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FOSS[®]

N E W S L E T T E R

Cultivating FOSS Connections to Your School Garden

By Karen Mendelow Nelson, FOSS Curriculum Specialist

Are you working on planning your school garden for this year? Making connections with the FOSS Program will help broaden your students' science explorations of nature outdoors. Schools around the United States are greening schoolyards by implementing school gardens, outdoor classrooms, and schoolyard wildlife habitats. Working in the garden, using your schoolyard as an outdoor classroom, can offer benefits to the curriculum. Students build consideration and learn stewardship for the Earth, learn and apply science concepts, get exercise, practice cooperation,

and taste healthy foods that they grow themselves. If you have some class parents who want to help your students in the garden, or if you're lucky enough to have a garden teacher at your school, the ideas in this article will help you collaborate and make more in-depth connections to FOSS.

For kindergarteners, the garden provides a natural space to dig in the dirt and discover the wonders of nature. In the **Trees Module**, students explore and learn about the trees on campus and how to care for them. As an extension, each year the kindergarten could plant

a fruit tree to both beautify and add a permaculture¹ element to the school campus. Or, at the beginning of the school year, students could harvest and taste varieties of fruit from the school garden. For the **Wood and Paper Module**, students could incorporate wildflower seeds into the paper they make, then plant their paper to grow a perennial garden.

There are many more extensions for primary FOSS modules. In the **Air and Weather Module**, the class could set up a weather station in the garden that students monitor. On winter mornings, they could look for ice and melting patterns or dig under snow to see what plants are still green. In the spring, students could plant seeds indoors in pots and learn about keeping seedlings warm in a classroom window, cold frame, or small greenhouse. In the fall, for the **Solids and Liquids Module**, students could make solutions such as peppermint tea from mint grown

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Lawrence Hall of Science
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Delta Education

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For More Information

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Cultivating FOSS continued

in their garden to learn more about liquids and solutions.

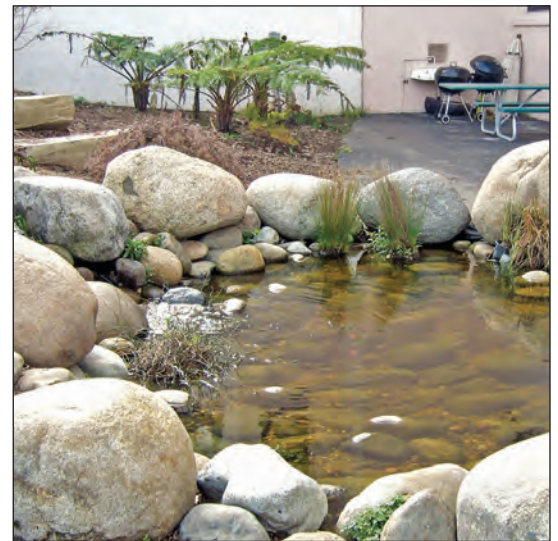
During the **Balance and Motion Module**, students could try out balance experiments by walking along raised beds, stepping stones, logs, and playground structures. Students can use the garden to investigate the relationship between **Insects and Plants**. They might discover insects eating plants, hiding in plants, or getting nectar and pollinating. They might find that an insect has come in contact with a plant, by discovering some munched leaf corners, finding small insect homes in the form of webs between leaves, or locating little-leaf galls. To investigate **New Plants**, you could start a potato garden. Potatoes come up every year, but can spread, so contain them in a structure like a chicken wire cylinder. For the **Pebbles, Sand, and Silt Module**, students can test the garden soil by shaking soil with water and letting it settle. Or students can sift dry soils with the sieves contained in the FOSS kit. Search your garden for the use of pebbles, sand, and silt in schoolyard building masonry, such as cement, walls, and paths.

For the **Matter and Energy Module**, you might want to harness solar energy outdoors by installing a solar pump in a pond or using solar cells to power motors. The garden is a great place to discuss how a plant transforms carbon dioxide, water, and energy through photosynthesis, into plant matter. Through photosynthesis, carbon dioxide, water, and energy are transformed into cellulose, sugar, and starch, providing us with building materials and food. You can see the results of this energy transformation by monitoring the progress of veggie growth over time and graphing it. You can also begin by reading the seed packet and then comparing that information with your data for how many days it really took for the seeds to produce fruit.

In the **Structures of Life Module**, after planting your bean seeds, you can examine garden plants and investigate their adaptations. Plants have specialized structural adaptations that help them

grow. Examples are squashes with large leaves and prickles that help them grow on the ground and succulents that have waxy leaves to conserve water. Be sure to choose plants that grow well in your local environment. (Note: Fava beans are a fun plant to grow in the winter in milder climates as a cover crop. Fava beans go through their life cycle, and we're provided with nutritious and delicious beans to cook and eat.) Select plants with interesting adaptations for students to investigate. Students can also examine the life cycles of insect pollinators to help make the connection that pollinators are essential for helping produce the food we eat. Harvest the whole plant, including the roots, to investigate the entire structure and system.

In the **Environments Module**, students can explore aquatic and terrestrial environments around your



STUDENTS OBSERVE THEIR SCHOOL'S POND ECOSYSTEM OVER THE SEASONS FOR THE **ENVIRONMENTS MODULE**.

school. Maybe you have a pond or creek on your school property, close to your garden. Your class might participate in a local ecological restoration project to enhance habitat. You might want to create a "wild" area in the school garden as a study site to contrast between managed and wild plots. How did uninvited plants get there? What happens when a managed plot is left to go wild? Discover how water is collected or drained on



TOP: STUDENTS MEASURE PLANTS WEEKLY TO TEST GROWTH WITH ADDED COMPOST VS. FERTILIZER SOLUTIONS.

BOTTOM: STUDENTS OBSERVE FAVA BEANS GROW THROUGH THEIR LIFE CYCLE.



surfaces in the schoolyard or do a survey of how much water your school uses for gardening.

