Taking FOSS Outdoors

Taking FOSS Outdoors Contents

If we want children to flourish, to become truly empowered, then let us allow them to love the earth before we ask them to save it.

David Sobel, ***Beyond Ecophobia***

During its first 20 years, FOSS focused on classroom science. The goal was to develop a scientifically literate population with an ever-growing knowledge of the natural world and the interactions and organizational models that govern and explain it. In recent years it has become clear that we have a larger responsibility to the children we touch with our program. We have to extend classroom learning into the field to bring the science concepts and principles to life. In the process of validating classroom learning among the schoolyard trees and shrubs, down in the weeds by the parking lot, and in the sky overhead, students will develop a relationship with nature. It is our relationship with natural systems that allows us to care deeply about them. For the children in our schools today to save Earth, and save it they must, they first have to feel the pulse and smell the breath and hear the music of nature. So pack up your explorer's kit, throw open the door, and join us. We're taking FOSS outdoors.

What Does FOSS Outdoors Look Like?

Visualize taking FOSS outdoors: Students exit the classroom in an orderly fashion, their direction and purpose undeterred by the joyful sounds of other students at recess. With focused enthusiasm the band of young scientists moves toward the edge of the schoolyard. Each student is carrying something, maybe a clipboard for recording, a container for collecting, or a hand lens. Students reach their destination and quickly form a sharing circle. After a brief orientation, students disperse and begin searching the tall grass along the chain-link fence. All are independently recording in their science notebooks, and all are on task. The teacher moves about with intention, speaking to a few students at a time. After several more minutes of this work, the teacher rings a chime. Students freeze, raise one arm, and look at her. She rings the chime again. Students leave their materials in their spots and re-form their sharing circle with their teacher for discussion or additional instructions.

This scenario could be anywhere in the country with a regular classroom teacher using any of the FOSS modules. FOSS Outdoors is a natural extension of the classroom work. FOSS Outdoors looks and feels a lot like standard FOSS lessons. Many of the routines you use inside the classroom can be implemented outdoors as well. Success, however, does depend on a few specialized skills and specific preparation to maximize outdoor teaching efficiency.

Expect the enthusiasm, participation, engagement, group discussions, and effort on notebook entries to be heightened during and after an outdoor experience. Even the simplest outdoor lessons create a surge of positive energy. It is difficult to determine whether the enthusiasm and commitment students exhibit when doing FOSS Outdoors comes from exercising content they already know or from just being outside. Students can be a bit louder and more excited when they are learning outdoors, and the space allows for this expansion in energy level, which benefits some students immensely.

Goals and Objectives

The three program goals set down 20 years ago still serve FOSS well. They are: (1) scientific literacy for all students, (2) instructional efficiency and support for teachers, and (3) systemic reform.

The march into the schoolyard has three objectives that relate to the goal for students. First, the outdoor activities **continue and extend the learning** that starts in the classroom. The outdoor activities provide more experience with the content and additional opportunities to practice skills and techniques developed in the classroom.

Second, venturing out provides opportunities for students to discover **applications and examples of classroom content and concepts**. The classroom activities work well for developing sound conceptual science knowledge. That knowledge, however, is constrained by the context in which the concepts are taught. For students to take the next level of ownership of that knowledge, they need to see how it applies and generalizes in the broader context of the world. Leaving the classroom context with a head full of new ideas and new tools for observation enriches the learning.

The third objective is to **connect students with nature**. On the boundaries of the planned, structured experiences are the intangibles that may spark a new relationship with natural systems. It may start with a multisensory experience in the native environment—wind, cold, sunshine, plants, insects, on and on—and advance to an awareness of the diversity of resources surrounding the school. It might evolve into a consciousness of place, followed by a flood of questions about the structure, organization, and operation of the schoolyard ecosystem. When students bond with nature, they have accepted a precious gift, and we have accomplished something important.

Managing Space

FOSS Outdoors is designed to be successful in a diversity of schoolyards. Some schoolyards are covered in asphalt, while others have been turned into well-designed outdoor learning environments. Some include large, grassy areas without trees, and others are covered with mulch. One outdoor space may be circled by a variety of mature trees; the next may have recently planted maples and pines scattered about. The space may reflect thoughtful attention or neglect. Nevertheless, FOSS believes that bringing students into the fresh air under a changing sky, into the available outdoor space, will awaken their well-being and stimulate their understanding of science concepts.

Choosing Outdoor Spaces

Whether your school's landscape is wild, manicured, or asphalt, there are more options for outdoor learning spaces than might initially meet the eye. This section will help you choose the best spaces near your school for the FOSS Outdoors activity.

Before choosing your outdoor study areas, get to know your outdoor spaces. Look closely at all areas surrounding the school building—even places that students do not normally go. Many seemingly uninteresting monoculture fields are flourishing with a diversity of different grass species and other small flowering plants. Consider the pile of leaves that blew into a corner of your schoolyard, a crack in the concrete, or the ragged, weedy edge of the field where the lawn mower doesn't reach. These are places that provide small animals with what they need—food, shelter, water, and space. Transition zones where vegetation changes from shrubbery to lawn or garden to field can present interesting study sites. As you ponder the learning possibilities in and around your schoolyard, consider these characteristics.

