

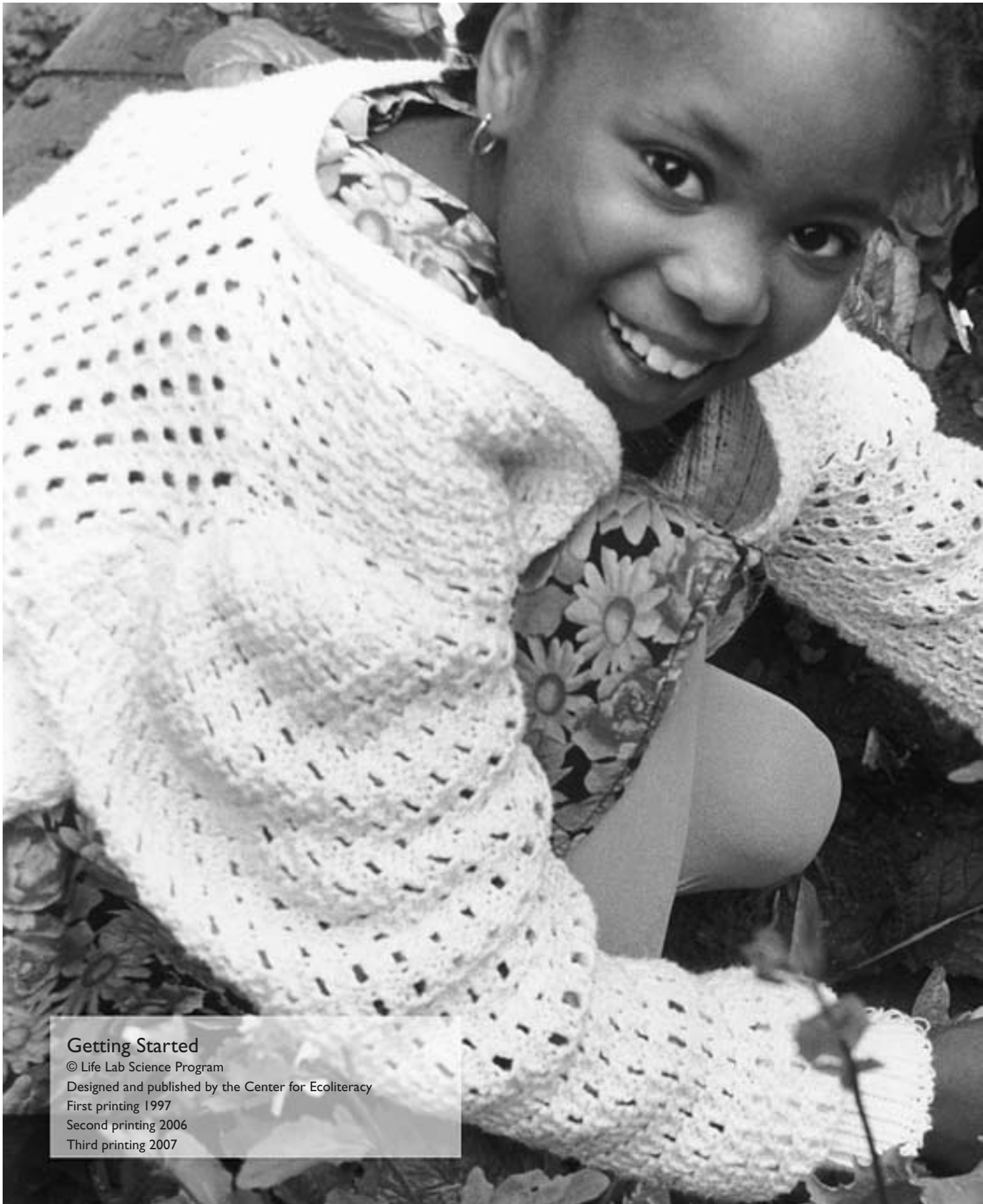
Getting Started

A Guide for Creating School Gardens as Outdoor Classrooms



Shaping and supporting the developing plant, tying the tendrils of the blue morning glories. © CEL/Barlow

*Your school garden provides
the context to learn about
the world we live in.*



Getting Started

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A black and white photograph of a garden bed. In the foreground, there are several large, dark leaves, possibly from a plant like a chard or spinach. A white, crocheted fabric, possibly a garden path or a protective cover, is visible on the left side. The background shows more foliage and a dark, possibly mulched, ground.

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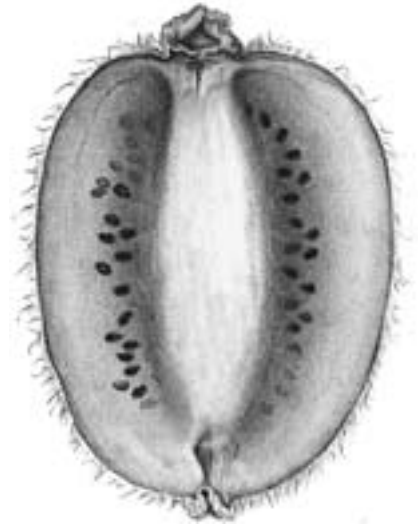
THE JOY OF GARDENING

The Life Lab idea for a living laboratory began in 1978 in a small garden developed by students and teachers at Green Acres Elementary School in Santa Cruz, California. Teachers there soon discovered that their students were learning science from gardening and enjoying it thoroughly. The idea grew and developed rapidly, attracting attention from other school districts, parents, universities, and community leaders. Since creating this first school garden, Life Lab has advocated the use of gardens as outdoor learning environments and as a means to create a sense of season and place for all children. A school garden puts the natural world at students' fingertips. This living laboratory—whether a planter box, an outdoor garden, or an indoor growing area—offers a rich context for exploring science, nutrition, social studies, math, art, language arts, and more.

Together teachers and students using the original living laboratory experienced the joy of gardening. With the contagious enthusiasm of the students and the steady support and leadership of the principal, soon all of the classes were participating in the program. Many discoveries took place that year: the discovery of watching a spider spin its web; the discovery that spinach could taste good; the discovery that a soil ecosystem is alive. But one of the greatest discoveries was that the school garden was much more than a garden. It was a powerful learning tool. The garden lab provided a much-needed context in which to investigate the world we live in.

NURTURING A CHILD'S CURIOSITY

As educators we have the opportunity to nurture a child's curiosity and desire to explore the world. We also have the responsibility to prepare the child for the world of tomorrow. Although we can't see that world, we can help students ask relevant questions; develop processes for thinking and searching for answers; and communicate, work, and live cooperatively. This is an exciting and important task. As



Take It Step-by-Step and Do It Together



The E. Ruth Sheldon Elementary School in Fairfield, California, began its school garden on a modest scale in 1987, with a small fenced area and plantings in donated wine barrels. By 1990 the school's garden included 23 raised beds, a fully equipped tool shed, and a 16' x 24' greenhouse. Careful planning and a ground swell of community support made this expansion possible. The greenhouse, for example, was built over seven Saturdays by students and 35 volunteer parents, staff, and community members. "We all take pride in the garden," says one E. Ruth Sheldon teacher. "It has not only beautified the school, but has increased everyone's enthusiasm by giving us something to build together."

we teach students basic academic skills, we can incorporate learning processes that will help them be informed, knowledgeable, responsible citizens. That is what Life Lab is all about—that's what your outdoor classroom can be all about.

Your school garden, or outdoor classroom, provides the context to learn about the world we live in. School gardens challenge students with an endless variety of systems through which to learn the principles of ecology, "the language of nature." A garden system provides a living context in which to study these principles: interdependence, diversity, cycles, scale and limits, energy and resources, succession, and sustainability.

This booklet will help you with everything from outdoor classroom design and site selection, to strategies for gardening with students, to creating community support that will sustain your school garden program. While there is no one recipe for a successful school garden, the tried and true techniques presented here are based on the 20 years of experience that Life Lab Science Program has had in helping teachers establish a school garden that's right for them.

YOU CAN CREATE A SCHOOL GARDEN!

We often hear teachers say: "This sounds like a terrific plan—but we just don't have enough room at our school." Our response: "Do you have a vacant 10' x 15' space? Or a courtyard? Or a patio? Or could you fit planter boxes outside classrooms?" The first Life Lab school began with just a 10' x 10' garden plot. Many schools have started with much less.