For the **Mixtures and Solutions Module**, you could experiment with fertilizer to learn more about the nutrient elements that plants require. Monitor plant growth to contrast plots where fertilizer is added and similar plots without fertilizer. Compost schoolyard plant and food waste to recycle the nutrients from decomposition. For the **Living Systems Module**, you might want to have each student test her or his pulse before and after doing a lot of digging when preparing garden beds for planting. Extend your leaf venation discovery outdoors to the school garden to find leaf patterns. For the **Water Planet Module**, track rain and see how fast water evaporates in the garden by setting out pans of water and mixtures of soil and water to compare and contrast

bright sunlight and shade evaporation; this will also help you know what kind of watering schedule to use.

Whatever strategies you implement, we're sure your year will produce some happy student gardeners, interested budding scientists, delicious food, and some small places of beauty in your schoolyard. If you have a success story from your class about how you connected your school garden to the FOSS Program, please share it with us by e-mailing foss@berkeley.edu, so other teachers can get super ideas to try in their garden. 🌱

¹Permaculture is a design system that seeks to integrate human activity with natural systems to create permanent sustainable agriculture.

PHOTOS BY KAREN MENDELOW NELSON

Materials Management

Van Allen Science Teacher Center (VAST), Cedar Rapids, Iowa

Editor's Note: In January 2011, I had the opportunity to visit the Van Allen Science Teaching Center (VAST) in Cedar Rapids, Iowa. Erica Larson, Science Consultant in the Grant Wood Area Education Agency (GWAEA) and long-time FOSS supporter, invited me on a tour of the facility. Needless to say, I was impressed. The following text is excerpted and annotated from The Linker, a newsletter published by the GWAEA (Summer 2011, vol. 31, issue 4, page 1).

The Van Allen Science Teaching Center (VAST) has experienced tremendous growth in the past 10 years since moving to its present location in Cedar Rapids. During 2001–2002, the staff at the center provided 1,432 science curriculum units to 545 K–6 teachers. In comparison, the staff provided 4,684 science curriculum units to 1,756 K–8 teachers during the 2010–2011 school

year. It became apparent early on that the level of growth required some changes in practice and use of resources



to maintain high-quality service to schools and keep costs low.

During the spring of 2009, the VAST Center staff embarked on a process to enhance workforce management using lean principles. Lean production

or manufacturing principles are used in business models to eliminate waste and enhance value for consumers. As Jeanne Bancroft, VAST Center supervisor, explained, “Routine processes in the VAST Center were identified and studied to determine where changes could be made to offer current services in a more efficient manner.”

The Iowa Quality Center provided support for the training and implementation of the lean process. Gary Nesteby, executive director of the Iowa Quality Center, explained that the process began by defining the VAST Center clients and their needs.

“We looked at current work processes and mapped them,” Nesteby said. “Measurements of the work area were

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Materials continued

completed, the available space determined, and the amount of space needed to effectively complete tasks was determined.”

Changes in operations and physical layout of the center were implemented during the 2010–2011 school year. “We’ve changed to better meet the needs of our clients,” Bancroft explained. “To be effective, we need to partner with those who use our services. Our goal is not to make more work, but to work more efficiently.”

Many data were collected to help identify areas of waste. Common waste areas included unnecessary motion, too much processing, and several other areas. Nестеby explained that a diagram was created of the work the VAST Center staff completes putting each science kit together. “We also measured the amount of bending and ergonomic motions that staff go through to put the science kits together,” Nестеby explained. “One of the big issues was safety because many of the tubs have to be manually lifted and moved with a two-wheel cart.”

Bancroft explained that each science kit contains hundreds of individual items, all of which must be inventoried before delivery and again upon return to the VAST Center. Through the use of lean principles, VAST Center staff determined methods to enhance the science kit replenishment process. One key change has been implementation of cardboard templates where areas are drawn and labeled on the workstation on which items from the kit are placed when unpacking and repacking a kit. This allowed a quick visual inventory and saved significant time over an item-by-item checklist inventory process.



AN EXAMPLE OF ONE OF THE CARDBOARD TEMPLATES USED TO ORGANIZE MATERIALS DURING THE UNPACKING AND REPACKING PROCESSES.

approach where workstations and needed supplies are organized in proximity of each other.

“A change process evolves over time,” says Nестеby. “The VAST Center implemented changes that ultimately will allow students to learn more, teachers more time in the classroom, and the science kits to operate even more efficiently.”



STAFF AT THE VAST CENTER USE SUB-KITS WHERE ITEMS ARE GROUPED AND PRE-PACKAGED IN ADVANCE FOR QUICK TURNAROUND.



VAST CENTER TECHNICIAN, LINDA SCHLICHT, USES A TEMPLATE TO PACK THE **FOSS MIXTURES AND SOLUTIONS MODULE** AS A STEM TEACHER-IN-RESIDENCE OBSERVES.

Another implemented change was the concept of sub-kitting, where items are grouped and pre-packaged in advance of packing a kit to allow for quick turnaround of units. This resulted in the creation of a “rework” area where these tasks are color-coded by when they are needed and stored for the rework team to prepare for the technicians.

Lean principles were used to review the physical space available for organization as well as the processes used to prepare the science kits for delivery to customers. Working with staff, decisions were made to improve the flow of materials through the center. The design was adapted from a cellular

The VAST Center staff is very much committed to this ongoing focus on improvement; they proudly shared their new processes with the GWAEA Board of Directors on February 16, 2010, by taking them on a tour of the center. You can view the video tour here: <https://gwaea.eduvision.tv/Default.aspx>. (Go to the “Most Viewed” tab and to “Grant Wood AEA Staff Info” in the pull-down menu.)

“It’s all about keeping our costs down, while maintaining high quality service,” Bancroft said. “We want to be partners with our clients and will do the best we can to continue our commitment to provide outstanding service to area teachers and students.”

For more information, contact Jeanne Bancroft, VAST Center supervisor by calling 319-399-6560 or e-mailing jbancroft@gwaea.org. You can also explore the VAST Center website here: <http://www.aea10.k12.ia.us/vastscience/materialssupport.html>.