Accessibility. You should be able to walk from your classroom to your outdoor site in 2–5 minutes. Sites farther than 10 minutes away can be considered for special outings, but are not realistic for frequent access. Check out physical access if you have students whose mobility requires consideration.

Purpose. Determine the space needs of the activity. Some activities will require open space like a field or blacktop. Others work better if students have a more diverse landscape with varying environmental conditions (such as temperature, light intensity, wind). Some activities require a variety of human-made materials to measure or test for certain properties (such as magnets to test for magnetism). Different areas will serve different needs.

Size. The space should be large enough for the class to work comfortably but small enough for you to supervise all students easily. You always need to be able to see all of your students, and your students need to be close enough to hear you and your attention signal.

Boundaries. For any space you intend to use, make sure you have clearly defined the boundaries before heading outside with your students. Ideally the landscape will be helpful. For example, stay between the sidewalk and the tree line. If natural markers are not present, you may need to bring along traffic cones or their equivalent to define limits. In general consider if there are any hazards such as dangerous debris, poisonous plants, or traffic.

Fostering and Maintaining Diversity

For life science and earth science studies, ideally you want your site to have a variety of living and dead plant matter and a range of environmental conditions. Survey your site to see if it includes places that have been left unmanaged. Even a small wild zone along a fence or behind the maintenance area, or an adjacent field can be a valuable resource. It is important for students to see that living things carry on, even in the city, without human assistance.

Enhancing your schoolyard. You may be able to secure a small section of the schoolyard from the school custodian allowing it to grow wild to compare to the managed school grounds. Consult with your custodian and principal to see if this can be arranged.

Another way to enhance biodiversity is to encourage decomposition by letting fall leaves and/or lawn clippings remain on an area of soil over the winter. This gives worms and other decomposers something to eat, which in turn provides food for everything else. Make sure all necessary parties are aware of your intentions to leave an area untouched. If you find that you need administrative permission, consider ways to contain and mark the unkempt (but not unloved) area so that it clearly represents an intentional project.

Tread lightly. Your schoolyard study areas will potentially experience some user impact. It is important to teach students to minimize their footprint. Otherwise the living things they disturb might seek a safer place to live. Unless the class is intentionally collecting specimens, nothing natural should be picked or removed from the area. This is a good opportunity to introduce the "leave no trace" philosophy, which encourages us to leave natural objects as we find them, in an effort to preserve an area for recreation.

At some schools, the outdoor space is used by so many classrooms that a system is needed to schedule outdoor activities. A sign-up sheet can be used to reserve outdoor spaces just as is done to reserve other school resources.

Weather

Weather can present great challenges and exceptional experiences. Inclement weather can provide an excellent opportunity to study environmental concepts: water drainage, wind impact, plant and animal survival adaptations. (There is nothing like being out in a snowstorm to appreciate the value of insulation!) Making the extra preparation to study out in the elements has value. If the activity can be undertaken with some assurance of success, try to make it work. Over time students acclimate to all sorts of weather and will actually look forward to the challenge of going out in difficult weather.

Clothing. The right gear at the right time can make all the difference. Baseball caps stored at school work well in light rain and are often essential in warmer climates as sun protection. Baseball caps in a light rain are especially helpful for students who wear glasses. If possible, invest in a set of rain ponchos to make it possible to go out in wet weather. Large trash bags can make very effective low-cost ponchos. Of course, you will want to model this elegant attire. Communicate regularly with students and parents about upcoming outdoor experiences.

Wind. A stiff breeze can fling your materials into disarray or send notebooks flying. If you anticipate wind, discuss ways to keep materials from blowing away (such as using natural paperweights or taping down specimens). If there is a protected area where you and your class can take shelter briefly, the activity can continue. You may have to chase down a couple of notebook sheets before students become accustomed to securing papers and other light materials.

Safety and Comfort

Be prepared for the unexpected. Insect stings (ants, bees, wasps, mosquitoes) can be alarmingly painful for young children, particularly if they have not been stung before. Although extremely unlikely in a schoolyard, have a plan developed with students in advance as to how to retreat with purpose if someone disturbs a nest. You should already know who is allergic and who has never been stung before.

Skin-irritating plants (poison oak, poison ivy, poison sumac, nettles) can certainly put a damper on a field trip. Take a moment and get to know your local irritant and toxic plants. The rule "leaves of three, let it be" works only for poison ivy and poison oak. Poison sumac has 7 to 13 leaves on a branch. Stinging nettle feels much like being stung by a jellyfish and can be very frightening for children who have never experienced it. Often the irritation subsides within a few minutes; do not treat rashes with bleach or rubbing alcohol.

Lyme disease is a treatable bacterial infection, carried by deer ticks, which is present throughout the country, but particularly in eastern states. It is possible to get sick without finding a tick bite. If you or your students experience flulike symptoms severe enough to see a doctor, make sure he or she is aware of any outdoor exposure.

If you are out and about in tick country, tuck pant legs into socks, spray DEET-based insect repellent around ankles, and take a few minutes at the end of the trip to pair up and look for obvious ticks on clothing and on the neck and shoulders of a partner.

Managing Time

When to Teach

When you start a new module, anticipate when you might want to go outdoors, and schedule the time. The At a Glance chart in each investigation can help with this planning.