Having the physical space to garden is just one obstacle cited by teachers. We often hear concern about managing a group of students outdoors. We know that you know how to work effectively with students in the classroom; we encourage you to apply those same skills outdoors. Identify the essential elements of effective classroom

instruction, and then directly transfer them to the garden as an outdoor classroom. Think about how you coordinate hands-on activities in the classroom, and then apply those techniques outside.

One of the great things about a school garden is that teachers don't have to be experienced gardeners to have one. This booklet, along with basic garden reference books, will guide you each step of the way. Hundreds of teachers with little gardening experience have quickly come to value their garden as an outdoor classroom for ongoing exploration.



A school garden puts the natural world at the students' fingertips. © CEL/Barlow



© CEL/Barlow

GETTING STARTED

School gardens thrive everywhere—in both cold and warm climates, and in urban, suburban, and rural communities. School gardens exist in schools with no bare ground, and in schools with acres of land. All of these schools have adapted strategies that work for them, tailoring gardens to fit their schools' needs.

Our experience in helping schools begin their gardens has shown that there are a few basic components to making your garden a success. Before anything else, consider starting your own garden journal as a way to help you organize your thoughts and keep track of your progress as you plan your outdoor classroom. Include a checklist of these basic components. Remember to leave space for notes and ideas that strike you as you work through the process. Your journal is also a great place to keep track of your garden contacts, including suppliers, volunteers, and outside experts.

Garden Purpose: The first thing you should do is ask yourself a few questions: Why am I interested in gardening with my students? Why does my school have a garden? Or, why is my school considering having a garden? How can I use a garden as an outdoor classroom? As you ponder these questions, be sure to consider the teachers' and students' roles, the physical structures that will be needed, and the necessary procedures for successful interactions.

Administrators: An enthusiastic and supportive principal is key to the development of your school garden, from approving and arranging teacher time for workshops, to finding and tapping outside funding sources. Your principal can also be an important school garden advocate outside of your school—an ambassador to your school district and your community. It is essential that the principal be an active participant in the process.

Other school administrators can also play an important role, as can



Spotlight on Miami, Florida



Palmetto School makes growing their business. The school sells its vegetables, herbs, herb vinegars, and potted plants from their garden at the Coral Gables Farmers' Market. To prepare for market day, students from K–5 harvest, wash, bag, label, weigh, and price their produce. On market day, the students and adult volunteers set up their umbrella by 7 a.m. and generally sell out by 9:30 a.m. Proceeds from the sales are evenly distributed among all participating classes. Students use the money to buy garden supplies.

your local government officials and even state and federal legislators. It's worth your while to make them part of your school garden "family." Invite them to your ground-breaking or dedication ceremony. Send project updates regularly to keep their attention, and invite your superintendent and other school board members to observe first hand how garden activities enhance classroom instruction and student learning.

Teachers: At most schools a core group of teachers will be the catalyst for your school garden program. These teachers, often with the principal and a few parents, will serve as the central organizing body that gets your garden growing. This planning, or steering, committee will work with other teachers, students, and staff members to determine what the school garden will look like, how it will be utilized, as well as what resources and materials to collect and who will accomplish which tasks.

Once the school garden plan is in place, the steering committee will oversee development and maintenance, evaluate successes, troubleshoot, and organize volunteers and community support. If your principal can't be a regular member of your planning team, be sure he or she is kept up to date on its progress. Some schools also include custodians on their steering committees, especially if their role will be important in implementation and maintenance. As you plan, be sure that your plans are incorporated into your school's short- and long-range goals and objectives. Your committee should define its role and meet on a regular basis.

Students: At Life Lab Science Program we like to say that each school's garden is "owned and operated by the students." The Life Lab philosophy is for students to be actively involved in the entire process. The more students are involved in planning and building their outdoor classroom, the greater sense of ownership they will feel. Involve them

in designing a garden plan, measuring and staking out garden beds, making garden signs, constructing a solar greenhouse, and/or analyzing soil for pH and nutrient content.

CONNECTING TO THE CLASSROOM

As you begin to plan your garden, you will soon discover that this outdoor classroom provides endless opportunities for integrating your curriculum areas. We strongly recommend that each student maintain a garden journal, appropriate to his or her abilities, to record observations, collect data, make analyses of his or her experiments, and keep records and drawings of the garden. If your class is scheduled to use



Students learn from the dramatic metamorphosis of the caterpillar to chrysalis to adult butterfly. © CEL/Tyler

Spotlight on Mill Valley, California



Teachers at Mill Valley Middle School worked with landscape architects from the Ecological Design Institute to develop curriculum materials that would provide students with the knowledge and tools to create a garden at their school. In this model, students are given the responsibility and opportunity to take charge of building a garden. Over a several-month period, students survey users to determine the programmatic needs of the garden, after which the students write proposals for funding.

This program approach provides students with hands-on experience developing and overseeing a project from start to finish. Students will learn about planning, scheduling, accessing local resources, and fundraising.

the school garden once a week, plan an outdoor lesson for that time and then plan related follow-up lessons for the classroom.

As you plan ways to integrate subject areas, you'll find lots of opportunities for students to apply the knowledge and skills they have learned in one subject area to the work they are doing with their garden. For example, to gather background information to help develop a theme garden, students will read reference materials to research information, and then write their plans. In analyzing garden data, students will be applying math skills. In studying the effects of erosion on soil, there are opportunities to integrate social studies and science. Sitting quietly in the garden and drawing the plants or animals that they see, students will be applying their drawing skills to natural history observations.

The important task of documenting the history of your outdoor classroom can become a class project that will provide opportunities to integrate language arts, photography, drawing, history, and science. Consider having your class document the changes that take place in the garden over the school year. Encourage students to document their garden in writing, photography, and drawing or painting. This class project can result in creating a book to pass on to next year's incoming class. Each new class can add to the history. Over the years you will have a wonderful document that traces your garden's past, from initial site selection to bountiful harvest.

THEME GARDENS

History Gardens: Use your garden to make history come alive for your students. Pick an area and time and investigate what kinds of gardens were grown there at that time. If your garden space is large enough, one group might study Victorian English cottage gardens; another might investigate gardens in Colonial America; while another might explore Native American gardens.

Butterfly Gardens: Use your school garden to investigate native plants and animals. Research what butterflies live in your area and the plants that they depend on. Then plant a butterfly habitat in your schoolyard.



Ecosystem Gardens: Use your school garden as a vehicle to investigate what your area looked like before buildings were placed there. Students can research the history of your local landscape and then re-create what the area once looked like. Try growing a prairie garden, or a chaparral garden, perhaps a woodland or a meadow.



Teaching a sense of place: students re-create the surrounding neighborhood in their garden. © CEL/Tyler



Heirloom tomatoes. © CEL/Barlow

Heritage Gardens: Use your school garden to learn about the importance of preserving biodiversity. Try collecting and growing heirloom vegetables. This type of garden provides opportunities for your students to research old varieties of vegetables and their growing requirements. You can join a seed-saver's group and exchange seeds and information.

Nutrition Gardens: Use your school garden as a place to help children learn more about where their food comes from. Students can learn about making food choices for a healthful diet and eating seasonal foods that are grown locally. Learning about where food comes from is a wonderful way to connect your garden to geography and history. You may wish to put together a class cookbook of favorite recipes using the crops from your class garden.

COMMUNITY INVOLVEMENT

When your garden program is ready to involve the community, we recommend that you establish a community support system to assist in coordinating such activities as: soliciting donations, asking for volunteer aides, or developing greater community awareness. When you ask for community support, be sure to make it clear why you are involving the community and how you plan to do it. Offer an orientation so volunteers can contribute to what the school needs.

In our experience we've found that community members are often people not associated with the school, yet are willing to offer their skills to the project. For example, we worked at one school where a landscaper built a pond, and at another where an entomologist taught the world of insects to a group of children. At another school a committee raised donations to build a school barn. Your community is often an untapped resource—one that is happy to share its skills with students.

