

Something Exciting Is Happening in Boston: Science in the Schoolyard

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Science teachers in Boston Public Schools (BPS) are getting kids outside on a regular basis, despite teaching in an urban district, in a high-stakes testing environment, and in a typically pressure-packed 21st-century public school. These outdoor explorations are an integral part of teaching with the elementary FOSS modules. Through Science in the Schoolyard (SSY), a project of the Boston Schoolyard Initiative (BSI) in conjunction with the BPS Science Department, teachers use the schoolyard to help students apply science concepts to the “real world.”

Science in the Schoolyard: Guides To Taking FOSS Outdoors helps teachers make these connections by providing detailed information about when and how to take students outdoors for each FOSS module used in Boston. The guides were co-developed and piloted by BPS teachers.



SECOND-GRADE SCIENTISTS AT THE HARVARD-KENT ELEMENTARY SCHOOL IN BOSTON OBSERVE PLANTS IN THEIR OUTDOOR CLASSROOM.

The BPS Science Department distributes the SSY guides through FOSS module trainings, other professional development events, and in the kits themselves. Peer-led professional development workshops and in-service courses also help teachers develop the skills and understanding to teach successfully outdoors.

How Going Outside Extends Science Learning

Why take students outside as part of a FOSS investigation? There are many reasons. At the most basic level, using the schoolyard to extend science investigations reinforces students' understanding that the properties of materials and the relationships between organisms, structures, and behaviors they are studying in science class are also found all around them outdoors every day. Wood is everywhere, air is moving, seeds are germinating, and magnets stick to some things but not others.

The schoolyard can also become a laboratory for messy investigations, allowing students to spread out and more freely explore their materials. Outdoors, students can observe organisms in their natural habitat (e.g., snails, insects, isopods, plants) and compare their structures and behaviors to the organisms studied in the classroom. Students can also experience how concepts they explored in the classroom have application in the outdoor environment, such as the movement of water on a slope, levers and pulleys at work, and erosion. And by using the schoolyard students gain access to elements unavailable in the classroom—winter cold and ice, air currents, weather, and living ecosystems. Perhaps most important is the opportunity the schoolyard offers for students to view changes over time—the germination and growth of seedlings, the life cycle of a plant, the impact of erosion, and seasonal variations in air and soil temperature.

Example: Water on a Slope

Water on a Slope (from the **FOSS Water Module**, Investigation 1, Part 3), as an example, shows how an outdoor activity can reinforce and deepen students' understanding of a science concept

covered by the module. During the indoor lesson, students use a plastic lunch tray covered by wax paper with various sized drops of water at one end of the tray. Students gradually tilt the tray to create a slope and then observe what happens.

In the SSY guide, students explore the behavior of water on a slope by pouring two liters of water on a variety of slopes and surfaces in the schoolyard. They begin with the seemingly “flat” paved schoolyard surface (about 15 meters from the schoolyard drain). After observing the flow for a few minutes, students realize the stream is moving toward the drain. Students often start to cheer on the water when it starts to move more slowly, chanting in unison, “Go. Go. Go.” Students notice many things during this lesson including:

- Water picks up and moves sediment as it flows down the slope.
- Many small streams turn into one or two larger streams.
- The water is not absorbed by the pavement.
- The pavement, their schoolyard, is indeed a slope.

The rest of the lesson, which continues over an entire class period, directs students to pour two liters of water onto three other surfaces with varying degrees of slope.

During the outdoor part of the lesson, teachers consistently find that children produce more advanced writing and thinking when recording their observations. Students write more



STUDENTS AT THE GARDNER PILOT ACADEMY IN BOSTON COUNT SEEDS IN DRIED MARIGOLD FLOWERS AS PART OF THE **FOSS NEW PLANTS** EXTENSION.

in their science notebooks and use richer descriptive vocabulary to capture the myriad real-world details they see, including accurately sequencing the steps of the experiment. They ask follow-up questions and contribute additional ideas including other slope investigations to try. Finally, students refer back to the schoolyard lesson at a later date.

One student at The Edward Everett School in Dorchester was investigating slope in the **FOSS Landforms Module** in fifth grade. He enthusiastically said, “Ms. Beck, this reminds me of when we did the water activity outside in third grade.”

