FOSS Newsletter, Spring 2013 No. 41.
**Equity through the Inquiry Science Education Consortium in New Mexico**

Gwendolyn Perea Warniment, LANL Foundation, ISEC Program Director, New Mexico

What does science look like? What does it sound like or feel like? How do we know we are participating in this endeavor we casually call science?

For students in northern New Mexico, science has traditionally been a mysterious enterprise, synonymous with a hidden national laboratory. Science has been enigmatic, quiet, and prestigious, built upon images of famous men in a laboratory with interesting gadgets or electronics that were astonishing in their ability. Many students in northern New Mexico are taught the connection between science and war, the history of an atomic bomb, and the enchanting power to split atoms and accelerate particles. Living with the Los Alamos National Laboratory (LANL) in your backyard is an interesting duality; the cultural divide between activities that occur at a national laboratory and the reality of students’ daily life can become more of a cultural chasm, particularly when science is inherently secretive.

The socioeconomic and racial divide among the students in northern New Mexico is stark. According to 2013 U.S. Census data, the current percentage of families living below poverty in New Mexico is 21.9%. And yet, the median income in Los Alamos County is often among the highest in the nation. New Mexico is a minority-majority state, with a combined population of nearly 60% identified as Hispanic, Latino, or American Indian. Contrasting this data is a 2013 report that lists disparities in STEM employment by sex, race, and Hispanic origin.¹ Nationally, Hispanics make up only 7% of the STEM workforce. Worse, of the 6.7% of Hispanics who do hold degrees in science or engineering, only 28% are employed in a STEM-related occupation.

LANL is to be commended. Outreach to area students is continually expanding and exposes students to the extensive variety of research that is often groundbreaking in many areas of science, technology, and engineering. And yet, students are still left wondering how to get there.

The Los Alamos National Laboratory Foundation (LANLF) thought deeply of this divide when it decided five years ago to embark on a new project, that involved science and elementary students in the areas surrounding the Lab—The Inquiry Science Education Consortium (ISEC). The ISEC is composed of six school districts in northern New Mexico, four of which are classified as “rural remote.” All districts have a considerable ELL population and high numbers of students who qualify for free and reduced lunch, with a combined average of 71.7%.²

The ISEC has components found in many other inquiry science projects: a materials management system and warehouse to supply high quality science equipment, a comprehensive approach to teacher professional development that includes a summer institute, follow-up coaching, and most importantly, FOSS modules. Evaluation results for this project reflect those of other inquiry science projects with statistically significant, positive differences in academic achievement for these students not only in science, but in math and language arts.³

What is significant about this inquiry science project is the impetus for change. Equity, a critical term in education, and in our location, is perhaps most about the expectations not only of our students but of teachers, administrators, parents and the community. In what ways are we facilitating equitable access for our students to engage as scientists? Are we comfortable with the content and nature of science? Do we explicitly recognize that acquisition of scientific discourse may be overwhelmingly political and can lead to social status?

A systems approach towards science education that is concerned with equity is particularly focused on curriculum that provides an entry point not only for students, but for teachers as well, given this explicit attention to the sociopolitical dimension of science. Both educators and students need to feel capable of engaging in scientific discourse and practices in order to inhabit this “identity kit” that James Gee describes.⁴

A unifying curriculum that provides an entry point to this practice of science can also be critical when teacher and administrator turnover is endemic in locations of rurality and poverty. Professional development that involves both the FOSS science modules and a robust scope and sequence of further topics allows teachers in ISEC to deeply understand the flow and expectations involved with conceptual frameworks and the overarching structure of inquiry pedagogy. These then provide trajectory through which instruction can advance. Administrators are also engaged in their own professional development designed specifically to meet the needs of site leaders as they adapt an identity kit of leadership in multidimensional instruction and sharing of effective practices with staff.
Science continues to evolve. It is a practice that involves both local and global communities and is much more comprehensive, involving interrelated activities that are theoretical, practical, and often involve engineering in tandem. Science instruction must evolve as well. It is equally important that we ask how students get to this place we now call science. Young students truly begin to identify with science when they are given explicit pathways along which to access the practice of science rather than merely the content. What we have noticed in New Mexico is the success of FOSS modules in doing just this.