SELECTING THE SITE

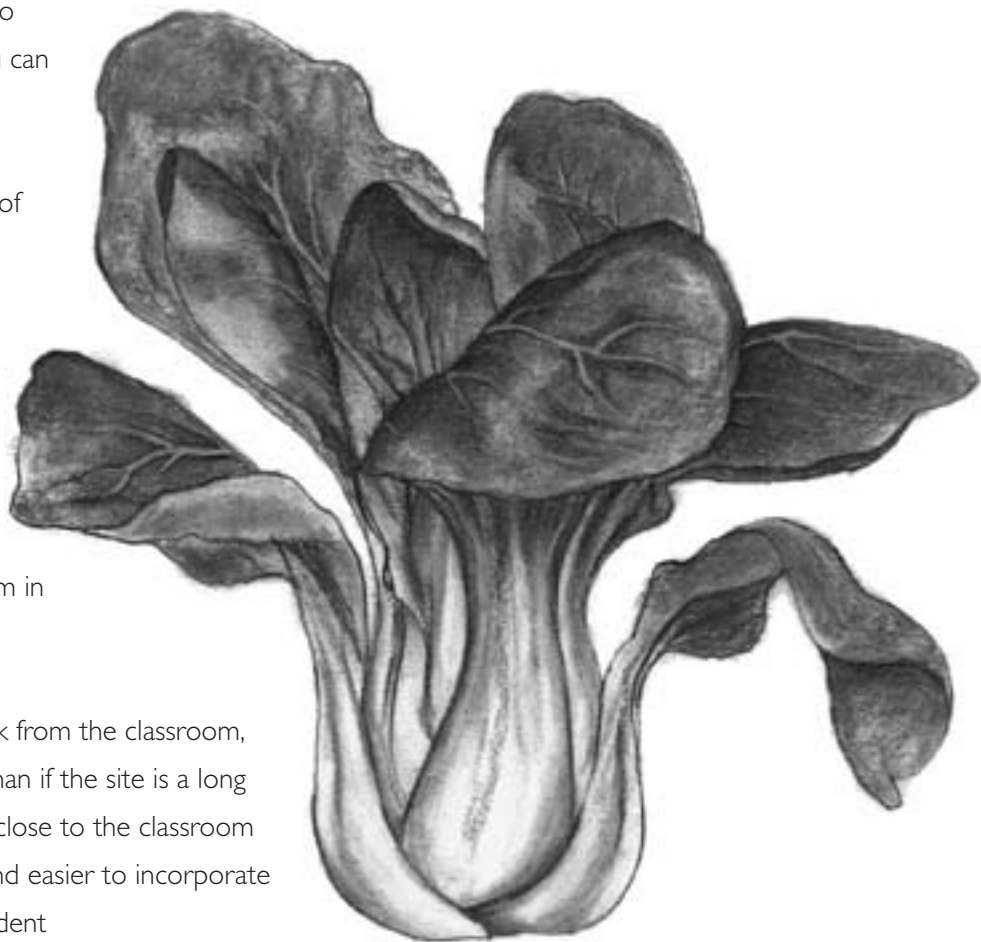
Whether large or small, here are a few things to consider when choosing your garden site.

Sunlight: Most flowers and vegetables need a minimum of six hours of full sun. Check your future garden site for sun exposure at different times of the day and, if possible, in different seasons. Keep track of shady spots. Use them for shade gardens—great observation areas and teaching areas on hot, sunny days.

Water: Watering the garden will be important for a good harvest and should be easy. The garden should be close to a water faucet so water is easily accessible to your plants. There are various systems you can consider: drip irrigation, overhead watering, or watering cans. Be sure to consider the importance of conservation of resources in your planning. Use mulch to help the soil retain moisture.

Drainage: Both slope and soil type affect drainage. Avoid steep slopes; if that's not possible, consider terracing or raised beds. Don't plan a garden in a low spot where puddles form in wet weather.

Accessibility: If your garden is a short walk from the classroom, there will be more teacher involvement than if the site is a long trek across the school grounds. A garden close to the classroom makes it more convenient, more visible, and easier to incorporate into the curriculum on a regular basis. Student



The Technical Side of Site Planning



Be sure to seek out parents or other community members who will lend their expertise to your projects. Among them you may find a local garden supply store owner, someone from the co-op extension, youth advisor, master gardener, or garden club member who will volunteer to assist you in laying out the garden plan and to advise you about soil quality. If you think your soil is contaminated with lead, have it tested. Contact your Public Health Department or local Extension Service to find out where lead testing is available.

You may also find a parent who is an irrigation expert willing to make suggestions about the garden's water needs and systems, or a carpenter who can help you build a simple tool shed.

If you consider building a structure on your site, be sure to consult the appropriate person in your district who oversees building. This individual will have information about any building codes, as well as district restrictions covering the use of grow lights in your classrooms. Make sure all projects meet fire and electrical safety code requirements.

management will be easier, too. For the early grades, garden beds or planter boxes right outside the classroom work especially well.

Security: If possible, locate your garden within sight of classrooms and neighbors. Fences and natural borders of plants, if they don't obstruct visibility and hide intruders, provide security. Make use of existing fences, trees, and hedges in selecting your site.

Visibility: Gardens always add beauty to school grounds. Try to integrate your garden with the existing landscape, but don't hide it. "Out of sight, out of mind" can apply to gardens that aren't in a central, visible location.

No two schools will have the same kind of outdoor classroom. One school's plan may be for planter boxes outside of the classrooms while another's may be an expansive garden site. Almost any site can be transformed into a thriving outdoor classroom, even a dirt parking lot or a rooftop.

PLANNING YOUR OUTDOOR CLASSROOM

Dream big, but start with a plan that is manageable for your school. Consider developing a three-year plan, adding a few components each year. You can organize your outdoor classroom in a variety of ways. We recommend allocating individual beds for each class to plan, plant, care for, and harvest together, as well as communal areas for the entire school to develop. In addition to planting areas, incorporating tables and benches creates a "user-friendly," manageable environment.

We repeat the advice we can't give often enough: Be realistic and start small. While you may have visions of a mini-farm on the back parking lot or maybe a greenhouse for those cold winter months, the best way to realize your dreams is to build them step-by-step.

Your first step should be to create a garden plan that works for your school, your teachers, and your students. With the support of your school community, you can take the next step—planning for the future. What do you want your outdoor classroom to look like in three years? Let that vision guide you in making reasonable annual goals. And remember, bigger is not necessarily better. Consider the purpose of the garden: Is it to teach science, or social studies, or math, or another discipline? Many schools have taught all these disciplines successfully, by using indoor container gardens, planter boxes, rooftop gardens, and patio plots.

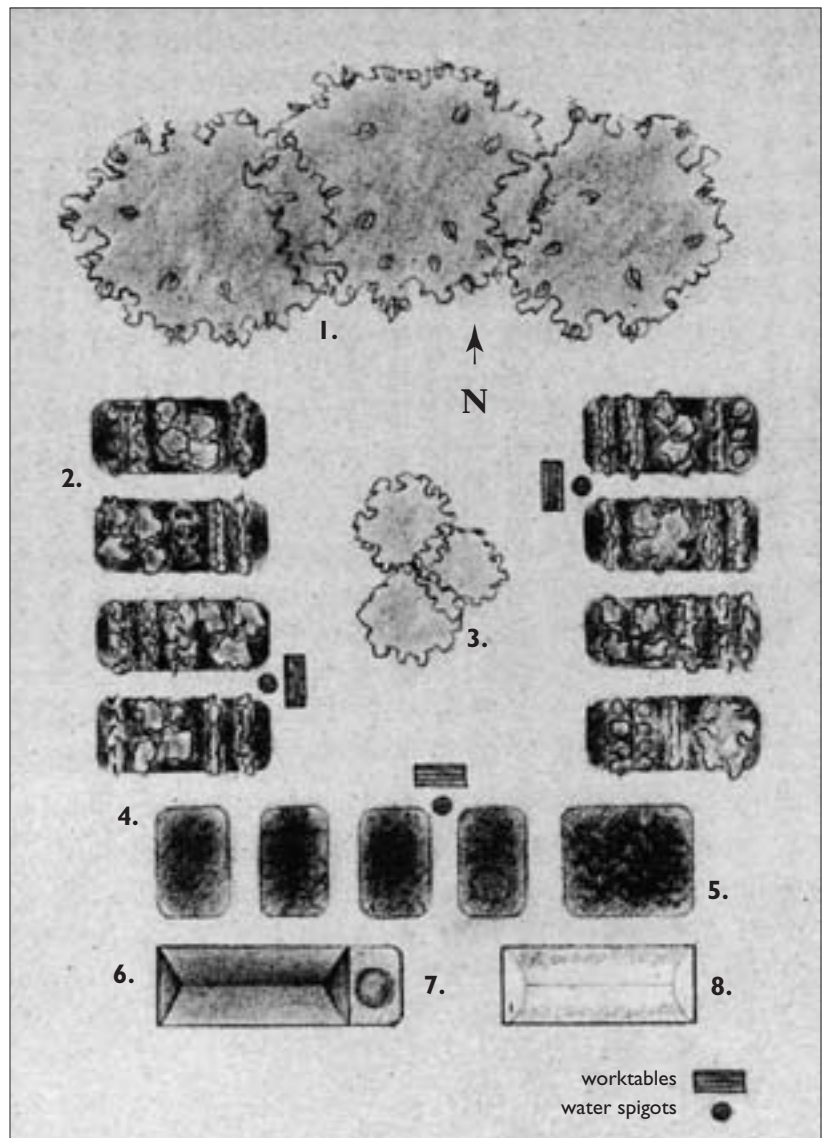


The delight of discovery. © CEL/Tyler

The Essentials of a Growing Classroom



1. Outdoor classroom and meeting area
2. Beds or planting areas for each classroom
3. Community growing area
4. Special project area for student experiments
5. Compost area
6. Tool shed or storage area
7. Sink
8. Greenhouse or cold frame



Sample Outdoor Classroom

THE DESIGN

Once the garden site is selected, it's time to design and map the garden itself. This is a great opportunity to heighten students' interest in the project. Many schools encourage each class to design its own vision of the garden, then pick unique elements of each for the final plan. This not only creates ownership, but also provides lots of learning opportunities.