Time of year. If possible, plan the time of year when you will teach particular modules. In the northern tier, life science and earth science modules would be best in the fall or spring. In the southern tier, it might be best to teach life science modules in the winter when it is not uncomfortably hot during the day. Good times to coordinate your outdoor activities with the school calendar include minimum days or other disruptions to the regular schedule, days just before or after school vacations, and days following district testing.

Time of day. Consider the time of day you teach your lessons. Established schedules are often difficult to alter, but you might find it advantageous to do so. If you do a lot of seat work in the mornings, you may want to break the routine occasionally with an outdoor activity. Students will return to the classroom refreshed and ready to focus on the next seated activity you have planned.

If you live in a climate where it gets really hot during the school day, you might want to teach outdoors early in the day. Conversely, if you live in a cold climate, you might want to do your winter outdoor activities midday. If you're looking for wildlife (birds, insects, mammals), the best time might be in the morning.

If you plan to use a part of the schoolyard that is heavily populated at predictable times during the day (lunch, physical education), plan to venture out at a time when other activities are minimal.

Stay flexible. If you are studying the FOSS **Water Module**, for example, be prepared to dash out if it rains or snows. One of the delights of outdoor education is going out when nature is putting on a show. Inquiring minds rush out for the experience when timid observers retreat.

Specific times. Some activities require a sunny day. Measuring shadows, solar water heaters, and solar cell investigations require sunshine. It can be tricky to move on without completing specific observations or experiments. Be creative. You may need to proceed with the module and return to the sunny-day lesson when the sun finally comes out.

Instructional Time

An outdoor activity might take 15 minutes, or it might require an hour. Only part of the time budgeted for outdoor learning is actually spent interacting with the schoolyard terrain, plants, and animals. The rest is management.

Travel time. It will take perhaps 10 minutes from the announcement that it is time to decamp for the schoolyard and the time you arrive there. It will take several minutes to describe and distribute materials, get warm clothing (if necessary), line up, and travel in an orderly fashion to the designated location. Travel back to the classroom will take another 3–4 minutes.

Instructions. Outside, students form a sharing circle. It will take 2–4 minutes to review rules, set the boundaries for the activity, describe the challenge, and distribute materials.

Investigation time. Students break into pairs or groups to engage in the outdoor investigation. This might be as short as 8–10 minutes or as long as 30–40 minutes.

Wrap-up. Students return to the sharing circle to share and discuss their discoveries for several minutes.

Classroom follow-up. Frequently students bring artifacts back to class to display in a classroom museum or to set up for further observation.

Some outdoor activities call for more flexible allocations of time. An activity may call for setup early in the day with periodic monitoring or measuring throughout the day.

Managing Materials

When students step onto the schoolyard, they are field scientists. In the field there is no lab bench where investigations can be set up, and there is no ready supply of materials. The field equipment must be minimal, portable, and durable so it can be easily and safely transported from the classroom and back.

Field Equipment

A student's tool kit will contain the specific materials needed for the lesson of the day as well as some core necessities, such as a hand lens and writing tool.

Student tool kits might contain these basics.

- Pens/pencils
- Hand lens on brightly colored string or yarn
- Colored pencils or crayons
- Measuring tape
- Vials with caps
- Clipboard or notebook
- Sit pad

Note that pens and pencils each have drawbacks: pencil points break, and pen ink freezes in extremely cold weather. Sit pads can simply be several sheets of newspaper covered by a plastic bag.

Your basic teacher kit will include a few backup student materials and some items for helping with management.

- Extra pencils, pens, hand lenses, vials, cups
- Attention signal (chime, whistle, cowbell)
- Tissues, paper towels
- Basic first-aid kit (adhesive bandages)
- Phone (if leaving the school grounds)
- Student class list (particularly if you teach more than one class)

Transporting Materials

Getting materials to and from the outdoor site is a shared responsibility. Students will carry their personal equipment, and class materials can be distributed among students or tackled as a teacher task. Students always carry something to the outdoor site even when it would be easier for you to carry everything. This reminds students that they are heading out for science, not recess. A hand lens on a neck string serves as such a token.

Some teachers prefer to have students carry only their clipboard or notebook and a pencil, while the teachers carry all of the field equipment in a canvas shopping bag or milk crate to the outdoor home base. Other teachers use a wagon or wheelie crate to transport the equipment. After teaching a few outdoor lessons, you will discover what works best for you. Students will get excited when they see you preparing your transport system for an outdoor lesson.

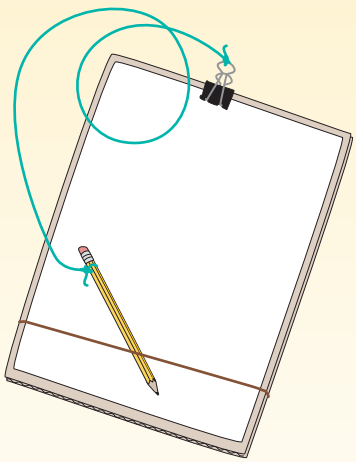
Water. Water is often used during outdoor activities. If you are lucky, there will be a tap near your study site. More likely you will carry water from the school building. Recycled gallon plastic jugs with screw caps and smaller bottles with screw caps are good vessels.

At times, you will want open containers of water, such as buckets or basins (for washing rocks, cleaning containers, and so on). Half-filled buckets can be carried a short distance, but basins should be carried empty and filled from jugs.