Student’s ability to participate in the practice of science is vital. This participation deepens their content knowledge. It allows students to understand science as a multidisciplinary endeavor. Participatory action provides teachers and students a significant entrance point into the new Next Generation Science Standards (NGSS). It provides context for all students (e.g., special ed, emergent bilinguals, gifted, and talented) to collaborate with peers. It provides a vantage point through which students can begin to compare their own practice to that of career scientists and engineers, and it introduces the academic discourse involved with science that allows an inherent scientific identity.

FOSS modules contributed to a cultural shift within ISEC schools, as students and teachers alike have adopted science practices with wide-ranging results. Not only is science a valued component of the school day, it is often the favorite. Similarly, cross-curricular connections are largely established, with science and literacy blocks set back to back. Most interestingly, now that science has a set, unifying curriculum, teachers are able to cultivate connections between science and local issues and move towards stronger student-centered instruction. In a sense, the FOSS modules have become a unifying scaffold.

Teachers at a school in Santa Fe, New Mexico, have deepened content understanding built from the FOSS Solar Energy Module by linking application to the energy resources present in New Mexico and the potential savings for their entire school. In other schools students researched additional sources of information—stories, myths, Native American ideologies—that involved the Sun. In addition, the literacy block utilizes work recorded in their science notebooks.

Tony E. Quintana Elementary School, a school in Española, New Mexico, held an end-of-year community science night called Sustainable Sombrillo. Community members were invited to join teachers and parents in supporting and celebrating their students’ community science and technology projects. The projects gave students the opportunity to display knowledge gained through ISEC science modules involving a study of the local environment, with the goal of determining how the community could use its natural resources (such as the Santa Cruz River, rich agricultural soil, solar energy, and naturally occurring rocks and minerals) to become a more sustainable community. Students as young as kindergarten communicated their data using Prezi and PowerPoint. Supportive organizations included Escala Education Services, the Santa Fe National Forest, the Santa Cruz Irrigation District, and the East Rio Arriba Soil Conservation District. They contributed their time and resources, helping students link learned science content knowledge and learned science practices with real world applications.

Yet, the most important aspect of this cultural shift is not the increased importance of science during the school day or even the resultant positive impact on student achievement scores, but the gentle, persistent recognition that all students and teachers are scientists in their own right.

Science sounds like many voices, in many languages, feels like a safe and exciting practice that involves a wonderful productive struggle. Science looks like children in a first-grade classroom in rural Peñasco, New Mexico, discussing their adobe homes and the connection to the bricks they are creating through the FOSS Pebbles, Sand, and Silt Module, or these same children playing by balancing pencils on a craft stick and exclaiming they have found “¡el punto de equilibrio!” (“The balance point!”) Science feels like a fourth-grade dual-language classroom at El Camino Real Academy in Santa Fe, New Mexico, richly discussing the potential strength of electromagnets in Spanish and then writing about it the following week in English.

The practice of science is multifaceted. It includes asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations, engaging in argument from evidence, and communicating and evaluating information.5 It is interdisciplinary and includes elements of engineering and design. It is located in both the spaces intimate to the individual and at the grand

Continued on page 12
scale universal. But what may be crucial is recognizing that the practice of science hinges on navigating academic discourse. In terms of equity, this deep process involves making sense of phenomena from multiple perspectives. As students and teachers work through that productive struggle, involving observation, investigation, and explanation, the bridge between individual perspective and appreciation of differing viewpoints is built. Science is a community of practice. Students and teachers replicate this community of practice inside the classroom, modeling democratic, respectful engagement.

In order for students to engage in this practice of sense making and for teachers to successfully facilitate the process, educators and administrators need first to experience this shift in classroom culture. Equity involves teachers as much as students. As part of the ongoing professional development that ISEC has provided, Brian Campbell, a FOSS curriculum developer, conducted a workshop focused on building these practices with teachers. During the training, science notebooks were used in a way that allowed participants’ thinking to become visible. Science talk was modeled and discussed using clear strategies that engage all students. Teachers were asked to construct explanations about the weathering of rocks and work around argumentation focused on application of concepts to the local area. This training proved indispensable, as it provided teachers additional tools to engage students in the scientific practices within the context of the FOSS modules they were already using. It also buoyed their foundational knowledge of the modules so that they might begin to make valuable connections with the regional resources.