Mapping the school garden provides hands-on opportunities to integrate and apply geography and math skills. Have students accurately measure and record the dimensions of the garden area. Then have them draw a map of the garden to scale. Lay out the main paths in the garden. Establish the boundaries of each class bed. Take careful measurements and draw the paths and beds on the garden map.

Locate the source of water for the garden. Be sure to include the water source on the map. Use a compass to figure out which direction is north, and show that on the map.

In designing what will go into the garden space, encourage students to think about: the purpose of the garden beds—are they for food, flowers, seeds, or to conduct science experiments, or to beautify the school grounds? Bring science into this process by having students research what the requirements are for the plants they want to grow. Working in teams, students can research seasonal (sun, temperature, frost) requirements and soil requirements. They can also investigate the physical requirements of the plants—will they be tall, short, trailing, or bushy? Is there companion planting that would work?

WHAT TO PUT IN THE GARDEN

Our sample outdoor classroom design includes:

- ☞ **Outdoor classroom and meeting areas.** Designate a shaded area with adequate seating for class discussion, writing, and drawing. An area with deciduous trees works well—in winter, you have light and warmth; in summer you have shade. A dry erase board attached to one side of your outdoor structure is useful for instructions and ongoing communication.
- ☞ **Beds or planting areas for each classroom.** Make them 3 feet wide so children can work from either side without stepping on the plants and compacting the soil.
- ☞ **Community growing area for schoolwide projects or plantings.** These can include a cut-flower growing area, herb garden, market garden, and specialty areas such as a pumpkin patch or plantings that attract butterflies and birds.



Students learn about food cycles through vermicomposting. © CEL/Tyler

- ☞ **Special project area for student experiments.** Dedicate a portion of the garden for individual projects. Signs can tell visitors what student scientists are investigating.
- ☞ **Compost area.** Walt Whitman said it all: “Behold this compost, behold it well, it grows such sweet things from such corruption.” Composting is a fundamental garden and science activity and a way to recycle garden waste; and on top of all of that, it produces valuable soil amendments. Set aside an area for collecting compost materials and building compost piles. You can never have too much of this important garden ingredient. Don’t forget the worms. Another method is vermicomposting—using worms to do your composting. Consider both approaches in your growing classroom.

A Special Note About Gardening Tools and Equipment



The quantity of each sort of gardening tool you buy will depend on your budget and the scale of your program. But be sure to buy quality tools, even though they cost a little more. Well-made tools will hold up under the wear and tear youngsters often give them. There are also tools available that are scaled to children’s sizes.

While gardening tools are not dangerous when used properly, it is important that all students (and adults) be instructed in their proper use. Set up a consistent training program to teach the basics of safe tool use.

Some basic gardening equipment:

spades	hoses/nozzles	tool cleaning brush	wheelbarrows
iron rakes	trowels	spading forks	stakes
hoes	twine/string	leaf rake	sharp knife
watering cans	pruning shears/scissors	shovels	harvest baskets
worm box	rain gauge	compost thermometer	clipboards

- ☞ **Tool shed or storage area.** A tool shed or storage area provides a central location where you can clean, organize, and protect tools and equipment.
- ☞ **Greenhouse or cold frame.** A greenhouse or cold frame is a protected place for starting seedlings in a controlled environment, and helps to extend the growing season. You can also set up an indoor growing area in your classroom.

GARDEN SIGNS

No matter what size your garden is, make a sign to give it an identity within the school. Let your neighbors know what this new patch of greenery is all about. Signs help identify your school garden as an outdoor learning center, announce times the garden is open, and provide rules and guidelines for using the space. The signs can be simple or complex—they just need to be clear. Signs are best when they represent the character of the class. Ask students to design the logo or drawing that will appear on their sign. Let a student construction committee make the sign. In addition to the overall garden sign, don't forget to have your students design a garden sign for their class bed. Sign making can be a great class project.

PURCHASING TOOLS AND MATERIALS

As you make a detailed list of the tools and materials you will need, try brainstorming ways you can get them. Here are some things you might have on your list and some ways Life Lab schools have acquired them.

- ☞ **Planter boxes and a tool shed:** Approach a local lumber company about providing materials or offering a discount; a parent may have the skills needed to design boxes or a shed and/or lead a volunteer work party in construction.



A shed to organize and protect tools and equipment. © CEL/Tyler

- ☞ **Fencing:** See if district funds are available, or seek donations of material. Remember to include openings large enough for truck access.
- ☞ **Tools:** A local garden supply business or a local charitable organization may donate tools. Many schools have found garden tools at local flea markets and garage sales; one Life Lab school placed a small notice in their local paper and was given the contents of a barn full of equipment.



Learning to use tools safely in the garden. © CEL/Barlow

PREPARING THE GARDEN SITE

With your garden site plan in hand and tools rounded up, it's time to start building your outdoor classroom. Remember to encourage students to help with this—as diggers, measurers, soil preparers. Students can even help adults with the larger construction tasks.

SOIL CONDITIONS

Establishing a garden begins with preparing the site—cultivating helps to improve soil structure. Before you start breaking ground, check soil moisture by squeezing a handful of soil into a ball in the palm of your hand. It should keep its shape when you open your hand, but crumble when touched. If soil sticks to your shoes or tools, it is too wet to dig. Digging wet soil will damage the soil's structure, and you will be left with huge clods of dirt. If, on the other hand, your soil is very dry and dusty, water it thoroughly and let the area sit for a day or two.

You can turn the soil using a spading fork and shovel if your site is small and the soil not too compacted. Using these tools gets more people involved, is less expensive than using machines, and is more energy efficient. But if your site hasn't been gardened recently, chances are the soil is compacted and will need to be turned initially by machine. Rototillers are a good solution for sites that are less than an acre. You might also consider using a small tractor with plowing attachments.

Rototillers not only work well for turning over new ground, but have many other garden uses—mixing in organic matter and soil amendments, cultivating, preparing seed beds, clearing weedy areas, and more—throughout the season.

STAKING OUT THE BEDS

Mark off the garden plots with stakes and string. The planting areas get cultivated; paths get mulched and compacted year after year. For this task you'll need:





Tying the stakes. © CEL/Tyler

- ✿ 18-inch wooden stakes
- ✿ twine or string
- ✿ hammers or mallets
- ✿ measuring tapes
- ✿ garden site plan

With the help of your students and the garden site plan, follow these steps to stake out your garden: first, locate the corners of the overall garden area and drive a stake into each corner. Next, stretch twine from stake to stake, forming one large rectangle.

Once you have the outside perimeter in place, use your garden map and tape measure to plot the paths and the boundaries between individual garden beds. Pound stakes into these points. Make sure beds are no more than three feet wide, so that students can reach the middle. String twine between the stakes to mark the boundaries of each bed. Be sure to allow about three feet between beds; make it wide enough for a wheelbarrow to pass through, and for children to move about and explore their garden with ease.

This method applies to garden designs with rectangular beds and plots, and straight pathways. You might want to try instead circular beds, star-shaped plots, or meandering paths. In any case, leave the twine boundaries around beds until garden paths are well established. Be sure to mulch the garden paths. Wood chips from tree pruning companies are an excellent, and often free, source of mulch for paths.