You rarely have to bring water back inside. Leftover water should be used to water schoolyard plants. Make this practice overt to help students develop respect for this vital natural resource.

Creating Outdoor Tools

A sturdy writing surface is essential for science in the schoolyard. A bound notebook (composition book) is excellent. A serviceable clipboard can be made from a piece of cardboard and a binder clip. Use a paper cutter to cut sturdy cardboard slightly larger than a sheet of notebook paper. Place a medium-size binder clip at the top and a large rubber band around the bottom (to keep the paper from flapping up). Tie a pencil on a brightly colored string to the binder clip.



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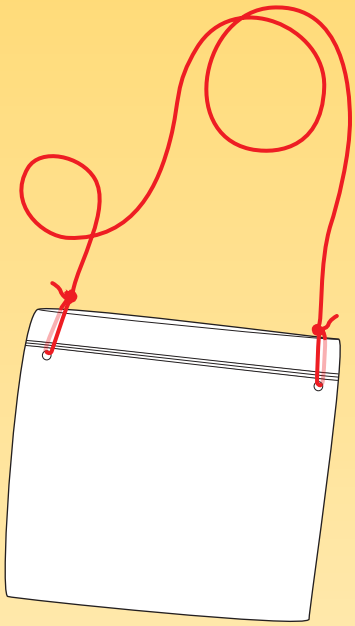


A group writing surface is important sometimes. You can use blue masking tape to attach a sheet of chart paper temporarily to a wall or clip it onto a chain-link fence with binder clips or clothespins. Attach all four corners on windy days.

A small pack can serve as a hands-free means for students to tote their equipment. Little backpacks are excellent, but a serviceable low-cost satchel can be crafted from a large plastic bag and string. Purchase enough gallon-size zip bags for your class. Punch two holes just *under* the ends of the zipper. (This reduces tearing.) Make the strings about a meter long. Tie sturdy knots that will not come undone. Store the string inside the bag after use to prevent tangling with other bags.

Hand lenses may disappear when students place them on the ground to perform a task. Run a bright-colored string or yarn through holes in the lens for students to wear around their necks. If your hand lenses do not already have holes, see if you can get holes drilled through the handles.

Managing Students

Going outside regularly is the best way to develop a productive and joyful working relationship with students in the outdoors. When students realize that going outside to learn is not a special event but rather a science event that will occur routinely, you may be surprised at how quickly they adapt to their expanded, enriched classroom.

Before the First Outing

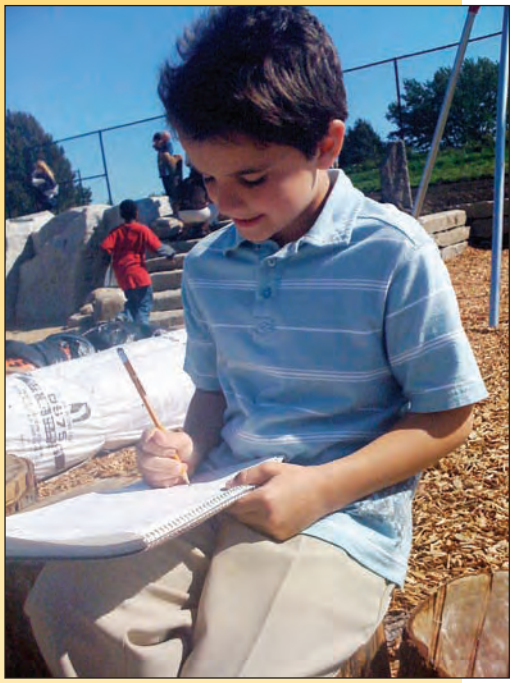
It is always important to let the school administration know that you and your students will periodically be out of the classroom. And if you are planning to leave the school grounds, remember to file a flight plan describing your itinerary, anticipated time of return, and contact partners.

At the beginning of the school year, send a letter home to families, letting them know that learning will extend to the schoolyard and possibly beyond. It may be possible to have a signed permission slip for impromptu walking field trips off campus. Have families put their contact information and specific student health information on the permission slip. Photocopy these and have one set of copies in the office and another set in your teacher tool kit in a zip bag for emergencies.

Tell students at the beginning of the year that they will be going outside often during science class. Remember to let them know a day in advance that they will be going out. Let them know what it means to dress appropriately. This is especially important in the cold or stormy season when students will need proper clothing for safety and comfort. Your class can go out in any weather if students are dressed appropriately. A consistent system of reminders and clothing preparation will train students to be prepared.

Ground Rules. Creating consistent, considerate rules of engagement is important. Learning is enhanced and behavior problems are largely averted by routines that students participate in and understand.

Have a discussion about what students think constitutes proper preparation and behavior for leaving the classroom to study outdoors.



(This discussion may be most productive *after* an initial orientation excursion to survey the schoolyard resources.) Have students generate a list of behaviors that they can adopt and respect. You may want to generate a second list of behaviors that you will agree to as leader of the adventure. Introduce as much formality into the process as you deem important. Develop the idea of a contract that all members of the class sign. Post the contract in your classroom. Here are the items that should appear in the list.

- Walk quickly and quietly to go outdoors.
- Outdoor science is not recess.
- Listen to the teacher's instructions.
- Freeze when the teacher rings the bell.
- Stay inside the boundaries.
- Don't make noise near the classrooms.
- Don't injure plants and animals in any way.
- Leave the outdoor environment the way you found it.