For students who have traditionally been reluctant writers, studying science outdoors can be a transformative experience. Words come

Teresa Strong, Science Specialist

“We had the good fortune of finding ladybug pupae and larvae in our schoolyard. Students have been bringing in mosquito larvae and grubs now that they know what to look for. Now they really understand that insects take different forms.”

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more easily, and they are able to express their thoughts with a degree of clarity that often surprises them.

Many Boston educators notice that after doing the FOSS lessons outside, students really begin to own the new vocabulary. After the indoor and outdoor *Water on a Slope* activities, students appreciate that there is a lot to notice in science and become invested in speaking and writing about their learning.

Tips and Tricks

Based on their experiences, many Boston teachers have developed tips and tricks that help students stay focused when learning outdoors.

A few of them are listed below:

- Establish clear routines and rules at the outset and stick to them. When students break a rule, as a result of overenthusiasm or conscious testing (and they will), return directly to the classroom. They will be disappointed, but the activity may be resumed later. Outdoor rules cannot be broken.
- Details make the difference! Bring extra pencils and other materials so the outdoor experience will not be interrupted.
- Students should always have something in hand: a clipboard with their science notebooks, a magnifying glass, a vial for collecting invertebrates—every child should carry something. This gives the student a sense of purpose and the feeling of being a professional scientist.
- Go out a different door than the one students use at recess. That recess door tends to evoke a feeling of freedom and sheer glee that is hard to override.
- Take students outside regularly. The more often they go outside, the more accustomed students become to outdoor routines. After the novelty of going outdoors is forgotten, students are more able to focus on learning.

“At first students were unsure of what to look for but soon they were able to find evidence of insects all over the schoolyard.”

Eric Meuse, Science Specialist



A STUDENT AT THE GARDNER PILOT ACADEMY IN BOSTON READS MULTIPLE THERMOMETERS WHILE RECORDING OBSERVATIONS IN HIS SCIENCE NOTEBOOK.

Boston Schoolyard Initiative

The Boston Schoolyard Initiative (BSI) is a public private partnership between the City of Boston, Boston Public Schools, and local private funders. Launched in 1995, the BSI sought to reverse years of neglect and disinvestment in the public schoolyards—broken pavements, torn fences, compacted soil, and hazardous play equipment—all contributing to a sense of malaise and urban blight throughout the city. Over the past 13 years, the BSI transformed 71 schoolyards into active centers of learning and play, with another 18 in the

pipeline. These improved schoolyards serve as valuable educational resources and contribute to neighborhood beautification and revitalization.

In addition to renovating schoolyards, resources are being developed that help teachers and students use the multifaceted assets of the schoolyard to support teaching and learning. Science in the Schoolyard and Outdoor Writers Workshop represent two key programs. Over the past four years, there has been increased attention on designing and constructing outdoor classrooms in public schoolyards.

Nine have been constructed, and by the fall of 2010, at least 27 will have been built. More information about these can be found at schoolyards.org. Educators and landscape designers work closely together to develop and test different designs. To date, the results are very promising.

Teachers' Enthusiasm

The Science in the Schoolyard workshops and courses have attracted a colorful cross-section of BPS teachers. Some came prepared to work outside; others, who came initially for the course credit, had doubts about taking their students outside. But a course requirement was that all participants would take their students outside and report back. After venturing outdoors with their students, teachers became enthusiastic about this approach to teaching and learning. Many spoke about their experience as transforming the way they think about and approach teaching. Almost without exception, these teachers have been impressed by how engaged their students are, by how much enthusiasm they have for the activity, by how well behaved they are, and by how working outdoors contributes to students' vocabulary development and science understanding.



TEACHER DEAN MARTIN LOOKS UNDER A ROCK WITH A STUDENT AT THE GARDNER PILOT ACADEMY IN BOSTON.



FIFTH-GRADE STUDENTS AT THE TROTTER ELEMENTARY SCHOOL DO SOME PLANNING IN THEIR SMALL GROUP.

Here are some typical comments heard from teachers:

"Students who are most antsy in the classroom tend to do best outdoors."

"My kids have been kicked out of two assemblies in the past two weeks and I have very low expectations of their behavior. I was shocked at how well they did outside."