BED PREPARATION

Once the beds have been laid out, the digging begins. Bed preparation is probably the most important step in the process of nurturing your soil. Healthy soil will produce healthy, nutritious plants less prone to pest and disease problems.

We recommend the “double-digging” method (also known as the “French intensive” or “deep bed” method) for preparing raised garden beds.

Double-digging involves loosening the soil to a depth of 24 inches (or about two spades deep) to improve aeration and water drainage, while adding organic matter to improve the soil’s structure and fertility. This method allows roots to grow down rather than out, giving plants access to water and nutrients deeper in the soil. It also reduces the amount of space needed between plants. If your soil is already loose, as some sandy soils may be, then double-digging may not be necessary.

You and your students may want to do an experiment comparing different soil cultivation methods—see for yourself if differences in how you dig and plant change the amount of food you can grow in a given area.

Although double-digging is a lot of work initially, over time the soil’s structure will improve, getting looser and easier to dig each year. Once you’ve established permanent raised beds, preparation can require as little as lightly loosening the bed with a spading fork. Eventually what began as a several-hour chore will become a fifteen-minute job. Weeding, watering, harvesting, and pest management are also made easier in the long run by double-dug, raised beds.

Spotlight on Cody, Wyoming



At an elevation of more than 5,000 feet, and with an average yearly temperature of 46½F (not to mention a first frost-free date of June 1), it took dogged determination on the part of the school committee at Livingston Elementary School to give students the experience of growing plants to maturity. After visits to the Cheyenne and Denver Botanical Gardens, the committee designed the Livingston Elementary Awareness Facility (LEAF), an indoor area that includes individual garden beds for the school’s classes. Enthusiasm for the garden runs high—according to one sage first-grader, “Our world will be a better place because we know how to grow plants.”

In celebration of Cody’s centennial, students elected to grow and study Wyoming’s native plants. As part of their studies, they learned about Native American uses of native plants, as well as the ways early settlers used these plants.

Outdoor Classroom Check List

1 PLANNING THE GARDEN

Form a steering committee of students, teachers, administrators, parents, and community members

Select a garden site with at least six hours of sunlight, access to water, and visibility from classrooms

Plan and design your outdoor classroom, indicating the location of the garden bed areas, the tool shed/storage area, the compost area, the outdoor instruction area, the greenhouse/cold frame area, and the water system

Purchase tools and materials

2 BREAKING GROUND

Organize a community work day

Cultivate soil, add soil amendments as needed

Do a preliminary soil test

Establish a compost pile

Order seeds

Stake garden beds

3 MAINTAINING THE GARDEN

Plant seeds in containers

Cultivate garden beds

Protect from pests and harsh weather

Add soil amendments

Plant and transplant

Maintain compost area

Water plants as needed

Prune plants

Weed and mulch beds

Test garden bed soil

Harvest crops

Plant cover crops

4 MANAGING THE GARDEN

Schedule class use of the outdoor classroom

Post garden maintenance tasks in outdoor area

Develop a work schedule for volunteers

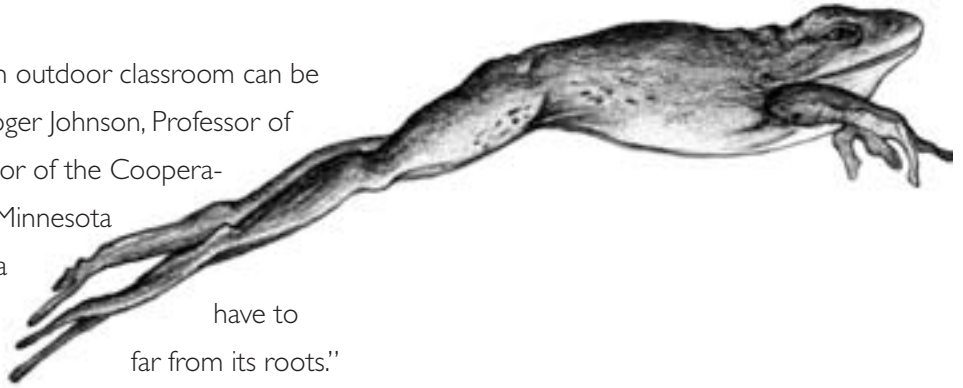
Plan a holiday and summer maintenance program

Create a supply-ordering system



MEETING THE CHALLENGE

As you can imagine, the logistics of an outdoor classroom can be tricky but the rewards are great. As Dr. Roger Johnson, Professor of Curriculum and Instruction and Co-director of the Cooperative Learning Center at the University of Minnesota puts it: "Once you see the excitement of a young child harvesting a first carrot, you wonder how education ever moved so far from its roots."



A STUDENT-CENTERED ENVIRONMENT

It takes time for children to develop the ability to work cooperatively in an outdoor classroom setting, but once it is established, you will find that from year-to-year, students will develop more independence and cooperative skills for their ongoing explorations. Here are some tips from Life Lab teachers.

Cooperative Structures: Life Lab teachers rely on a variety of small-group approaches to learning, many of which involve the techniques of cooperative learning.

Small-group cooperative learning is especially effective in an outdoor classroom setting. For example, if your students are observing how insects help pollinate plants in the garden, try dividing the class into groups of five, giving each group instructions to find one plant and quietly observe any visitor insects. Members of the group can be given specific tasks, such as timing each insect's stay, making a quick sketch of the insect, writing about how the insect moves, and communicating the group's findings to the class. In this way students develop cooperative learning skills (such as listening, explaining, suggesting, and group decision-making) while learning science concepts. And you become a resource for six groups rather than for 30 individuals.

Or you can divide the class into three groups for outdoor classroom work. As one group pursues an unsupervised writing or drawing

Spotlight on Charlton, Massachusetts



A school garden has become the cornerstone of Heritage School's science program for third and fourth graders. Here students build forest terrariums, study beneficial insects and integrated pest management, and conduct manufacturer trials for various seeds.

Teachers reduce class size by team teaching. While one teacher takes six students out for a lesson, her partner teaches a music lesson to the remaining students using songs related to what's happening outdoors. Worm songs are a big favorite!

project in the garden area, another can gather around for a teacher-guided science investigation, and a third can work in the garden with a volunteer. Be sure to rotate the groups so that all students experience the full range of activities.

Or you can set up classroom stations that students can explore in groups. For example, while learning to use microscopes, students might move from one station where they prepare slides, to another where they examine the slides.

Team Teaching: Some teachers temporarily reduce class size by making reciprocal arrangements with another teacher to take half of their class for P.E. during a garden project. (Be sure to repeat the project, this time permitting the other half of the class to participate.)

Buddy Classes: Or try an interesting variation on team teaching that also includes aspects of cooperative learning. A "buddy class" system teams a lower-grade class with an upper grade, matching students one-on-one for projects. Each teacher works with half of both classes at once. Another approach is "cross-age tutoring," which groups one older student with several younger ones.

Additional Adults: Another way teachers manage class time in the school garden is by increasing the adult to student ratio. Some schools have a paid garden aide, while others make use of community volunteers and parents.

Rules: The garden is a special kind of classroom and requires special rules for both effective learning and safety. You will want to set up a standard garden orientation program for your students and another for volunteers. Over the years, Life Lab has generated these basic rules:

- ☞ Always walk when in the garden.
- ☞ Stay on the paths.
- ☞ Always ask before using any tool or harvesting any crop.
- ☞ Respect the plants, the animals, the nonliving things, and each other.

In addition, create specific rules for using garden tools, and demonstrate to students proper and improper use of tools. Some teachers find it helpful to model correct and incorrect behavior and have



Students benefit from cooperative learning and buddy classes in the garden. © CEL/Tyler

A Community Work Day



Hosting a community work day is one of the most popular ways for Life Lab schools to accomplish big tasks in their outdoor classrooms.

At a kickoff community work day held for Freedom School in Watsonville, California, the staff, students, and parents got together on a sunny Saturday to dig beds, build work tables and cold frames, and construct a tool shed. An unexpected bonus was media coverage: a local newspaper reporter and photographer attended and a photo spread documenting the event appeared the next day.

students critique them. Your garden may require certain other rules, such as “Always keep the gate shut” or “Always wipe your feet and wash your hands before returning to class.” Phrase the rules positively and try to keep them simple—the fewer the better. Letting students help develop these rules will promote greater understanding and follow-through.

Post a list of your garden rules prominently, perhaps on the door of your tool shed. Explain the importance of a set of schoolwide guidelines for all students, teachers, volunteers, and visitors to follow.