Observations ... by Larry

By Larry Malone, FOSS Co-director

As we continue to labor through and over the process of reinventing and redesigning the Full Option Science System, one issue that has come up is identifying the over-arching goals of the next generation of the FOSS Program. We forged the original goals 25 years ago when we wrote the original FOSS proposal to the National Science Foundation. Those NSF Triad Program guidelines required proposal writers to describe a plan for developing a science curriculum that would serve American science education into the 21st century. After a recent bout of rumination and soul-searching, we concluded that the original goals set forth in 1986 are still viable and currently speak to the mission and direction we envision for the next generation of FOSS. The goals still serve as we march with purpose through the 21st century.

The FOSS Program goals continue to be

- to provide experiences that lead to scientific literacy for all students;
- to provide instructional efficiency for all elementary teachers; and
- to enable systemic reform for school systems.

The goals largely remain solid, but the small print describing what each means and how each has been redefined requires fine-tuning in order to bring them into a contemporary context.

Scientific literacy goal

To prepare a generation of students with a) knowledge of scientific and environmental concepts and principles and b) functional understanding of how that knowledge prepares them to pursue advanced study and productive careers in the scientific, technical, and engineering communities.

To prepare students to participate in the scientific discourse that promotes productive, data-driven decision-making and community action.

Instructional efficiency goal

To design, produce, disseminate, and implement high-quality instructional materials that provide every teacher with the means for orchestrating exemplary science learning in all communities across the country.

To design high-quality instructional materials incorporating acclaimed, current information available from research in the areas of science, science education, language arts, mathematics, cognitive science, instructional design, professional development, and best classroom practice.

Systemic reform goal

In the 1990s, systemic reform meant enacting major structural changes in the mega-structures of science education. This was enacted in three waves of implementation, with each wave focused on a specific level of educational organization:

- a. state education bureaucracies,
- b. major urban education structures, and
- c. large geographic collaborations of rural educational agencies.

FOSS (the instructional materials and the project staff) played a role in all levels of systemic reform with a number of successes

that produced important but minimally effective reform efforts. The potential for FOSS to initiate a significant reform in the science educational experience of all children in a mega-system by itself is unrealistic.

In rethinking systemic reform, we have redefined the system that we think we can expect to reform. FOSS has readjusted our focus much closer to the scene of the action, the school. Going forward, the goals will be to

- encourage the development of science-centered schools. The locus of reform will be the school and the community it serves.
- create a new paradigm for science performance and academic success that will pervade and redefine the culture of the school.

The redefined goal of systemic reform maintains a prominent position in our field of vision as we design and craft the next generation of the FOSS Program. We envision new communities of learners in which science is the academic core of the curriculum, and learning is oriented around natural phenomena that have immediate, historical, and cultural significance for students, educators, families, and community leaders associated with the school. FOSS will enhance and promote the educational priorities and aspirations of the community that represents the school.

Sound unrealistic? FOSS is being redesigned to accomplish its three goals. Goal 3, systemic reform, is the most challenging. We can't accomplish that one by just designing a world-class curriculum. Systemic reform can occur only when educators understand and value the potential of the program to reform education.

Reform is change. We know from experience that change doesn't happen in institutions, it happens in people. Institutions change as a result of changes in the people who define and operate the institutions. Reform means "form again." To do so requires dismantling the system and disentangling the interacting elements, followed by a thoughtful and careful reassembly of the parts to create new structure from the existing elements. The new structure may require previously ineffective components to assume new functions with new expectations. Perhaps previously dominant elements or players will have to relinquish power and authority to fashion functions more compatible with the revised vision.

Make no mistake, the instigator in the process of reform is invariably a top administrator, perhaps a site principal, a district STEM coordinator, or a district superintendent. Someone with authority has to say "our efforts have not been getting the job done. Let's take a different tack." It takes an immense amount of courage on the part of an administrator to confront the wave of accountability in literacy and math. Even when it is clear that the creative juice is draining out of the teaching staff, and the students are indifferent and spiritless as a result of the monotony of skills-based curriculum, it is difficult for an administrator to implement a more humane and stimulating instructional practice for young learners. The background discussion of concerned parents agitating for better opportunities for their children and the chorus of wailing from the community when the school fails to deliver satisfactory spikes in standardized test scores is hard to ignore.

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Science Buddies: How One District is Successfully Pairing up Students to Maximize Science Instruction

By Joanna Totino, FOSS CA K-5 Professional Development, Co-Director, and David Lippman, FOSS Project Specialist

You've probably heard of Reading Buddies; it's a program that pairs older and younger elementary students in a buddy system and has them read aloud to each other, benefiting both students. The program has been very successful in schools across the country. If it can work with reading, then why not with science? That's exactly what a group of lead science teachers from Cambrian Unified School District in San Jose, California, thought. Cambrian has four elementary schools, and at each school there are teachers using Science Buddies.

The idea of Science Buddies came about during a FOSS Leadership Academy (FLA) meeting. Teachers from each Cambrian school participate in the FLA. The FLA is a three-year professional development program consisting of groups of teachers from different school or district sites. The program includes off-site summer institutes and technical assistance days at the school sites.

Cambrian teachers had previously participated in forming buddy classes, but after this particular FLA meeting, Cambrian teachers agreed to use their buddies as a way to integrate more science into additional classrooms at their school sites. Regarding how they came up with the idea for science buddies, Lisa Lansberg, a fifth-grade teacher, says, "We were trying to come up with more avenues for our role as teacher leaders at our school. We are trying to use our FLA leadership skills to bring more teachers onboard, both with teaching FOSS and integrating science with English Language Arts (ELA). Buddies are another way for us to affect change at our sites via supporting our fellow teachers."

The Science Buddies program works by having one elementary class pair up with another class at a higher grade level. For example, a first-grade class teams up with a fifth-grade class. The classes usually meet once a week for about 45 minutes. The students engage in a FOSS activity at the lower grade level (in our example, the students would do an activity from a first-grade module). The older students act as a support group for the younger students. The older students guide the younger students by asking questions and helping the younger students move through the steps to complete the science investigation. Jannelle Lam, a second-grade teacher, says,

“Lisa’s class comes to visit every Thursday for at least 45 minutes. I tell her which investigation we will be working on. She has her fifth graders do the science activity first before meeting with their buddies so that they are able to help their second-grade buddies.”