Teachers often remark that taking the students outside reinforced concepts by showing them real-world examples. Special needs and English language learners are among those who benefit the most from outdoor learning.

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Potential for National Schoolyard Support

While the Boston Schoolyard Initiative (BSI) continues its work locally, we are considering how we can best support the growing schoolyard movement around the country. We receive regular inquiries from schools, municipalities, community organizations, and foundations seeking information about our work in Boston. In response, we have begun to explore the development of a national schoolyard institute to provide training, consulting, and technical assistance; workshops and conferences; curricula support materials; and evaluation information about the

impact of schoolyards on teaching and learning, health, and social-emotional development. The institute would also serve as a clearinghouse for information about schoolyard improvement projects and use of schoolyards to support academic learning.

We would very much appreciate your feedback and advice about this idea through a five-minute online survey. Your participation in this survey will provide important data as we move forward. Please go to the BSI website (schoolyards.org) and click on "Institute Survey."



A STUDENT AT THE GARDNER PILOT ACADEMY IN BOSTON RECORDS IN HER SCIENCE NOTEBOOK.

District-Wide Implementation

SSY has become an important element in science instruction in the BPS. Marilyn Decker, Assistant Superintendent for Curriculum and Instruction, says, “We are seeing teachers who have not been involved with the science curriculum participate in the SSY training and then get excited about being trained in the kit-based curriculum in order to best teach their kids. Conducting science instruction outside has stimulated new interest and energy among teachers and students. It also provides new grounds for curiosity and inquiry.”

According to Bev Nadeau, Materials Specialist for the BPS Science Department, “BSI and Science in the Schoolyard brought a breath of fresh air to the science program. It gave teachers a new opportunity to make the learning more interesting and real. Teachers who were reluctant to teach science found that this was a way to engage children in learning and provide an authentic learning environment.”

“I hate bugs and dirt but I care about science and I see how much they learn when they go out. Students in the city see science as a classroom activity, not as something they are actually living within. Teaching outside is so enlightening for them.”

Rose Reeves Harris, Classroom Teacher

the BSI will be expanding SSY training in the Boston Public Schools in the 2008–09 school year. With a growing cohort of highly skilled teacher-leaders, more frequent trainings will be offered, reaching more teachers. Specialized SSY trainings for special education classes and English language learners are being developed, as well as more advanced SSY courses for teachers who have taken the basic-level course. A teacher-training video that shows BPS teachers engaged in SSY activities is in the works; this will serve as another useful tool for professional development.

The BSI’s Science in the Schoolyard program is amplifying the impacts of using FOSS kits and is helping to make science come alive for hundreds of teachers and thousands of students in Boston. 🌿

She continues, “The program has been a very successful component for getting the curriculum taught. It has brought the inner-city child outdoors to experience things they would never see without this initiative. It links the basic science curriculum with the outdoors and makes learning very exciting.”

With strong support from the BPS leadership, including the Superintendent,

Science in the Schoolyard: Guides to Teaching FOSS Outdoors

Six SSY guides are available online as pdfs at www.foosweb.com. Go to the specific module page and click the “Taking Science Outdoors” icon in the Teacher Resources section.

Animals Two by Two (K)
Air and Weather (1–2)
Insects (1–2)
Pebbles, Sand, and Silt (1–2)
Water (3–4)
Magnetism and Electricity (3–4)

Check the “News” section of FOSSweb for information about the availability of other SSY guides as well as the introductory video that will be available online in 2009.

The guides are available in print from Delta Education. For more information about obtaining the print versions, contact Delta Education at 800.258.1302.

Erica Beck Spencer (erica@indigoinvent.com) was a classroom teacher in Cambridge, Massachusetts, and a science specialist in Boston, Massachusetts, public schools. Her consulting work has included co-writing the SSY guides and teaching teachers about how to use their schoolyards to enhance the science curriculum and how to use the FOSS modules.

Kristen Metz (kristinmetz@schoolyards.org) is Director of Education for the Boston Schoolyard Initiative, working over the past 10 years to turn Boston schoolyards into “open space” actively used by the school and community. Her work focuses on developing curriculum support and professional development materials to help teachers in Boston Public Schools use the outdoors (schoolyard) to support teaching and learning in BPS. These materials include Science in the Schoolyard Guides to the BPS FOSS and STC modules.