RAISING FUNDS AND MORE

Donations of money and materials from community members, businesses, and charitable organizations can enhance your outdoor classroom program tremendously. Fundraising may provide a garden aide’s salary, special science equipment, or reference books. Even if you can’t get district funds for your outdoor classroom, your tool shed, or your dream greenhouse, there’s a good chance you can get someone to donate many of the materials and much of the labor you need.

Because most teachers don’t have time for a lot of fundraising, many schools rely on the assistance of the community support committees mentioned above. Here are some strategies that Life Lab schools have found fruitful.

Start locally: While you may have heard about “all those big grants” available from the state and federal government, your best bet for school garden support is right in your own backyard. Draw on any district funds that may be available. Go to your school’s “network” for help—parents, the friends and relatives of faculty and staff, and neighborhood businesses that have helped your school before.

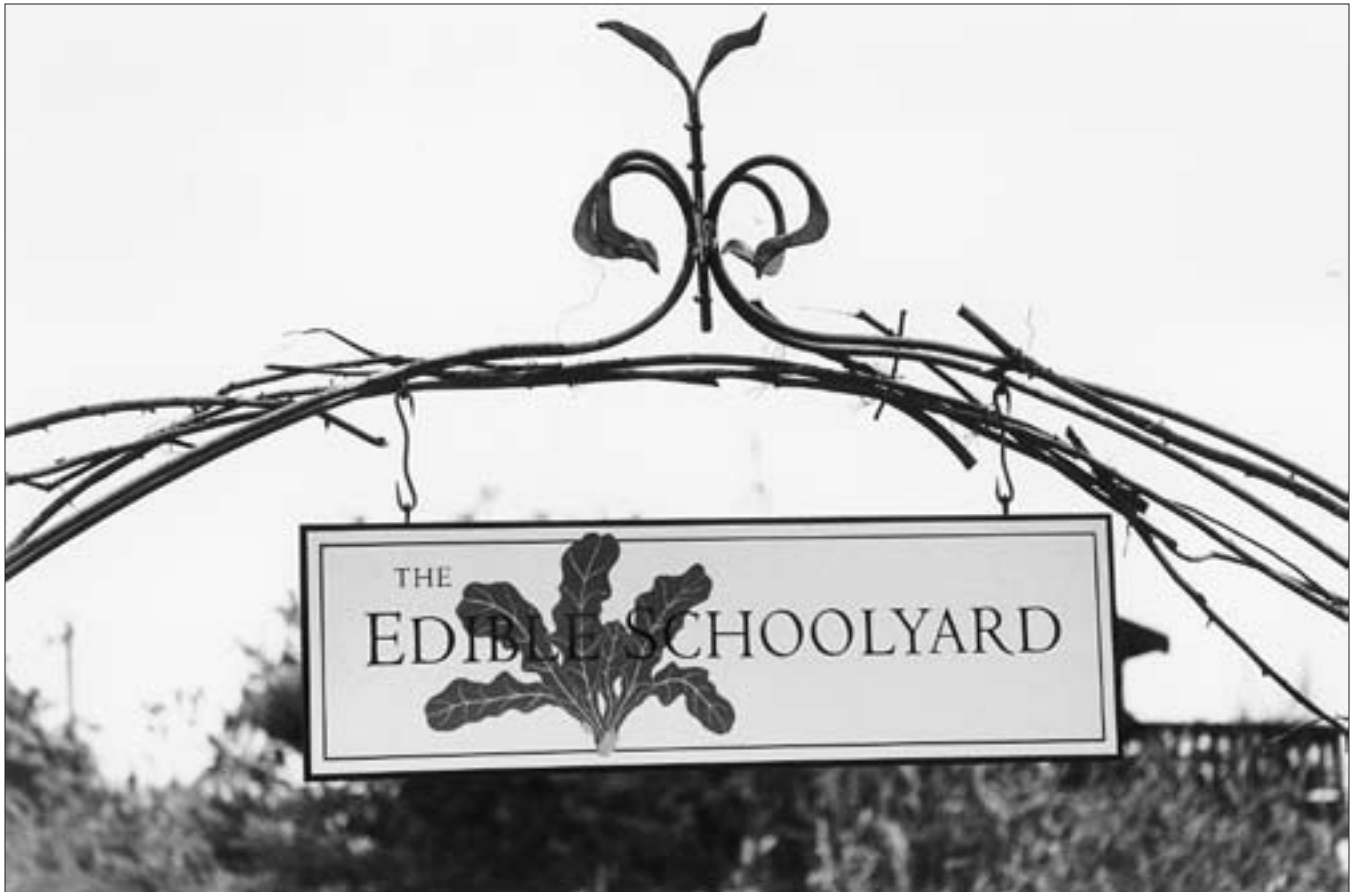
The type of help easiest to get is a donation of goods or services—“in-kind” contributions. Consider such sources as:



The garden serves as a meeting place for the school community. © CEL/Tyler

- ☞ Local businesses: nurseries, lumber companies, irrigation or bulldozing contractors; any business that has or does something you need. Bookstores might be another possibility as you augment your outdoor classroom library.
- ☞ Local farmers: parents or other school supporters in the farming business can be a valuable source of services (rototilling), goods (seedlings, used tools, or even historic farm equipment for a display), and expertise.
- ☞ Garden clubs: members of these organizations can be sources of both expertise and gardening goods and services.





Sign over the entrance to the Edible Schoolyard garden. © CEL/Tyler

- ☞ Individuals: parents and other community members may present unexpected talents and resources. For example, at Palmetto School in Miami, Florida, local TV newscasters volunteered to work with students on a special project to study the weather.

Sometimes what you need is something a donor wants to give away. Be creative. One teacher reports that she makes the rounds of area pumpkin lots after Halloween and collects their decorative bales of hay for mulch. Frank Porter Graham Elementary School in Chapel Hill, North Carolina, has organized a post-Halloween “pumpkin drop” to collect compost material.

For cash contributions, look to the following community sources: community service groups such as the Lions or Kiwanis clubs; waste disposal companies; PTA or PTO school improvement funds; or community foundation grants. Your local United Way will have information about community foundations in your area and about other sources of funding.

Research whether or not your city sponsors beautification projects. For example, several Life Lab schools in San Jose, California, have received matching grants from a city program called "San Jose Beautiful."

Consider contacting the large businesses and corporations in your city, county, or region. Most large companies have a "charitable arm" or



The Edible Schoolyard receives community support for its garden and kitchen classroom. © CEL/Tyler
Life Lab Science Program www.lifelab.org

even a foundation that funds local projects. In addition, large companies (and even some small ones) have Adopt-a-School programs which you can modify to “Adopt-an-Outdoor-Classroom.”

Many school gardens have found support for their garden projects by connecting their garden projects to funding sources that support nutrition education, waste reduction and watershed education.

For example:

Federal funds: U.S. Department of Education sources include:

- ☞ Nutrition Education: some schools use their garden to increase the consumption and appreciation of fresh fruits and vegetables.
- ☞ Waste Reduction: The Waste Free Schools program, which Life Lab Science Program helps manage, receives funding to reduce school generated waste through composting and recycling.
- ☞ Watershed Education: School gardens can be used to teach pesticide reduction, water conservation and to reduce urban runoff.

The following organizations provide grants for school gardens:

- ☞ The California School Garden Network (www.csgn.org)
- ☞ The National Gardening Association (www.kidsgardening.com)

You may find that you need to solicit large donations. Aside from sending notices home to parents, there are a variety of ways to get the word out about what your school garden needs, including public service announcements in the local media or even letters to local merchants from students.

Larger projects, however, call for a more formal approach. Let’s say you plan to build a greenhouse or irrigation system and need donations of materials from local businesses. Here’s an approach you can take: develop a specific project request, being sure to include a list of needed materials and an estimated budget. Compile a list of businesses that could supply those materials. Next, make an appointment to go in

person to meet with the owners or managers.

In the meeting, describe the purpose of your garden as it relates to student learning. If possible, bring along photos of the site and samples of student work. Show the business people the materials list and ask if they can contribute any of the items on it. Don't get discouraged if your early attempts at fundraising are not successful—it can take time and perseverance.

After you receive your funds or supplies, you will want to respond to every donation, regardless of size, with a thank you letter. Letters handwritten and illustrated by students are always nice. Keep a record of all donations. Many schools acknowledge large donations with a more elaborate thank you (including perhaps a certificate or plaque) incorporated into a special event at the school garden.