LANLF’s particular concern is to provide our youngest students with STEM education that not only functions to prepare them for college and career, but also gives them the tools of discourse, which might help them fully engage in their schools, family, communities, and beyond. LANLF envisions students who become critical consumers of scientific information related to their everyday lives, and are prepared to pursue careers in science, engineering, and technology. Perhaps most importantly, we envision students who are prepared to confront and solve the future challenges that face society: energy, disease, food and water, and environmental change. Strong democratic decision-making must include our American Indian population, our rural students, our emergent bilingual students, our Hispano families that have inherited poverty over generations inside the United States, and the plethora of identities not mentioned here but that make New Mexico the Land of Enchantment. Most valuable, however, is that we provide our students the skills, knowledge, practices, and discourse that provide the opportunity to work at a premier national laboratory that is close to home.

It is interesting to consider the impact of such a program considering the NGSS and the call for science for all students. The future of the Inquiry Science Education Consortium is motivated by this tremendous call. The program will continue, looks to expand and will use several of the new Next Generation FOSS Modules to evolve (see page 1 of this newsletter for more on the Next Generation FOSS Modules). Something so seemingly complex as science and engineering has become a simple, unifying thread for school districts in northern New Mexico. Equity is an undercurrent of this work, providing experiences, materials and resources to students, teachers, and schools.

Notes
We have a lot of old FOSS modules in our storeroom that aren’t being used. Can you help us decide what to do with them? This was the question the elementary science central office team kept receiving. At the same time, many schools were indicating a need for refurbishing their current equipment. After seven years of heavy use, many permanent items needed to be replaced. With limited resources in money, personnel, and time, we had a problem in need of a creative solution.

To understand the problem, some background information is necessary. Los Angeles Unified School District (LAUSD) has been using the FOSS program for over 20 years. In addition to formally adopting the FOSS California Edition in 2007, individual schools had purchased modules from earlier editions, going as far back as 1992. Additional grants and Title One funds also provided schools with modules from the FOSS Second Edition. As teachers retired or changed locations, and as enrollment fluctuated, unused modules began accumulating in closets, equipment seemed both environmentally and fiscally foolish. With all necessary. Los Angeles Unified School District (LAUSD) has been using the FOSS program for over 20 years. In addition to formally adopting the FOSS California Edition in 2007, individual schools had purchased modules from earlier editions, going as far back as 1992. Additional grants and Title One funds also provided schools with modules from the FOSS Second Edition. As teachers retired or changed locations, and as enrollment fluctuated, unused modules began accumulating in closets, bins, and storerooms.

As part of the district’s efforts to “go green,” throwing away equipment seemed both environmentally and fiscally foolish. With all these materials as resources, it seemed natural to try and “harvest” the old FOSS modules to refurbish the current ones. The question was how. LAUSD is a huge district with over 500 elementary schools spread out over a 30-mile radius. Currently there are no science lead teachers at LAUSD is a huge district with over 500 elementary schools spread out over a 30-mile radius. Currently there are no science lead teachers at schools to oversee module maintenance. Six district science specialists and a team of four science technicians serve as the central science leadership team. Although this team was ready and eager to help, other responsibilities took priority.

Nevertheless, the opportunity to repurpose all those FOSS materials was too tempting to ignore. One of the first considerations was how to collect the old FOSS equipment. The central leadership team developed a FOSS inventory list that was sent to schools that had asked for module refurbishment. This list included both current and old modules. Principals were asked to consult with their teachers to determine which modules should be refurbished and returned to the school and which could be donated for repurposing. Over the summer the science technicians picked up over 2,000 boxes from 43 schools. Some schools sent over 150 boxes, both current and old. The Science Materials Center was overflowing with palettes of FOSS boxes.

Now that the boxes had been picked up, the challenge was how to sort the components from old modules and, at the same time, refurbish and return current ones to the schools. Working diligently, we were able to get many modules refurbished and back to the schools, but we still had hundreds of old modules left to work on, containing a great deal of FOSS equipment inventory. These boxes were stored randomly with no one knowing what they contained.