First Outing

Your first trip to the schoolyard may be a bit chaotic. Students may be distracted by other activities going on, and they may lapse into recess mode. A few precautions will minimize disruptive behaviors.

The path of egress. Determine which doors are available to access your outdoor site. Make sure you follow your school's policy for using auxiliary doors during the school day. Do they need to be closed at all times, or can you prop one open? Are they locked from the outside? You may be able to access keys in order to reduce travel time. When possible, avoid using the door you would normally use for recess. Students have a different mind-set when they walk onto the schoolyard through the "outdoor classroom" door.

Sacrificial lesson. Consider a sacrificial orientation "lesson" for your first outing. The stated goal might be a site tour to inventory the resources on hand. Your primary agenda, however, is to dissipate the energy generated by the novelty of leaving the classroom during class time. Focus on preparing your transition to the outdoors, moving out in a purposeful and orderly fashion, and arriving at your predetermined "home base," a destination that you will always go to initially when you leave the classroom. Form a sharing circle, a process you will use time and again. Tour the schoolyard, proceeding as a whole group, then

ask students to walk as individuals for a few minutes, with a partner for a minute, and finally with a group of four. This gives students a brief experience with each of the four ways they will be organized for various outdoor activities. End with another sharing circle and the orderly return to the classroom.

Challenging students. Sometimes the class will be wired for mischief. They will be inattentive and unresponsive. At such times, it is appropriate to lower the boom and direct students back to the classroom. Breaking the contract has consequences, and students need to understand that the opportunity to learn in nature is a privilege. They will remember that day.

In rare instances you may have an individual student who is regularly not able to comply. Interestingly this is probably not the student who you anticipated would be a handful. Often students who have difficulty with attention and performance in traditional classroom seat work shine and take leadership outdoors. In the case of the noncompliant student, it may be necessary to ask him or her to take a time-out if he or she is able to sit without disrupting others' experience. If the bad behavior persists, you may be obliged to return to the classroom early. Even so, it is important to give the student a chance to redeem himself or herself the next time you go outdoors.

Routines

Routines are good for management. They impose a measure of self-monitoring because they represent behaviors that are already known and have been practiced. If one person transgresses during a routine, other students are able to intervene to help you with student management. Here are a few routines that may work for you.

Science door. Have you ever watched a group of students pass through the exterior door on their way to recess? As soon as one foot hits the asphalt, they start running and cheering. It is a beautiful sight. Clearly this is not how you want students to leave the building as you head out for science. One subtle but effective way to distinguish science from recess is to use a different door for science than for recess.

Transition behavior. Be explicit about how you want students to walk through the hallways and into the schoolyard. If students exit wildly, simply ring the bell, have them line up inside, and try it again. If this continues to be

a problem, return to the classroom and try another day. By consistently showing students that this behavior limits their time outdoors, they will follow your directions.

Home base. Establish a destination in the schoolyard where every outdoor activity will begin. Students should walk directly there after leaving the school building. Choose a place that is level and, if possible, away from classroom windows and popular recess areas.

Sharing circle. When students arrive at home base, they should form a large sharing circle—everyone in a single ring with no double-parkers hanging back. This is an effective way to maintain eye contact with all students while you give instructions or share findings. Take a position in the circle where you are facing the sun. This way you will know that students won't be distracted by having the sun's glare in their eyes. A sharing circle is also used to transition from one task to another, to summarize a lesson, or anytime you need to regroup.

Techniques for forming a circle vary. One method is "magnetic feet." Students spread their legs to meet their neighbors' feet. Magically these magnets turn off when you direct them to do so. Students may also stand with hands on hips, elbows touching. Pick or create a method that works with your students.

To speed up the formation of a sharing circle, try the tried-and-true countdown from five with the objective that everyone is in a proper circle by zero.

Attention signal. Adopt a uniform signal for attention. It is essential that students respond to the attention signal immediately. You may choose the same method you use in the classroom or, if this is not appropriate for the outdoors, try one of these.

- A chime, whistle, or other singular and loud sound. These are appropriate outdoors. When students hear it, they stop, look, and listen.
- Count down from five to one and at one, students are silent with their hands up. This might not be appropriate outdoors. A countdown from ten can be used to call students back to a sharing circle.
- Clap call and response. You clap a pattern, and students return it by repeating the clapping pattern. This works if students are all nearby.

Focus question. Inquiry-based activities are guided by a question. This pedagogical routine should extend into the schoolyard, too. *Students need to know why they are engaged in the outdoor investigation.* They should expect to write the focus question in their notebook at the outset of the investigation and produce an answer at the end of the investigation.

Boundaries. Setting boundaries allows students freedom within a defined space. Because different activities may require different locations, it is always important to be explicit about where students are allowed to travel during the outdoor lesson.

Buddy system. You may want to institute a buddy system, particularly if you leave the school campus. When participants are paired off, tell them that each individual is responsible at all times for the whereabouts and safety of his or her buddy. It is helpful and fun to number the pairs in order to count off quickly and account for everyone.

Considerations for Students with Disabilities

FOSS evolved from pioneering work done in the 1970s with students with physical disabilities. The legacy of that work is that FOSS investigations incorporate multisensory methods, not only to accommodate students with physical and learning disabilities, but also to maximize information gathering for all students. Strategies that provide opportunities to learn for students with disabilities turn out to be good strategies for all students.