John Hayes, a fifth-grade teacher, says, “We follow the first-grade science curriculum. Each week, usually on Tuesday, we meet for about 20–30 minutes to talk about which FOSS lesson we’ll do on Thursday. Stephanie lets me know which lesson is up next, and we talk about materials and how the fifth-grade buddies can best help. What the fifth-grade buddies do each week depends on the lesson, but generally we do the investigation together, including adding notes and illustrations to the first-grade notebooks. Sometimes the students will read the FOSS science books together, but we’ve found that the hands-on investigation is a great opportunity for interaction between buddy pairs.” John teaches his fifth graders the new science vocabulary they will be working with and helps them find simple, easy ways to explain it to the first graders that they buddy up with. “A big part of my coaching the fifth graders is to let them do the first-grade investigation first and satisfy their own curiosities about the investigation and the science,” he says.

This system benefits both grade levels. The older students attending Cambrian Unified did not have the FOSS curriculum taught in their first- and second-grade classes; the investigations they do with their younger buddies are largely new to them. The older students benefit by improving their leadership skills and further developing their oral and writing skills. They are able to expand their skills by teaching the younger students and explaining the science investigation, helping them with whatever questions come up. One of the fifth-grade students writes, “Having a buddy taught me flexibility and patience. I also learned so much science that I did not know because FOSS wasn’t in our [school] in second grade.” The student goes on to explain how fun

and exciting it is to have a buddy and do science investigations with her or him. The younger students benefit greatly from the one-on-one attention from their older buddies. They find great joy and excitement from doing science investigations assisted by older students. Both grade levels are able to expand their knowledge about science by working as scientists together, engaging in active investigation.

For teachers, the Science Buddies program sets up a strong framework for establishing a schedule for teaching science. This is essential for lower grade teachers who often don’t get much

opportunity to plan science lessons. It is most beneficial to pair up teachers who are less comfortable with science with those who have more experience teaching science. John Hayes says, “[Science Buddies] is a fun and productive way for teachers to collaborate on science at different grade levels. When one teacher is new to the curriculum, it provides a built-in mentor relationship.”

Teachers who are newer to teaching FOSS are provided a support system through pairing up with teachers who have more experience with FOSS. Karyann

Wilson, a fourth-grade teacher, says, “Teachers who are intimidated by science have an opportunity to plan science investigations with another teacher and to see how science concepts can be taught in different ways.” Allowing teachers time specifically set aside to plan science lessons, while having another teacher support their planning, allows teachers to become much more comfortable with teaching science. “This is a fantastic arrangement for teachers to use. It takes the traditional buddies model and focuses it on a content area, capitalizing on the instructional minutes used to bring two classes together,” says Tyler Graff, a third-grade teacher.

Before beginning a Science Buddies program at your school, there are a few challenges to the project that will need some consideration. Scheduling a good time for both grade levels can be difficult, and it can sometimes even be hard to find a space large enough to hold both classes and all of the materials. The program can be time-consuming, and teachers have to work together to organize each activity. However, these challenges can be easily dealt with. As long as both teachers are eager to make the program a success, they won’t have any trouble overcoming these obstacles. Jannelle Lam says, “You just need to be able to schedule time with your buddy class. It’s amazing to see a classroom of over 50 kids all engaged in science. Loud, yes, but amazing nonetheless.” Matt Hill, a fourth-grade teacher, says, “Before we meet, I walk through the investigation with my kids and talk to them about



A FIFTH GRADER GUIDES A SECOND GRADER THROUGH A BALANCE INVESTIGATION.

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Science Buddies continued

how to ‘teach’ the lesson. We talk a lot about the inquiry bit—letting the first graders explore and make mistakes rather than just showing them what to do. If the first graders are drawing or writing something, their buddies are supposed to help them with their vocabulary, labeling diagrams, etc. My buddy teachers were interested in still periodically doing Reading Buddy class activities so we alternate between science and other activities.” One idea they might try next is combining Reading and Science Buddies by reading *FOSS Science Resources* and other books related to the FOSS module.

The Cambrian Science Leadership Team highly recommends trying Science Buddies. They’ve found it to be a fun and productive way for teachers to collaborate on science at different grade levels. Many

schools already pair up primary and secondary grade classrooms. Usually these partnerships focus on reading. Why not try a science activity? Pairing up teachers who are less comfortable with science with more experienced FOSS teachers provides new FOSS teachers additional support by giving them their own buddy too! Lisa Landsberg says, “Because teachers already do buddy classes, this is not ‘one more thing’ to fit into the day, but simply requires teachers to rethink how to use the buddy time for maximum impact to support science instruction.” Having Science Buddies is a great, easy, and effective way to teach science that provides benefits that students’ at different grade levels and teachers can all enjoy. 🌿

FOSSweb 2.0 Coming January 2012

Exciting changes are coming to FOSSweb! Starting in January 2012, FOSSweb users will have the option of using a new and improved FOSS website. The redesign of FOSSweb ensures that teachers, administrators, students, and parents will be able to quickly and easily locate valuable online resources. The new site will also include newly released online teaching tools and features.

Some of the things you’ll find on the new FOSSweb include:

- the ability for teachers to create online class notes and assignments for students,
- a full listing of module resources for each investigation in an easy-to-access location,
- interactive-whiteboard resources and access to streaming-media clips for select FOSS modules,
- online versions of the Teacher Guides and student books (for more information, speak to your Delta sales representative)
- Teacher Preparation Videos,
- audio versions of student books,
- exciting student multimedia activities for the classroom or at home
- lists of recommended books and videos for students and teachers, and
- many more student media, teaching tools, and administrative support resources.

To take advantage of the new and enhanced resources, teachers and administrators will need to register for an account to access some FOSSweb features. This registration process is designed to enable our users to customize their experiences on

FOSSweb and to quickly access the modules and resources that they are currently using. For more details about the new registration process and to sign up for updates, you can follow the link in the News area of the present FOSSweb Welcome page at www.FOSSweb.com. By signing up, we’ll keep you informed about when the new site will launch and send you important information on how to register for an account. In January, you will find more information on how to register for an account on the new FOSSweb homepage by clicking “New FOSSweb User? Register here.”