The school year began, and we had just begun to make progress with the refurbishment. After a few brainstorming sessions, phone calls, meetings, email exchanges, more meetings, faxes, and final approvals, we had a solution that turned out to be workable, efficient, rewarding, fun, and beneficial, not only for our central team but for a crew of young adults in the community. Our local Delta Education Sales Manager, Maggie Ostler, connected us with The Church of Jesus Christ of Latter-Day Saints. As you may know, they have a well-regarded program in which college students serve two-year missions, during which they make themselves available for various types of community service. This was just what we needed; 20 strong, eager young men and women to help us organize all the FOSS materials.

On a perfect cool spring day the missionaries descended on our storage buildings. For eight straight hours they lifted, sorted, and marked boxes. Modules were arranged on palettes by title and grade level. Current modules were separated from retired ones.

Thanks to their efforts, our old modules were processed and labeled. Then the question was how to organize everything so that we could use the materials to refurbish active modules. The answer came in a mutually beneficial relationship with the Miller Career and Transition Center. Located near the materials center, the Miller Center provides employment-based training for students with disabilities, aged 18–22. The teachers at Miller realized that sorting these materials would be a solid employment-based learning opportunity for their students. So a partnership developed.

For the whole school year, every day for one hour, 10–15 students would arrive at the materials center and sort the items in retired FOSS modules. Their work was so efficient that the center staff was hard pressed to keep them supplied with boxes to sort. At the end of the school year their hard work was celebrated with personal recognition.

Because of their exemplary work, there is talk of expanding the Miller Center students’ work to assist with refurbishment of current FOSS modules. Knowing that there are partners in the community that we can call on helps us to keep a quality science program going even with limited resources.
Observations by Larry: NGSS Angst and the Way Forward

By Larry Malone, FOSS Co-director

There are those around us who are wondering what the initialism NGSS stands for. Some suggest maybe it is short for Next Guess Science Standards. Those who have lived through countless versions of “the next big thing” in education have grown justifiably cynical about implementing “promising new” policies and practices in education. So it’s not surprising that elementary educators may be experiencing NGSS angst. NGSS angst is the stress and anxiety created by the perceived urgency to make informed decisions and take meaningful action around the Next Generation Science Standards. NGSS angst is exacerbated by tension produced by the call to recreate science as a priority in an environment where the accountability police mandate that instructional time be dominated by language skills and arithmetic, leaving only scraps of time for content instruction: science, social studies, and art.

But that was then, and this is now, or should I say this is next, because next is now. Informed elementary educators are turning to science for solutions to intractable achievement deficits. The usual priority topics of language arts—reading, writing, active listening, coherent speaking, vocabulary, and communication—are being exercised more effectively than ever before by embedding them in science instruction. And the overarching goals of science instruction are gaining traction as business and government spokespeople are becoming increasingly vocal in their desire to see more graduates who are scientifically literate and knowledgeable in the various dimensions of STEM education. To these ends it is incumbent on elementary educators to be conversant in the goals and cognizant of the spirit of the NGSS. How should we prepare to make effective decisions about how to act on the NGSS?

First, we have to remember that the NGSS are based on the National Research Council’s A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012). The NGSS are a derivative product of this fine document. Consider this analogy: many of us have had the experience of going to a movie based on a book we read that we considered to be top-notch, only to be disappointed that the film version did not meet our expectations. Those involved in the adaptation may have had the best of intentions, but the end product doesn’t meet exactly with what we personally would have liked to have seen. I’m afraid that this will be the experience of many of us as we study the Framework and the NGSS. For me, the NGSS are the well-intentioned derivative product of a really good book that ultimately didn’t entirely meet my hopes for what the end product could have been. To understand where the NGSS are leading—the intention—we have to study the Framework carefully and thoroughly.

The Framework is at the same time a thoughtfully crafted description of the structure and scope of the anticipated student scientific knowledge, and a philosophical stance on how we should expect our students to learn that science. The Framework exposes and delimits the knowledge our students should acquire while simultaneously expecting a sufficient exposure to the crosscutting concepts that weave all of scientific knowledge and thinking into an integrated fabric that embraces all natural and human created systems. And an even deeper current running through the Framework is teaching about the nature of science. Deep engagement with science promotes a particularly unique kind of intellectual activity. Those who accept the challenge to engage the nature of science advance into a rarified cognitive state someplace between belief and enlightenment. Those who have taken the nature of science into their hearts have an almost spiritual level of comfort and familiarity with natural systems and principles. Not everyone is prepared to accept the nature of science as a guiding life principle, but that is an implicit goal of the new vision of science.