All students benefit from opportunities to experience the natural world outdoors. For students with disabilities, consider how to make the schoolyard accessible and safe so they can work with a degree of independence. This requires advance planning to make sure that the student, his or her family, the special education teacher, and others involved in the child's school experience are informed and have input in the process.

Whenever a student with a disability is successful in a full-inclusion classroom, there is a behind-the-scenes collaborative effort of caring educators who work together to support the student with just the right amount of scaffolding. In advance of teaching the first outdoor lesson, contact the special education teachers in charge of each student's Individualized Education Plan (IEP) and have them review the planned outdoor experiences. Ask the teachers to recommend modifications that will better accommodate and support each student. And invite the special educators to join the class for the outdoor activity.

Attention and language-based disabilities. Students with attention and behavioral issues often thrive when they are engaged in science outdoors. A fenced area will help you to both keep track of students and to provide a sense of safety. Having students work in buddy teams allows students to look after each other. Provide short, structured opportunities for students to participate in outdoor lessons in a clearly defined space and expand the boundaries and time expectations as students earn your trust and confidence. Many educators have found great success with treating the outdoor lesson as a reward for excellent behavior indoors.

Consider students' communication requirements and plan to bring specialty devices outdoors with you. This might be as simple as some picture cue cards to help enhance your message or an electronic communication device such as a computer.

Physical disabilities and visual impairments. In the Guiding the Investigation section of each outdoor lesson we ask that the teacher decide where the outdoor lesson should be taught. You may find that certain locations are better than others for the purposes of developing science concepts and meeting the physical needs of students with disabilities. Get to know your schoolyard really well and try to experience it as your students do.

One side of most schoolyards is typically a parking lot and the other three sides have spaces accessible to students for work and play. If you have a student with a physical disability you need to consider if the terrain provides for good mobility for the student. Often schoolyards are handicapped accessible because they are covered in asphalt. For many of the Taking FOSS Outdoors lessons, an asphalt area is appropriate to use. But when you want to use a greener location make sure wheelchairs or crutches will work on these new surfaces. If the surface will be a

mobility challenge see if a paraprofessional or educational assistant is able to help the student. If someone is not able to join you, consider if a classmate can help, and if this is not an option, then consider working at a transition zone, where the grass meets the asphalt.

A student with a visual impairment should make a scouting trip to the outdoor site with a mobility instructor to get the lay of the land and to learn where things are located. If the student becomes familiar with his or her outdoor surroundings and knows how to navigate them, it will allow for more independence. Even so, during the actual outdoor activity, the student may need someone to quietly describe the terrain ahead and may need a fellow student's arm for balance and security.

If a student struggles with gross motor coordination, uneven ground may present a challenge. Just as you would in the classroom, begin by offering more support and slowly pull back on this assistance as students become more comfortable with their stamina, security, and endurance with regular outdoor activities.

Sensory sensitivity. For a student with tactile sensitivity issues, make it clear that he or she may, for example, observe as a classmate digs in the soil to collect a sample. Over time this student may feel better able to participate through the use of gloves, or by washing his or her hands as soon as the digging is complete. Knowing where each student falls on the continuum of a disability will help you decide when to hold back asking a student to fully participate, allowing him or her to just observe, and when to give a gentle nudge and expect more active participation.

For students with sensory disorders the outdoors is often a calming space. Consider where the quietest place in the schoolyard is and use this more often if you have students with sensitivity to noise.

No matter what the disability, educators have found success taking students outdoors. With advance planning, communication with the student and the special education team, and a little extra effort, you too can provide a rich, safe outdoor learning experience for all your students.

Teaching Strategies

In the beginning you may find that students regularly use descriptive terms like "icky," "yucky," and "gross." You may have students who say things like "I cannot get my clothes dirty. My mom will be mad." Many students are fearful of bugs, wooded areas, and even just sitting on the grass. Often, after a few outdoor lessons, these fears and excuses fade away. With patience, persistence, and support, student resistance may be overcome entirely. If you suspect that your students may be reluctant to work outdoors, structure your first few lessons to be low-stress activities. The first few times outdoors can be fairly benign lessons with students choosing a comfortable place to just sit (or stand), practicing writing outdoors, and doing simple collecting or counting tasks.

Set the tone. Many teaching strategies that are effective in the classroom work outside, too. For example, at the sharing circle, instead of instinctively talking louder (because it is noisy outside), kneel down and speak in a loud whisper so that students need to focus to hear you. If students are speaking, put up your silent signal and wait for silence. The educator's voice sets the tone for the lesson.

Take a position. In the sharing circle, position yourself where you have the sun in your face so that students need not squint. If possible, place yourself next to those students who might benefit from a silent look or hand on the shoulder to remind them to be silent.

Meet the challenge. Students who struggle with behavior problems often respond well outdoors when given responsibility. Let the active student carry the heavy jug of water or take the position at the front of the line to lead the class outside. For many students, this is all it takes to get them off on the right foot for the outdoor lesson.

Students who have the greatest difficulty controlling their behavior indoors are often the leaders when it comes to working in an outdoor space. You may find that students who are not as attentive or cannot sit still inside are the most insistent about quieting down so that the class can get outside for science.