For students, their families, and users who want to look around before registering, select FOSSweb resources on the new site will be available without a login. To view these resources, you can visit as a guest by supplying your role (teacher, administrator, student, parent), state, and grade level. You will then be able to view selected resources for your module or course. By selecting state and grade level, users will get to the resources most important to them more quickly.

For those who would like to continue using the existing FOSSweb, you will be able to do so until August 2012. At that time all FOSSweb users will transition to the new, improved site.

Please go to FOSSweb.com, FOSSweb.com/CA, or FOSSweb.com/NYC to sign up to receive important FOSSweb



Observations continued

Those educators who choose the path less traveled into science-centered learning will be rewarded by the immediate quickening of the pace exhibited by students and the exclamations of teachers scrambling to keep up with students as they rush forward along all the new paths open to them. Teachers at schools where they have adopted a science-centered curriculum are pleasantly surprised to see the enhanced excellence of their students' writing. Students write more and do so with vigor, creativity, and imagination.

After the decade of systemic reform programs, a report issued by NSF distilled a number of dos and don'ts. Some of them are compatible with the systemic reform goal of FOSS. The report recommends the following.

LESS EMPHASIS ON	MORE EMPHASIS ON
Policies unrelated to standards-based science reform.	Policies designed to support changes called for in standards.
Administration determining what will be involved in improving science education.	Teacher leadership in improvement of science education.
Authority at upper levels of education.	Authority for decisions at level of implementation.
Union contracts that ignore changes in curriculum, instruction, and assessment.	Union contracts that support improvements indicated by standards.
Standardized tests and assessments unrelated to standards-based instruction.	Assessments aligned with standards-based instruction.

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The table of NSF recommendations resonates well with core issues in American educational policy. To succeed in our efforts to produce a generation of scientifically literate citizens, we will have to establish new fundamental priorities that honor teachers, respect and cherish learners, and encourage institutional reform. In the punitive environment created by No Child Left Behind, there are few winners. The prospects for change seem remote, but even so, Diane Ravitch finds glimmers of hope on the horizon. In a recent Education Week blog, Reasons for Hope, she provides an insightful essay on her perceptions of the state of educational policy, http://blogs.edweek.org/edweek/Bridging-Differences/2011/06/reasons_for_hope.html.


The momentum of educational reform is further supported by the powerful message presented by Michael Fullan, in a recent paper, *Choosing the Wrong Drivers for Whole System Reform*, www.michaelfullan.ca/home_articles/SeminarPaper204.pdf. This paper, commissioned and published by the Center for Strategic Education (CSE), is assigned reading for all FOSS educators. Among other things, Fullan says in the introduction,

Whole system reform is the name of the game and 'drivers' are those policy and strategy levers that have the least and best chance of driving successful reform. A 'wrong driver' then is a deliberate policy force that has little chance of achieving the desired result, while a 'right driver' is one that ends up achieving better measurable results for students. Whole system reform is just that, 100 per cent of the system, a whole state, province, region or entire country. This paper examines those drivers typically chosen by leaders to accomplish reform, critiques their inadequacy, and offers an alternative set of drivers that have been proven to be more effective at accomplishing the desired goal, which I express as:

The moral imperative of raising the bar (for all students) and closing the gap (for lower performing groups) relative to higher order skills and competencies required to be successful world citizens.

As an advance organizer I suggest four criteria, all of which must be met in concert, which should be used for judging the likely effectiveness of a driver or set of drivers. Specifically, do the drivers, sooner than later,

- 1. foster intrinsic motivation of teachers and students;*
- 2. engage educators and students in continuous improvement of instruction and learning;*
- 3. inspire collective or team work; and*
- 4. affect all teachers and students—100 per cent?*

And, of course, the same drivers apply at the more intimate school system level as well. If Ravitch and Fullan are right, and I'm sure they are, FOSS will be ready and able to help administrators muster the courage to create the new wave of next generation schools that will establish the vanguard of a new age of science, mathematics, and engineering education reform. 

Wai Chin Ng

Josiah Quincy Elementary School in Boston, Massachusetts
 By Erica Beck Spencer, FOSS Developer/Outdoor Initiatives Coordinator



PHOTO CREDIT: FANNIE NG

Wai Chin Ng, a fifth-grade classroom teacher at the Josiah Quincy Elementary School in Boston, Massachusetts, was recently awarded the Presidential Award for Excellence in Mathematics and Science Teaching in 2011. The award is the highest recognition a K–12 math or science teacher can receive. “This award brings great joy and honor to our school and our city,” said Quincy Elementary Principal Simon Ho. “Mr. Ng

believes that every student has a scientist inside them that is waiting to be unleashed; it is our job to make it as easy as possible for our students to open this door of discovery.”

He began his teaching career in the same school 18 years ago. He’s learned a few important lessons along the way. For example, when I asked him how he finds time to teach all the core subjects he shared, “It is impossible to have enough minutes to cover everything. I just have to be creative at times. I find that it is actually more effective to integrate various disciplines so that learning doesn’t become so disconnected. Students enjoy project-based learning and absolutely love science. Whenever I have an

opportunity, I always try to connect their learning to science.”

Wai Chin is a teacher leader for the Boston Public School Science Department. In addition to teaching FOSS, he teaches fellow BPS teachers how to teach the adopted FOSS science modules. Beverly Nadeau, the materials specialist for the science department shared, “Wai Chin Ng provides all his students, both students and teachers, with instruction that is engaging and challenging. He has developed a community of learners in his workshops and his classroom that impacts science learning in the Boston Public Schools.” About his work as a teacher leader he says, “I have many opportunities to conduct workshops for teachers, participate in professional development activities, and to reflect on my teaching. With the strong support from colleagues, administrators, and the Science Department, I feel quite confident and equipped in teaching science.”

In addition to his demanding work as a classroom teacher and a science teacher leader, he has coached a before-school robotics club for five years. They compete in regional and state championships. Some competitions require three months of preparation.