So how does this relate to the NGSS? Remember, the NGSS are descriptions of student performance expectations. Each expectation is a complex statement including all three dimensions of the new vision of science instruction/learning: core disciplinary ideas (content), science and engineering practices (process), and crosscutting concepts (big ideas/themes of science). Students will not be able to demonstrate mastery of the NGSS performance expectations with a correct answer to a question. In the old paradigm we expected students to know the answers to questions, so we taught them the answers. “Good students” learned and remembered the answers and got As on their exams. In the new paradigm, student will be asked to respond to complex scenarios and will be expected to develop and communicate
sophisticated explanations based on their knowledge and understanding of scientific content and principles, crosscutting concepts, and the practices engaged in by scientists and engineers. Wow, this is a path never before traveled in science education. So, if we can’t teach students the answers to questions they are going to be asked, what are we suppose to teach? We are supposed to provide students with the opportunity to learn comprehensive, meaningful science, which they will draw upon to answer questions they have never encountered or thought about before. Thus, NGSS angst!

Achieve, Inc., the brain trust behind the NGSS, has developed documents to assist with the work of making thoughtful decisions concerning the adoption of instructional materials to move learning in the right directions. The first tool released by Achieve was the Educators Evaluating the Quality of Instructional Products (EQuIP) Rubric. This rubric guides educators through a series of evaluative steps to determine how well an instructional event (lesson or unit) is aligned with the goals of the NGSS. The process of using the EQuIP tool can be a bit long and somewhat tedious, and may in the long run be of limited usefulness. As I write this, a second evaluative document is just out in draft form, Primary Evaluation of Essential Criteria for Alignment (PEEC-Alignment). The PEEC-Alignment tool is designed to provide information about the alignment of entire school programs—curriculum, instructional materials, teacher support materials—with the intent of NGSS. Because of the revolutionary nature of the new vision for American science, the guidance provided by the PEEC-Alignment holds more potential for helping school systems make coherent, comprehensive decisions in the interest of deep reform of the structure and practice of elementary school science instruction.

The PEEC-Alignment tool will focus on a number of critically important considerations. Following are a few of these considerations.

- Inventory and allocation of school resources; fiscal capital, human capital, community resources, professional development policy
- Recognizing the essential relationship between science and language development
- Commitment to learning progressions within grade-level units and coordinated across all grades
- Commitment to sufficient instructional time
- Commitment to professional/staff development
- Developing a coherent, intelligent curriculum plan

In summary, the most efficient, straightforward remedy for NGSS angst is pretty simple: adopt FOSS Next Generation Edition. Doing so will replace NGSS angst with another form of angst: FOSS Next Gen implementation angst. And for this form of angst you have a lot of support: Your FOSS product team at Delta Education, a strong national network of knowledgeable, experienced FOSS teachers, administrators, and professional developers, and your FOSS program development team at the Lawrence Hall of Science.

And a simple parting thought, thanks to scientist Neil deGrasse Tyson, “The good thing about science is that it is true whether or not you believe in it.”

In the spring of 2015, the White House released the Every Kid in a Park initiative, which seems like a natural extension of Let’s Move (Michelle Obama’s initiative to get kids more physically active). Starting in September of 2015, all fourth-grade students and their families will receive free admission to all federal lands and waters for the entire year. This is great for families, as well as fourth-grade teachers. In addition, the National Park Service (NPS) will be expanding its services to award transportation grants for visits. President Obama has requested $20 million in new funding specifically provided to the NPS for youth activities in his 2016 budget. It is not yet clear how this money will be disseminated or how teachers and parents can request funding, but it is clear that this is a priority for the Obama initiative.

In addition to being important for the health and wellness of children, this initiative is touted as part of President Obama’s commitment to protect our national treasures. In 2016, the NPS will celebrate its 100th anniversary. By Erica Beck Spencer, FOSS Curriculum Specialist, The Lawrence Hall of Science

Continued on page 17
The Assessment Corner

Kathy Long, FOSS Assessment Coordinator, The Lawrence Hall of Science

What’s New in Assessment for the Next Generation Edition?