Get them writing. First and second graders can fill out a chart on a clipboard outside. Also, students in kindergarten through second grade are capable of recording observations outside in their notebooks if observation is their only task. Most primary-age students will need to sit down with their clipboards on their laps or the ground to do this successfully. In the early years most writing follows an outdoor activity and is done inside with desks and the classroom's word wall.

Intermediate students (grades 3–6) are capable of writing outside. Students will benefit from a quick lesson about how to place the notebook or clipboard in the crook of their nonwriting arm for support.

Depending on the activity, you might decide to have students attach their notebooks to a clipboard and place the clipboards in a crate for easy transport and storage. This technique is useful when the ground is moist, when the activity is messy, or when students need to use their hands to complete the activity. The recording will happen immediately after the hands-on activity. Be open to the surprise of how much your students are capable of noticing and recording during and after an outdoor lesson.

Flow of the Lessons

The natural flow of a FOSS Outdoors lesson is slightly different from that of a standard FOSS lesson. The steps of a typical outdoor lesson are listed below. This list may be helpful if you want to teach more than the handful of outdoor lessons in the teacher guide or if you want to adapt an indoor lesson for schoolyard use. It can also help if you leave your teacher guide inside and need to teach without it.

1. **Prepare for the outdoor lesson.**
   - Determine the best location to teach the lesson.
   - Check the weather forecast.
   - Make sure students will be dressed appropriately.
   - Prepare materials for distribution.
   - Check the site the morning of the lesson.
2. **Set the learning objective.**
   - Present the focus question.
3. **Model or describe the activity.**
   - Organize students.
   - Introduce/distribute materials.
   - Discuss procedures.
   - Define boundaries.
4. **Monitor the activity.**
   - Check student engagement.
   - Check student recording.
   - Ask questions.
5. **Share the experience.**
   - Form a sharing circle to discuss experiences.
   - Share thinking.
   - Share answers to the focus question.
6. **Return to the classroom**
   - Make connections to the related indoor lesson.
   - Display student work and collections.

Extending Beyond FOSS Outdoors

Occasionally you may stumble upon a serendipitous opportunity. A breeze may launch thousands of twirling seeds from a maple tree; a woodpecker may alight on a tree so close that students can observe it drumming for insects; student-made parachutes may be carried by an updraft high into the sky and out of sight. To your delight, you may spy something you have never seen before. It can happen at any time . . . when you are outdoors!

At special moments like these, our job as educators is to signal students to stop and quietly appreciate the suspension of time. Sometimes words break the wonder. Trust your instincts at magical moments like these. The answers to questions will come eventually. It is not essential to label the event or even to understand it. By inviting children to be alive with their feelings in the moment, you give them a gift for a lifetime.

It is not uncommon for educators to experience the powerful effect of the outdoors on student learning. If you find yourself searching for other outdoor learning opportunities, consider the ones below.

Move messy activities outdoors. Whatever the subject, students will have more room outdoors to be creative with messy activities, and you can worry less about water, sand, and gravel spills. You must still consider how to transport materials, where students will sit for messy work, how they will return their project to the classroom, and how to clean up the outdoor space and students' hands before returning to the building.

Use the outdoors for extensions. Extending an inside concept to the outdoors is an excellent way to apply new knowledge. For example, in **Structures of Life**, students grow bush beans hydroponically. If the large leaves fascinate students, go outside and see how many kinds of leaves you can find in the schoolyard. Do they all have smooth edges and come to a point at their tips? Go on a leaf hunt, group the leaves by their characteristics, and eventually have students tape them into science notebooks.

There is great value in repeating an indoor activity outdoors. If your students are sanding wood samples inside, follow this up with a trip outdoors to find a stick and sand it. Have you been studying sow bugs? Ask students if they think they know where in the schoolyard they might find these bugs. Applying what students have learned in the classroom and putting that knowledge to work outdoors is an effective way to solidify their understanding. It's also a effective way to assess informally whether students understand the concepts as well as a method for reinforcing the learning.

Find solitude. Use your outdoor space for silent independent work time. Just as in the classroom, at times, the outdoor space is a work space with activities going on. At times, the outdoor space is more of a sanctuary for independent observation and notebook writing. It can be a place for special classroom rituals, awakening awareness of the beauty of nature, and sometimes it can just be a place to be silent for a minute to awaken the senses and refocus students' energy. Some teachers increase this silent minute to 2, 3, or even 5 minutes. Silence is something to be practiced, and for many students and teachers, this can be challenging. This is a special way to end an outdoor experience and will help students transition into the classroom.

NOTE
Remember, do not release any classroom animals into schoolyard environments.

Enhance biodiversity. Modify your schoolyard by adding natural materials, such as logs, rocks, or paving stones. These structures can provide safe havens that may attract more living things. These types of shelters can be particularly helpful if you have an environment without natural shelter from the sun, such as trees and shrubs. Students can be involved in the design and implementation of these projects as well.

Schoolyard modification of this kind requires administrative participation and the school custodian's support. Marking the area with educational signage can further benefit the enhanced site. If your schoolyard habitat needs your intervention to cultivate biodiversity, understand that it can take a couple of years to get established. Areas completely surrounded by blacktop or concrete can become filled with living things if provided with food, shelter, and water.

Attract wildlife. There are many responsible ways to attract wildlife to your class windows with feeders for birds, squirrels, hummingbirds, or butterflies, as well as many great programs for monitoring these animals. See FOSSweb for ideas for additional wildlife observation projects.