Wai Chin shared, “It was truly an honor and a humbling experience for me to visit Washington, D.C., and meet some of the nation’s dedicated leaders from groups like EPA, NASA, NSF, NOAA and the Obama administration—inspirational educators, scientists, astronauts, congressmen, and the President! This is definitely not an end of a journey but merely the beginning of another chapter on challenging myself to become a more effective teacher in impacting our future leaders.”

The entire FOSS team would like to extend our sincere appreciation for the dedication to the teaching profession that Wai Chin exemplifies. Congratulations on this tremendous achievement. Your students and the teachers you inspire to teach science well are all so lucky to have you. 🌿

Launching a Revised and Improved Website, Outdoor Biology Instructional Strategies (OBIS) www.outdoorbiology.com

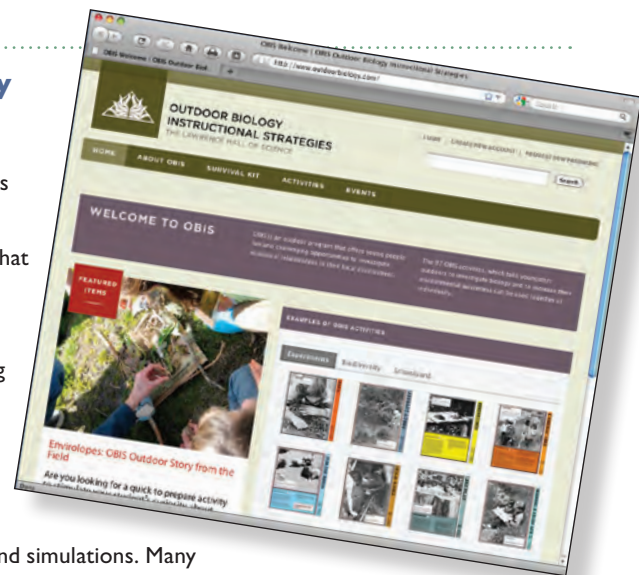
We are excited to announce the launch of the improved website for the Outdoor Biology Instructional Strategies (OBIS). OBIS activities, developed in the late 1970s and early 1980s at the Lawrence Hall of Science, provide hands-on outdoor experiences that engage students in the local environment. OBIS can be used to extend FOSS modules and courses. For example, if you are teaching the **FOSS Structures of Life** or **Environments Modules**, consider teaching the OBIS Food Chain Game or Population Game to simulate animal behaviors and population dynamics students are studying in class. If you are using the **Insects and Plants Module**, try Litter Critters.

The new OBIS website includes thumbnails of the front page of each activity. You can search for activities by ecological concept, type of study site, and type of activity. The website will highlight various activities and share stories from the field about how teachers use activities with students, and offer a Leadership Guide suggesting strategies for taking your students outdoors. You will find a calendar of OBIS workshops being offered around the country.

The OBIS Program is designed to engage students outdoors in ecological study. The outdoors becomes a laboratory where the

OBIS activities provide the experiences that help children develop an understanding of basic ecological concepts through exploration and simulations. Many activities can be done in the schoolyard, as well as various other outdoor locations.

Stay connected to FOSSweb for FOSS module links to outdoor investigations and OBIS. As school begins this year and FOSS investigations are stimulating your student’s science fascination, keep their environmental attention as well by going outdoors and doing OBIS! 🌿



Educators Rendezvous for FOSS Planetary Science Institute

On Tuesday, June 28, 2011, twenty-one science educators from around the country rendezvoused at the Lawrence Hall of Science to begin four days of exploration of the revised **FOSS Planetary Science Course for Middle School**. The **FOSS Planetary Science Course** was initially introduced in 2001, before Google Earth was released and before space exploration like the Kepler Mission (<http://kepler.nasa.gov/>)

provided new tools and information for the study of our planetary system and beyond. Now, the **Planetary Science Course** has been updated to include these new tools. (See the Spring 2011 issue of the *FOSS Newsletter* [<http://lhsfoss.org/newsletters/present/FOSS37.middle.school.html>] for more details about the revision process.) It also incorporates new assessment tools and notebooking strategies.

During their mission with the FOSS staff at the Hall, participants reviewed the investigations and materials that were derived from the original **Planetary Science Course** and experienced the new

components. They viewed Earth from above, investigated craters, and set up models to demonstrate Earth's seasons and the phases of

the Moon. They took a closer look at the planets and other objects in the solar system. They also focused on the tools and data used in the search for Earth-like planets among the trillions of potential exoplanets (i.e., planets beyond the solar system) orbiting other stars. The FOSS revision team worked with staff from NASA's Kepler Mission to include these investigations in the revised edition.

Members of the astronomical community in the Bay Area provided the teachers with insights into the latest research in planetary exploration.

- Andrew Fraknoi, Chair of the Astronomy Department at Foothill College and the former Executive Director of the Astronomical Society of the Pacific, presented an illustrated lecture called "Where Bill Gates' Great Granddaughter Might Go on Her Honeymoon: The Top Tourist Sights of the Solar System."

- Fraknoi moderated a public dialogue titled "Are We Alone?" with leaders of the NASA Kepler Mission, Bill Borucki (Principal Investigator, NASA Kepler Mission), Natalie Batalha (Co-Investigator and Deputy Science Team Lead, NASA Kepler Mission, and lead author for the discovery of the first nearly Earth-size rocky planet), and Gibor Basri (Co-Investigator for NASA Kepler Mission and professor in the Department of Astronomy at University of California, Berkeley).

- Edna DeVore, Deputy CEO and Director of Education and Public Outreach for the SETI Institute, talked about "Life in the Universe."

The finale of the workshop was an evening at the Chabot Science Center situated on the East Bay Hills in Oakland, California.

Participants viewed two planetarium shows, had a chance to explore the science center's exhibits, and to cap it off, had a special viewing through "Nellie," Chabot's new 36" reflector, where they saw Saturn and its moons, a star cluster, and the Ring Nebula (<http://www.chabot.space.org/nellie.htm>).