As many of you know, assessment for the FOSS program has been evolving since the 1990s. The current system has its foundation in the Assessing Science Knowledge (ASK) project (2003–2009) funded by the National Science Foundation and Delta Education. That project involved nine school districts as well as experts from the Berkeley Evaluation and Assessment Research Center and SRI International, working closely with the FOSS development team. I-Checks, as well as the embedded reflective assessment practice, have their roots in that project. (Reflective assessment was developed in conjunction with another NSF-funded project called Formative Assessment in Science Through Technology. We were attempting to do with PalmPilots what we could do these days with iPads; we were ahead of our time!)

The system developed in ASK was originally developed to supplement FOSS Second Edition. It has since evolved to be an integral part of both the Third Edition and the Next Generation Edition. So what’s new in the Next Generation Edition?

Performance Expectation Grade-Level Chart. The Next Generation Edition assessment chapter for each module includes a two-page chart aligning the grade-level performance expectations with FOSS assessments. On that chart you will find references to all of the embedded and benchmark assessments that include items to develop students’ abilities to answer questions that will most likely appear on future state and district tests.

Performance Assessments. In each module, you will find two to four parts of investigations that are designated as performance assessments. FOSS students work and think like scientists in every lesson, but these specific parts will guide you to assess progress of specific science and engineering practices and how students are thinking about crosscutting concepts. There are no additional stations that need to be set up (as there were in the Second Edition)—these are authentic assessments in which students make observations, conduct investigations, gather and analyze data, think about systems or cause and effect—all with a purpose that is part of the ongoing learning.

Benchmark Item Descriptions. Next Generation items on benchmark assessments are described in three dimensions. The purpose of this description is to show how each item fits into the scheme of three-dimensional learning (most, but not all include the three dimensions), and as a support for teachers to provide information about how the item is connected to the investigations in the module. When you look at the assessments, you won’t notice a big difference in the item format. We still have multiple-choice, short-answer, and open-response questions. Each item still has one coding guide, so we are coding the items as a blend of the three dimensions rather than trying to pull the dimensions apart to assess them separately. We believe this follows the spirit of the National Research Council’s A Framework for K–12 Science Education and the Next Generation Science Standards. Taken together, all of the items should give you a diagnostic snapshot of what students know and what they need help with. Achieve has made clear many times that NGSS Performance Expectations are not meant to be a complete curriculum. And the assessment system for FOSS is not meant to be a mini-version of the state tests that will be developed from the

Performance Expectations. The assessments that accompany FOSS remain closely related to the curriculum and include items that require students to apply what they have learned directly in the FOSS classroom. The FOSS curriculum and assessment system include all the experiences students need to be successful on new state tests (assuming those tests remain true to the Framework and NGSS).

Next-Step Strategies. A new feature in the Assessment chapter that teachers will find helpful is suggestions for next-step strategies, found in the sidebars next to each item coding guide. These are suggestions to use with individual students or when a large number of students have difficulty with any of the items on the I-Checks.

The FOSS assessment system puts a heavy emphasis on formative assessment. The next-step strategies provide an opportunity for teachers and students to take action when
Next-step strategies are not suggested for items on the Survey/Posttest as the Survey is given to provide information about students’ prior knowledge and help teachers make decisions about where they will need to spend more time when teaching the curriculum. The Posttest is a summative test given at the end of the module. FOSSmap is also available for the Next Generation Edition (see FOSS Newsletter, Spring 2014). In Fall 2015, students will be able to take the items online, and you will be able to score open response items and run any of the frequency reports (code frequency, class by item, student by item, student responses), but those reports that require statistical analysis to provide level information will be coming later (class frequency, class by level, and assessment summary reports for individual students). Those require us to gather some additional data to make sure that they are working properly.

We will put them online as we complete that work behind the scenes.

We’ve put a lot of thought into the latest version of the FOSS assessment system for the FOSS Next Generation Edition. We hope you will find it informative and easy to use!