In Santa Cruz, California, students at Branciforte Elementary School made tiles to thank their donors. The tiles listed the donors' names. The children used the tiles to make a decorative border on the outside of their tool shed; in the center, they placed a handmade plaque.

With garden-related businesses, in particular, you will want to establish ongoing relationships. For example, encourage a local nursery to give you a call when they plan to discard plants, flats or seedlings; landscape suppliers could provide plants and gardening expertise; stables and farms can be a regular source of straw or compost. One Washington, D.C. school found that even their local zoo was a valuable resource, providing masses of manure for their compost pile.

VOLUNTEERS: EXTENDING THE TEACHER'S REACH

Volunteers are a major part of successful garden programs. Volunteers can help you build a tool shed or fence, organize a fundraiser to pay for a garden aide, contribute gardening expertise, or help you in the classroom. For many schools this volunteer support takes the form of

Working with Volunteers



Barbara Bonsac, a parent and Life Lab school garden volunteer coordinator at Palmetto Elementary School in Miami, Florida, offers these tips on how teachers can best work with volunteers:

- ☞ Encourage volunteers to attend school garden workshops in order to become acquainted with the teachers and the purpose of the program.
- ☞ Set meeting times with volunteers to discuss the upcoming activities. Discuss lessons and volunteers' tasks (teaching, supervising small groups, or assembling supplies) and set up a schedule.
- ☞ Give volunteers a copy of relevant curriculum materials to review ahead of time.
- ☞ At some point before the lesson, meet with volunteers to finalize plans.
- ☞ The day of the lesson, have volunteers arrive a few minutes early to help set up materials for the lesson.
- ☞ Encourage volunteers to have fun. And be sure to schedule special events such as potlucks and awards ceremonies to honor the volunteers for all their great work!



Exploring the world. © CEL/Tyler

an enthusiastic community support committee, often made up of parents and associated with PTA or PTO groups. But don't worry if you don't have that enthusiastic core of support to begin with; it will grow with your outdoor classroom.

Keep parents informed as you plan your outdoor classroom. Send home flyers letting them know about your new outdoor classroom and how they might get involved. Ask them for specific types of help, such as expert help in gardening, design, or carpentry, and donations of tools, materials, and supplies.

Some Life Lab schools have found enthusiastic and knowledgeable volunteers in local garden clubs. Area educational institutions (universities, community colleges, and high schools) are also good sources, as are teacher education and science departments. Environmental studies and horticulture departments often offer internships, work study programs, or other community involvement opportunities to their students. Local senior citizen organizations are yet another source to tap.

Your county's Cooperative Extension Office is designed to provide various types of assistance to enterprises like yours. Some of the programs they coordinate, including 4-H Clubs and master gardener programs, have provided assistance to many Life Lab garden programs.

Once you have your volunteers lined up, the next task is to organize them. Ideally, organizing your school garden volunteers will be a task for a volunteer support committee. It can make recruiting, organizing, training, and scheduling volunteers one of its tasks. While the initial establishment of a volunteer corps can be time consuming, this groundwork will result in an ongoing, dedicated, and reliable group that provides a steady flow of energetic help.

Volunteers will come to you with varying degrees of expertise. Some may have experience with children, some with gardening, and others with both. Provide a short orientation for new volunteers (it

can be led by a teacher, aide, or experienced volunteer) covering basic gardening practices, safety, discipline, as well as the purpose and philosophy of your school garden.

Let your volunteers observe the class until they feel comfortable supervising a small group on their own. Keep the number of students per volunteer as low as possible.

Regular volunteer meetings will not only allow you to discuss activities and address problems and questions, but will also let the volunteers know how valuable they are to your program. Make volunteer



High school students are enthusiastic volunteers. © CEL/Tyler



A volunteer parent and students work together.
© CEL/Tyler

appreciation a major theme of garden events and have your students write thank you letters to the volunteers.

Be sure, however, to resist the temptation to have all of your outdoor classroom work done by volunteers or aides. We cannot overemphasize the importance of having teachers work with their students.

PREVENTING VANDALISM

One sure way to minimize vandalism is to involve the community outside your school, as well as your immediate school community. Invite your neighbors to the ground-breaking ceremony. Help them understand the importance of the garden and its purpose. Ask your neighbors to keep an eye on the garden when school is not in session. It's important to have a garden sign telling who is involved and why, as well as who to call in an emergency. Some schools put up fences or grow natural borders. If you take this route, be sure that your fence or border doesn't obstruct visibility and hide intruders.

Within your school community be sure to include all students, even if they are not actively gardening. Share your harvest with them and invite them to special events in the garden.

Reality is, all of those beautiful flowers and vegetables will be tempting. Be prepared and plant more than you will need. If you harvest as soon as the crop is ripe, you'll also remove the temptation. Some experienced gardeners have even dusted plants with wood ashes or powder to make the crops look less inviting.



WHAT ABOUT THE SUMMER AND HOLIDAYS?

We highly recommend maintaining your school garden during the summer and holidays. This way you and your students will return to a bountiful fall harvest of crops, as well as plenty of weeds for the compost pile. Garden maintenance, especially during summer, can be a

challenge, but many of the schools we work with have come up with creative solutions. The first of two popular ways is to have a summer program using the garden and/or family gardening. Some schools coordinate a science program as part of summer school; others let city recreation programs use the garden for an environmental education summer camp. At other schools, students and their families can water and maintain the school garden for a week at a time in exchange for harvesting the wonderful summer crops and sharing in the adventure of gardening.

Students can learn a great deal from returning to a garden that is wildly overgrown, too. We recommend planting fast-growing crops



Gardens provide opportunities for integrating math studies. © CEL/Tyler



Harvesting lettuce in early spring. © CEL/Tyler

such as lettuce, radishes, carrots, and broccoli in early spring so that students can harvest them before school is out, and slow-growing crops such as pumpkins, corn, and tomatoes in late spring so that students can harvest them in the fall.

GARDEN COORDINATOR

No doubt you realize, it's helpful to have someone to coordinate the daily details. Some schools that Life Lab works with have a part-time aide, a parent volunteer, or even a teacher with time officially allotted to garden responsibilities.

Schools fund their paid aide position in various ways—sometimes with district funds and grants, sometimes with fundraisers. Garden fundraisers can offer unique community events. Selling live plants, plant seedlings, and seeds provide communities with valuable products and promote personal gardens. Consider an annual harvest festival, which not only generates cash, but is loads of fun and gets the community excited about the school garden program. You also might consider inquiring about a mentor program through your school district. Some teachers have received stipends and materials budgets through their district office so they can work as garden program mentors at their site or within their district. Schools that do not have an aide often rely upon an active steering committee of teachers, volunteers, and an administrator.

But remember, no matter how much help you may have, we strongly recommend that teachers continue to participate in the outdoor classroom. Unless teachers are present during the student garden experiences, they cannot realize the numerous opportunities for incorporating the garden experience throughout other curricular topics. The garden should not become a pull-out program.

KEEPING YOUR GARDEN IN THE PUBLIC EYE

One way to generate increased community attention and support is through local media coverage. Local newspapers, as well as radio and TV stations around the country, continue to be eager to publicize their communities' school garden programs.

Be sure to invite members of the local press to any school garden events you organize, or give the paper a call whenever something interesting is happening at your school. Be sure to let them know of any photo opportunities that might be of interest. A weekend work party at Freedom Elementary School in Watsonville, California, for example, got big play in the local daily paper and suddenly many people in town wanted to know more about the Life Lab school garden program and how they could help. Consider the political angle: invite your assemblyperson, congressperson, or mayor to speak at your garden event.

Generating good public relations can also involve the students. Here are a few examples of ways children have brought their living laboratory activities to the public's attention: one sixth-grade class compiled and called in weather reports to their local radio station; first and second graders read their garden poems on a local public radio children's show; at another school, students worked together to write a press release about an upcoming garden work party.

EVENTS AND SPECIAL ACTIVITIES

Special events revolving around your Life Lab program are a great way for your school to come together and celebrate, and they give members of the community a way to get involved as well.

Events can be as simple or elaborate as you like. Be creative and be sure to involve students in planning—they have wonderful ideas. Some schools sell plants or garden produce at their special events; many plant a special tree or shrub as part of the festivities. Classes often put on skits about their studies, and students might even dress up as their favorite garden fruits or vegetables.