Watch for the public launch of the revised **FOSS Planetary Science Course** in 2012. If you are attending one of the NSTA Area Conferences this fall, you can explore the course during one of the introductory workshops being offered. Check out the calendar on page 15 of this newsletter for dates and times. 🌿



ANDREW FRAKNOI MODERATED THE DIALOGUE WITH THE LEADERS OF THE KEPLER MISSION.



WORKSHOP PARTICIPANTS, AS WELL AS THE GENERAL PUBLIC, ARE ENGROSSED IN THE UPDATES OF THE KEPLER MISSION.



HELEN WEBER FINDS OUT WHAT IT MIGHT BE LIKE TO WORK IN SPACE.



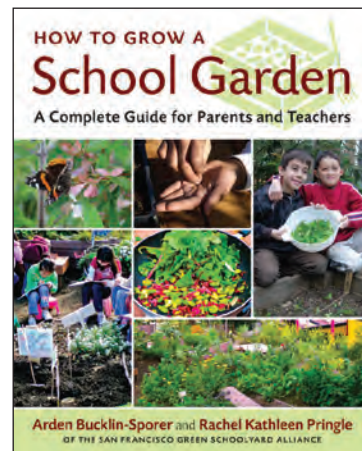
DARRICK WOOD RIDES HIS WAY THROUGH THE BILL NYE'S CLIMATE LAB AT THE CHABOT SCIENCE CENTER.



New from the Wordsmiths

This Wordsmiths column features books on schoolyard design and school gardens. If you have found a book that you think other FOSS users should know about, please send the reference to foss@berkeley.edu, including author, title, ISBN, and a short annotation.

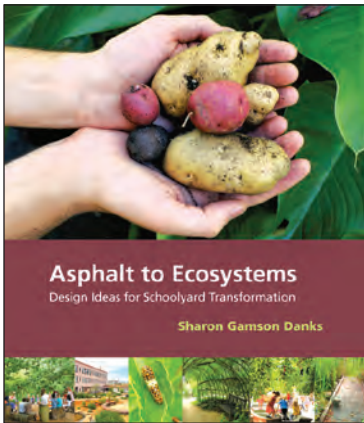
The books for this issue of the *FOSS Newsletter* were reviewed by Erica Beck Spencer, FOSS Developer/Outdoor Initiatives Coordinator.



**How To Grow a School Garden:
A Complete Guide for Parents
and Teachers**

By Arden Bucklin-Sporer and Rachel Kathleen Pringle. Timber Press, Portland, OR, 2010. ISBN: 978-1-60469-000-2. Adult. **(Life Science Strand)**

Be careful! If you crack this book open, you're going to want to start gardening with students. The enthusiasm for school gardens in this book is contagious—you can feel it in the photographs of the students and adults working outside. The authors are the backbone of the well-established San Francisco Green Schoolyard Alliance and have successfully greened many of the schoolyards in San Francisco with outdoor classrooms or gardens, as well as lending support to others who started on their green schoolyard projects. The book is loaded with strategies for creating sustainable garden projects, helpful to-do lists, easy recipes, tricks of the trade, and of course great lesson ideas for K–8 gardening. “Salad Partyyyy!” (as third-graders enthusiastically call it) is my favorite garden activity where students harvest from the garden, make a salad, and eat it, all while in the garden. My favorite gardening trick is to drill holes on the bottom of one-liter sized yogurt containers for young students to water the gardens. My favorite list in the book is titled, “What to do with a recalcitrant principal.” If you have already fallen in love with gardening with students, or if you want to begin a garden adventure at your school, you will not be disappointed with this book. The authors are experts on the subject of school gardens and will inspire and improve some aspect of your practice.



Asphalt to Ecosystems: Design Ideas for Schoolyard Transformation

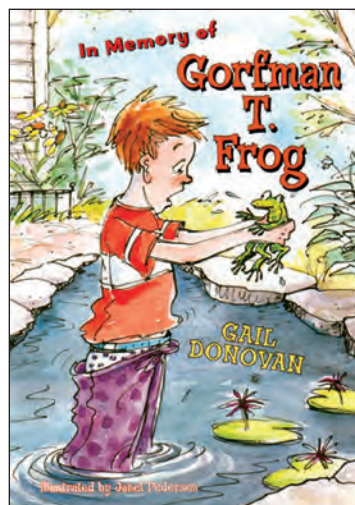
By Sharon Gamson Danks. New Village Press, Oakland, CA, 2010.

ISBN: 978-0-9766054-8-5. Adult. **(Life Science Strand)**

Hands down, this is absolutely the most comprehensive book about greening schoolyards that I have seen, and I've seen most of them. The author's work involves photos from unbelievable green spaces from 11 countries around the world and spans a decade of research. If you have an inkling of desire to do some greening projects in a schoolyard or are looking for inspiration for yourself or others, this book provides all the information you need, along with saving you time and money. It is loaded with gorgeous photos of students working and learning outdoors in spaces that are now teeming with life but were once barren asphalt. The teacher in me focused on the many ways to organize seating outdoors. Some are simple seating arrangements using tree sections in a circle or various ways to have amphitheater seating. There are also photos of artful and functional cob bench sculptures or the dual functioning flower-shaped concrete raised tree bed that also provides seating.

The book is brimming with integrated art projects that range from tile mosaics, painted asphalt, to willow sculptures. Often the art is functional and beautiful. These outdoor spaces are welcoming, provide ownership when created by students and parents, build community, and, of course, invite active learning right

outside the classroom door. Concluding the book, Sharon Gamson Danks writes, "The examples in this book are intended to help you envision what is best for your school, to help you avoid 'reinventing the wheel.' Use this book as a springboard to develop your own ideas or tailor those you have read about to reflect your own school community and its geographic location. Dream of the schoolyard you would like to achieve and then help to shape this reality at your school." *Asphalt to Ecosystems* provides a wealth of information about how to create effective and beautiful spaces while simultaneously truly inspiring everyone to get out there and start building. Looking at the pictures of this book makes me want to get over to my kids' schoolyards and start working—and as a full-time working mother, that's saying something.