If you’d like to receive a sample section from a fourth-grade Assessment chapter, please send an email to foss@berkeley.edu.

assessments show that action is needed to improve learning. The next-step strategies help establish an academic dialogue between teachers and students, or encourage students to work with their peers to think again about what they have learned and what they still need to know. These interactive activities provide another opportunity for students to use their science and engineering practices when they debate and defend their answers, evaluate and obtain new information that might help them make connections among the pieces of knowledge they already have, and examine and reconstruct explanations.

Next-step strategies include self- and peer-assessment activities, articles in the FOSS Science Resources book that might be helpful to review, as well as tutorials, virtual investigations, and other online activities that can enhance student understanding (available through FOSSweb). We make these suggestions as a place for teachers to start from. Which next-step strategy a teacher uses depends on teacher preference and student need. Once teachers try a few of our published next steps, we know they will enjoy creating their own!

Every Kid continued

birthday. Free admission, helping to make it easier for schools and families to plan trips, providing transportation to support schools, and providing educational materials to support a wide range of educational programs are all part of this Every Kid in a Park initiative. These measures are important to ensure that the parks are protected and adored for generations to come.

To encourage exploration by students at all grade levels, many parks have academic waivers for academic exploration and have forms that can be filled out prior to the experience to grant free access. Some parks’ websites make these easy to find, but it is always worth asking.

Here’s hoping that bus loads of fourth graders go on field trips to explore the soils, rocks, and landforms of Acadia National Park, to discover the environment of Yosemite National Park, and even to explore the importance of energy in America’s first planned industrial town which is memorialized at Pullman National Monument in Illinois.

Leave your wallets at home (not really, you might need your identification) and get your fourth graders to one of our country’s finest treasures!
Physicist Inducted into the National Inventors Hall of Fame Affects the Lives of Over 100 Million People

By Erica Beck Spencer, FOSS Curriculum Specialist

The home of FOSS, the Lawrence Hall of Science (the Hall), is perched atop the Berkeley hills looking down upon the University of California at Berkeley. Slightly farther than a stone’s throw down the hill from us are brilliant scientists and engineers studying, researching, designing, and teaching at the Lawrence Berkeley National Laboratory. Professor Ashok Gadgil is one such scientist, conducting work that will help millions living in extreme poverty and dangerous situations, such as in Darfur refugee camps. This award-winning scientist was recently inducted into the National Inventors Hall of Fame!

Approximately 100 million people on four continents have been helped by inventions that Prof. Gadgil has created to solve fundamental problems in developing countries. He has designed numerous products, but we will focus on his system to provide access to clean drinking water and his energy efficient stoves.

The water-disinfecting device Professor Gadgil designed is capable of providing safe drinking water for 2,000 people at a rate of four gallons per minute. The UV Waterworks system uses 60 watts of electricity to kill disease-causing pathogens with UV light, and can be powered with a car battery or a solar panel. The device is slightly smaller than a FOSS box and weighs approximately 15 pounds. The cost of producing a thousand gallons of clean water! About five cents! This outlet-free device can be used in disaster areas where both electricity and water are scarce.

In the FOSS Motion, Force, and Models Science Resources book, Third Edition, we feature Prof. Gadgil’s easy to assemble, energy-efficient, lightweight, durable, and stable stoves that are used in refugee camps such as those found in Western Sudan. Before development he spoke with female refugees to determine their needs. Women were spending hours walking miles outside of the safety of the camp to find firewood for their inefficient three-stone cooking fires. The stove Gadgil designed requires one-half the amount of wood as their traditional system and ultimately means women spend less time looking for wood and don’t have to travel as far from the safety of the camps.

We asked Professor Gadgil if he had any advice for teachers. He suggested that teachers “reach out to real practicing young engineers and get them in front of students—so they can talk about what cool stuff they do, why they chose to do engineering, and what it is as a career.”

He continued, “teachers should try to convey to the students that engineering is about thinking and understanding, planning, then designing, and then building stuff that works, that makes life easier, or makes life fun.”

We also asked him his thoughts on engineering in the K–12 Next Generation Science Standards. He responded, “It is terrific that there will be increased emphasis on engineering in the K–12 Next Gen Science Standards! Engineering and Science really do go together—good engineering tools enable advanced science (e.g., electron microscopes), and vice versa. They are truly inseparable.”