Establish long-term studies. The possibilities for long-term studies are endless, ranging from weather monitoring to seasonal population variation. It can be as simple as adopting an observation location and visiting it monthly to monitor various aspects of change over time. See FOSSweb for ideas for long-term projects.

Create gardens. Planting a garden in raised beds or improved soil is an ambitious option for increasing the biodiversity of your schoolyard. Consider carefully, especially with a vegetable garden, the timing of the school year. In most parts of the country, the time when plants require the most support is during summer vacation. Even if you can get a summer program involved, we suggest starting with indigenous plants that bloom or mature in spring and fall and require little maintenance.

Elementary-Level Environmental Education

In the early 1990s David Sobel noticed something poignant about children's perceptions of the environment. If a child had been introduced to environmental issues at school presented in the context of doom-and-gloom scenarios, the child expressed a heightened sense of anxiety and hopelessness, which Sobel calls ecophobia (Sobel 1996). The implications of his finding should raise a cautionary flag. Sobel is not suggesting that we abandon teaching about the environment in our elementary schools. He is proposing a different approach to environmental education that will bring our children into natural, heathly relationships with environmental issues.

Effective early environmental education should focus on local and ultralocal issues. What is happening in our schoolyard? What factors influence the communities of plants and animals in our neighborhood? How do changing weather conditions affect the populations around our school? How are our actions affecting the habitats in our schoolyard? What can we do to enhance natural systems at school? Elaborate rain-forest projects provide little understanding and have negligible impact on student connection to nature; researching and installing a butterfly garden or keeping an inventory of the birds on campus can be transformative. The children from Sobel's 1996 study could tell you how many species were going extinct each minute in the Amazon, but were unfamiliar with the most common plants in their schoolyard.

Time outdoors during the school day is beneficial for student learning. Students who are exposed to hands-on experiences in their local environment often become enthusiastic, self-motivated learners and typically academically outperform their peers who do not have these learning opportunities (Liebermann and Hoody 1998). Children are able to pay attention for longer periods of time on the same assignment outdoors and are more focused when they return to their indoors class work (Louv 2008).

Research has produced evidence that using the schoolyard is an effective way to enhance student learning. Texas A&M University, in conjunction with the Texas Education Agency, conducted a meta-analysis of the research in order to identify and rank effective instructional methods for science education and to define how best to improve student achievement. The highest ranked teaching strategy was Enhanced Context Strategies, which included taking meaningful field trips and using the schoolyard for lessons (Scott et al 2005).

Taking FOSS Outdoors

Student attitudes toward learning are influenced by simple outdoor experiences. In one study (Shaw and Terrance 1981) students who experienced outdoor instruction reported they enjoyed school more in general and felt more supported and trusted by their teacher than they had prior to the outdoor experiences. These pretest/posttest differences were more pronounced for students who had been identified as being "uninvolved" in the classroom activities. Also, this student perception was a lasting effect that carried over to the regular classroom activities weeks later.

Perhaps the most important benefit of incorporating the outdoors into the traditional school learning environment is that it offers opportunities for students to synthesize concepts and personal experience by applying what they have learned to a new environment.

FOSS Outdoors will help you focus on age-appropriate environmental topics and enable you to create meaningful and personal connections between your students and their local environment. When students can openly explore the environment, they can create meaningful connections to their learning and establish positive relationships with nature. You'll be amazed what students notice.

Here's the good news. If you focus on inquiry and direct experience instead of problems, it takes remarkably little guidance for students to make positive, empowering, lifelong connections to nature. One insightful young man explained, "My video games have a pattern that is always the same, but nature is like a game that is different every time you play." As an educator, you can draw out that sense of wonder and curiosity for children while simultaneously helping them build a solid science foundation.

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The Taking FOSS Outdoors initiative got its start through a collaboration with the Boston Schoolyard Initiative (BSI). In 2004, BSI began developing an approach to teaching science that routinely takes students into the schoolyard to test, apply, and explore core science concepts and skills. As part of this project BSI developed *Science in the Schoolyard Guides*™ for 12 FOSS modules and a companion *Science in the Schoolyard*™ DVD. In partnership with the City of Boston, BSI designs and builds schoolyards that provide a rich environment for teaching, learning, and play. For more information on BSI, *Science in the Schoolyard*, or BSI's *Outdoor Writer's Workshop*™ professional development program and materials, see www.schoolyards.org.

The BSI *Science in the Schoolyard Guides*™ are available for the following 12 FOSS modules. Download them from the specific module pages on FOSSweb (www.FOSSweb.com).* On a module's home page, go to For Parents and Teachers, and then Teacher Resources, to locate the *Science in the Schoolyard Guide*™ for that module.

Animals Two by Two (Grade K)
Wood and Paper (Grade K)
Air and Weather (Grades 1–2)
Pebbles, Sand, and Silt (Grades 1–2)
Insects (Grades 1–2)
New Plants (Grades 1–2)
Magnetism and Electricity (Grades 3–4)
Physics of Sound (Grades 3–4)
Structures of Life (Grades 3–4)
Water (Grades 3–4)
Landforms (Grades 5–6)
Levers and Pulleys (Grades 5–6)

*Visit www.FOSSweb.com/CA for California-specific guides.

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