In Memory of Gorfman T. Frog

By Gail Donovan. Illustrated by Janet Pedersen. Dutton Children's Books (Penguin Young Readers Group), New York, NY, 2009. ISBN: 978-0-525-42085-9. Grades 3-6. **(Structures of Life Module, Environments Module)**

After playing the OBIS Food Chain Game with third graders, a student told me about a novel in which students played a very similar game. The main character, the adventurous fifth grader Joshua Tree Hewitt, is often getting in trouble for talking too much. While trying to avoid getting into any more trouble before school one day, he stumbles upon

a frog in the pond near his house. Not just any frog—a five-legged one! In order to win some much needed approval from his teacher, he brings the frog to school. The entire class falls into deep adoration for the frog and unites together to uncover the mystery of the frog's fifth leg. This is the kind of book that will make students beg for you to read to them. Third-through fifth-graders will gobble it up as fast as I did.

After students have enjoyed reading the book, they may be interested to learn more about the book, the author, and her writing practice. Check out the interview with the author on page 14. You can make copies of the interview to share with your students. If you have any comments or ideas about using this book and any of the other books reviewed in this issue, you can send them to Erica at ebspencer@berkeley.edu.

Curricular Connections

Want your students to really understand what a food chain is? Check out an OBIS simulation game called Food Chain Game at <http://www.outdoorbiology.com/node/42>. If you're teaching the **Structures of Life Module**, you may want to introduce the game by talking about the food chain of a crayfish. Focus question: What is necessary to create a balanced food chain?

Interview with Gail Donovan

Author of *In Memory of Gorfman T. Frog*



We asked Gail Donovan, the author of *In Memory of Gorfman T. Frog*, some questions about her book and about writing. Here's what she had to say.

Q: When did you decide that you wanted to be a writer?

A: In first and second grade I struggled with reading, maybe because I was young for my grade. But by third grade reading was a pleasure, and I loved curling up with a good book. Within a couple of years I knew that I wanted to do more than read books—I wanted to write them, too.

Q: How long did it take you to write this book?

A: Six years.

Q: Is it hard work writing books?

A: It can be hard to make myself go sit down in a quiet room and start to work. But once I get started, writing doesn't feel hard. It's when my brain feels the most *awake*, like a beehive buzzing with activity. I can't see all the work going on in there, but I know my brain is working and thinking and creating. I love that feeling.

Q: What do you do if you're having trouble finishing a story?

A: One tool I like to use is asking for help. When I was halfway through *In Memory of Gorfman T. Frog*, I got stuck. I asked my daughter's third-grade teacher if I could read the story to his

class because I knew I could never read them half a book and then say, "There's no more." So each morning I would go in and read a chapter, and each afternoon I would go home and write another chapter. I finally finished.

Q: Where did you get the idea to have Joshua find a deformed frog?

A: I had to figure out what would make a talkative boy like Josh talk more than he already did and get in even more trouble. I felt that many kids care deeply about animals and nature. But what animal would Josh care deeply about? And why? Then I read an article about deformed frogs in the science section of a newspaper, and I knew that was the creature that Josh would find.

Q: What do you think makes a strong main character?

A: A main character should be unique, with a combination of characteristics that we have never seen put together in exactly that way before.

Q: Since you put so much effort into writing a book and developing the characters, is it hard when you have to stop working on a book?

A: It is a big relief! I also get excited, thinking about readers reading the book, which can't happen until I stop working and say, "It's done."

Q: Tell us about your next book? Does it cover some interesting science content?

A: My newest book, *What's Bugging Bailey Blecker?* features another creature that is kind of gross but also fascinating: the head louse. The main character learns more than she ever wanted to about the life cycle of the head louse when lice invade her classroom and unfortunately, her head.

Calendar of Events

► FOSS Institutes

Delta Education will host two one-day FOSS Institutes before the National NSTA Conference in Indianapolis, Indiana (March 28, 2012). These Institutes, one for K-5 and one for middle school, will be for educators from districts that have implemented FOSS or are planning to implement FOSS. The Institutes will focus on newly developed FOSS materials which include: K-6 FOSS 3rd Edition, *The Next Generation of Active Learning*, and the revision of the FOSS middle school **Planetary Science Course**. 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 the Institute, please write, fax, or e-mail:
Pam Frisoni
Delta Education
80 Northwest Boulevard
Nashua, NH 03063
pam.frisoni@schoolspecialty.com
Fax: 920.882.4598

FOSS CA Newsletter E-blasts

Are you a teacher using the California edition of FOSS? Sign up to receive the FOSS CA newsletter e-blasts today! The FOSS CA newsletter e-blasts will be delivered biannually to your e-mail inbox and feature content specific to the FOSS California edition. To sign up for the newsletter, visit www.FOSSweb.com/CA and click on the e-blasts button.

FOSS Newsletter

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

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

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NSTA 2011 FALL AREA CONFERENCES

K-8 Commercial Workshop Schedule

Hartford, CT	October 27–29, 2011
New Orleans, LA	November 10–12
Seattle, WA	December 8–10

Thursday (10/27, 11/10, 12/8)

8:30–10:30	Using Science Notebooks with FOSS
11:30–1:00	FOSS Program Evolution and the Next-Generation Science Standards
2:00–4:00	Taking Science Outdoors with FOSS K–8

Friday (10/28, 11/11, 12/9)

8:00–10:30	Using Student Science Notebooks to Assess Learning (For Experienced Users)
11:30–1:30	FOSS Planetary Science for Middle School
2:00–4:00	Developing Language Using FOSS

Follow us on Facebook and Twitter!



<http://www.facebook.com/FOSSscience>



<http://twitter.com/FOSSscience>

See you at the NSTA Area Conferences this fall!

Attend an introduction to the revised Planetary Science Course at NSTA!

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 the Lawrence Hall of Science will work together to bring you news two times per year, including articles regarding the latest development of modules, tips about management from teachers and administrators, ways to make connections with other teachers and districts, extensions and reading materials to add to modules you are already using, and informative articles about good educational practices.

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

Sue Jagoda, Editor (skjagoda@berkeley.edu)
FOSS Newsletter
The Lawrence Hall of Science
University of California
Berkeley, CA 94720-5200

The deadline for submissions to the next issue is December 9, 2011. We're waiting to hear from you.

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