We also have a FOSS Resources article about a female engineer who works alongside Professor Gadgil. Dr. Susan Amrose. Dr Amrose is an environmental engineer who has worked with communities in Bangladesh where most of the groundwater in wells is poisoned with naturally occurring arsenic. She has worked with a team of engineers to design an inexpensive way to remove the poison. The full article about her and other engineers designing things related to water can be found in the FOSS Next Generation Edition Water and Climate Science Resources book.

FOSS believes strongly in sharing the work of inspirational inventors, engineers, scientists, and other humans doing good work to improve the world we all inhabit. Our hope is to open the eyes of students about the abundant possibilities and exciting career choices for their future. We, like Professor Gadgil, believe deeply in the potential energy of these young people and never know when or what will inspire them.

Citations:
FOSS Institutes: Spring 2016

Delta Education will host FOSS Institutes before the 2016 National NSTA Conference in Nashville, Tennessee (March 30, 2016). These Institutes will be for educators from districts that have implemented FOSS or are planning to implement FOSS. The Institutes will focus on FOSS Next Generation, and FOSS Middle School, Second Edition Courses. These Institutes are designed for experienced FOSS educators—lead teachers, administrators, curriculum coordinators, professional developers, and university methods instructors.

These Institutes are free, but you must register in advance to attend.

To secure your spot at an Institute, please contact:
Jenn Reid at Delta Education
800.258.1302 x3667
jenn.reid@schoolspecialty.com

NSTA 2015 FALL AREA CONFERENCES

K–8 Workshop Schedule

<table>
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<tr>
<th>Date</th>
<th>Workshop Title</th>
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<tbody>
<tr>
<td>Reno, NV</td>
<td>Archaea and the Three Domains: Classification of Life for Middle School</td>
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<tr>
<td>8:00–9:00</td>
<td>Scientific Practices: What Does Argumentation Look Like in an Elementary Classroom?</td>
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<tr>
<td>9:30–10:30</td>
<td>Get Them Started Early and Make it Relevant—K–2 Science and Engineering Experiences</td>
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<tr>
<td>11:00–12:00</td>
<td>Engineering in Elementary Science: Designing with FOSS</td>
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<tr>
<td>12:30–1:30</td>
<td>What to Look for in Physical Science Learning Progressions—Experience FOSS K–5</td>
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<tr>
<td>2:00–3:00</td>
<td>Floods, Heat Waves, and Hurricanes: Analyzing Evidence for a Changing Climate using FOSS Middle School</td>
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CSTA CONFERENCE

Sacramento, CA, October 2–4, 2015

Friday, October 2, 2015
1:00–4:00   Engineering Understanding: Applying Science Concepts and Building Academic Language (SC6)

Saturday, October 3, 2015
12:30–1:30  Language for Meaning: Accelerating 3-Dimensional Learning for English Language Learners in the Science Classroom

Regional Institutes

Regional institutes for elementary and middle school programs are offered throughout the country. For a complete list of dates and locations, please visit the Professional Development calendar on FOSSweb, or contact Jenn Reid for more information.

http://www.FOSSweb.com/pd-event-calendar

FOSSWEB HELP AND ACCESS CODES

- FOSS Third, Next Generation Edition, and Middle School Second Edition users will find access codes on the inside of the FOSS Investigations Guide for each module. Users of other editions can use the access codes below.

Permanent Access Codes
  AME2EL1650
- FOSS Middle School 1st Edition Access Code
  AME1MS4600
- FOSS CA Edition (K–5) Access Code
  AME1CA8460

FOSS Help

Account Questions/Help Logging In/Access Code Issues
School Specialty Science Technical Support
techsupport.science@schoolspecialty.com
Phone: 800.258.1302, 8:00 am–5:00 pm ET

General FOSS Help
FOSS Technical Support
support@fossweb.com

FOSS Registration Walkthrough Videos
http://tinyurl.com/pp2bw3v

Sign Up to Receive the FOSS Newsletter

To receive the FOSS Newsletter electronically or in print, sign up at www.deltaeducation.com/FOSSnewsletter.

You can view the current and previous issues at http://www.FOSSweb.com/newsletter.

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- FOSS Science Resources eBooks feature audio narration with synchronous highlighting and embedded videos and animations.
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