The first event held by many Life Lab classes or schools is a dedication and/or ground-breaking ceremony. This event provides an opportunity to give an early introduction of the program to the community. It should include everyone who is involved or who you would like to be involved. Try inviting your state senator or U.S. congressional representative. Most are delighted to be associated with a unique, locally developed project. Be sure to notify the local media of any events.

Once schools get their garden program going, most develop a series of annual events that students and teachers can look forward to each year. Some examples to consider: seasonal planting and harvest-



As educators we have the opportunity to nurture a child's curiosity and desire to explore the world. © CEL/Tyler

ing festival; Halloween pumpkin sale followed by pumpkin compost; Garden Science Fair; community workday; family gardening activities; or sharing the school harvest with senior citizens.

Any new addition to your outdoor classroom can also be cause for celebration. Many schools have ceremonially dedicated their new wildlife area, nature walk, or birdhouse.

Some schools use their school garden events as fundraisers. Many also hold more traditional fundraising events to support their programs, including raffles, carnivals, walk-a-thons, or casino nights, usually organized by their community support groups.



The underlying theme in gathering support for your outdoor classroom is to make your program accessible in a variety of ways to the entire community, including people who don't ordinarily associate with schools. In this way, your school garden program becomes a catalyst for expanded community involvement with our most important resource—our children.



UNDERSTANDING NATURE'S CYCLES

FRITJOF CAPRA



Fritjof Capra is a cofounder and chair of the board of directors of the Center for Ecoliteracy. In addition to his research in physics and systems theory, he has been engaged in a systematic examination of the philosophical and social implications of contemporary science for the past 30 years. His internationally acclaimed books include *The Tao of Physics*, *The Turning Point*, *The Web of Life*, and *The Hidden Connections*. He serves on the faculty of Schumacher College, and lectures widely to lay and professional audiences in Europe, Asia, and North and South America.

Over the past two decades a new systems view of life has emerged at the forefront of science. The central insight is that there is a basic pattern of life that is common to all living systems—living organisms, ecosystems, or social systems. That basic pattern is the network. There is a web of relationships among all the components of a living organism, just as there is a network of relationships among the plants, animals, and microorganisms in an ecosystem, or among people in a human community.

One of the key characteristics of these living networks is the fact that all their nutrients are passed along in cycles. In an ecosystem, energy flows through the network, while the water, oxygen, carbon, and all other nutrients move in these well-known ecological cycles. Similarly, the blood cycles through our body, and so does the air, the lymph fluid, and so on. Wherever we see life we see networks; and wherever we see living networks, we see cycles.

These three insights—the network pattern, the flow of energy, and the nutrient cycles—are essential to the new scientific conception of life. But the basic phenomena are the web of life, the flow of energy, and the cycles of nature. And these are exactly the phenomena that are experienced, explored, and understood by children through gardening.

As we move towards the twenty-first century, the great challenge of our time is to create ecologically sustainable communities, communities in which we can satisfy our needs and aspirations without diminishing the chances of future generations. For this task, we can

learn valuable lessons from the study of ecosystems, which are sustainable communities of plants, animals, and microorganisms. To understand these lessons, we need to learn the basic principles of ecology. We need to become ecologically literate, and the best place to acquire ecological literacy is the school garden.

Gardening and cooking are examples of cyclical work—work that has to be done over and over again, work that does not leave any lasting traces. You cook a meal that is immediately eaten. You clean the dishes, but they will soon be dirty again. You plant, tend the garden, harvest, and then plant again.

In the garden, we learn about food cycles, one of the earliest and most important ecological concepts. From the beginning of the science of ecology, ecologists have been studying feeding relationships. At first, they formulated the concept of the food chain, which we still use today—small creatures being eaten by bigger ones, which are eaten in turn by still bigger ones, and so on. Soon ecologists realized that all the big creatures are eaten by smaller ones when they die, by the so-called decomposer organisms. This led to the concept of food cycles. And finally, ecologists recognized that these food cycles are all interconnected, because most species feed on several other species, as we do, and thus the food cycles become part of one interconnected network. So, the contemporary concept in ecology is that of the food web, a network of feeding relationships.

In the garden, we learn that green plants play a vital role in the flow of energy through all ecological cycles. Their roots take in water and mineral salts from the earth, and the resulting liquids rise up to the leaves, where they combine with carbon dioxide (CO_2) from the air to form sugars and other organic compounds. In this marvelous process, known as photosynthesis, solar energy is converted into chemical energy and bound in the organic substances while oxygen is released into the air to be taken up again by other plants, and by animals, in the



Snails secrete their own slimy pathways to help them glide along. © CEL/Tyler

process of respiration.

By blending water and minerals from below with sunlight and CO_2 from above, green plants link the earth and the sky. We tend to believe that plants grow out of the soil, but in fact most of their substance comes from the air. The bulk of the cellulose and the other organic compounds produced through photosynthesis consists of heavy carbon and oxygen atoms, which plants take directly from the air in the form of CO_2 . The weight of a wooden log comes almost entirely from the air. When we burn a log in a fireplace, oxygen and carbon combine once more into CO_2 , and in the light and heat of the fire we recover part of the solar energy that went into making the wood. All this we

can learn from gardening.

In a typical food cycle, the plants are eaten by animals, which in turn are eaten by other animals, and thus the plants' nutrients are passed on through the food web, while energy is dissipated as heat through respiration and as waste. The wastes, as well as dead animals and plants, are decomposed by insects and bacteria, the decomposer organisms, which break them down into basic nutrients, to be taken up once more by green plants.

LINKS IN THE WEB OF LIFE

In gardening, we integrate the natural food cycles into our cycles of planting, growing, harvesting, composting, and recycling. Through this practice, we also learn that the garden as a whole is embedded in larger systems that are again living networks with their own cycles. The food cycles intersect with these larger cycles—the water cycle, the cycle of the seasons, and so on, all of which are links in the planetary web of life.

In the garden, we learn that a fertile soil is a living soil containing billions of living organisms in every cubic centimeter. These soil bacteria carry out various chemical transformations that are essential to sustain life on Earth. Because of the basic nature of the living soil, we need to preserve the integrity of the great ecological cycles in our practice of gardening and agriculture.

Another type of cycle we encounter in the garden is the life cycle of an organism—the cycle of birth, growth, maturation, decline, death, and new growth of the next generation. In the garden, we experience growth and development on a daily basis. We can follow the development of a plant from the seed to the first shoot, the growth of the stem and leaves, the buds, the flowers, and the fruits. And when we look into a fruit, we find that at its very core are the new seeds; and so the life cycle begins again.

The understanding of growth and development, of course, is essential not only for gardening but also for education. While the children learn that their work in the school garden changes with the development and maturing of the plants, the teachers' methods of instruction and the entire discourse in the classroom changes with the development and maturing of the students. This is systems thinking in action—applying the same principle to different systems levels.

Since the pioneering work of Jean Piaget in the 1920s and 30s, a broad consensus has emerged among scientists and educators about the unfolding of cognitive functions in the growing child. Part



Students practice observing animal behavior. © CEL/Tyler

of that consensus is the recognition that a rich, multisensory learning environment—the shapes and textures, the colors, smells, and sounds of the real world—is essential for the full cognitive and emotional development of the child. Learning in the school garden is learning in the real world at its very best. It is beneficial for the development of the individual student and the school community, and it is one of the best ways for children to become ecologically literate and thus able to contribute to building a sustainable future.



Through our senses we experience the world. © CEL / Barlow

ABOUT THE COLLABORATORS

CENTER FOR ECOLITERACY

The Center for Ecoliteracy is a nonprofit organization dedicated to education for sustainable living in K-12 schools nationwide. Through its initiative, Smart by Nature: Schooling for Sustainability, the Center provides expertise, inspiration, and support to the vital and growing movement of educators who are preparing young people to meet today's environmental challenges by developing the knowledge, skills, and values essential to sustainable living. Based on nearly 20 years of experience, the Center for Ecoliteracy offers books, teaching guides, and other publications; professional development seminars; and direct consulting services, including academic program audits, in-depth curriculum development, and coaching to improve teaching and learning around sustainability. The Center's newest book is *Smart by Nature: Schooling for Sustainability* (Watershed Media/UC Press, fall of 2009). Other books and guides include *Big Ideas: Linking Food, Culture, Health and the Environment* (Center for Ecoliteracy, 2008); *Ecological Literacy: Educating Our Children for a Sustainable World* (Sierra Club Books, 2005); and *Rethinking School Lunch* (Learning in the Real World, 2004).



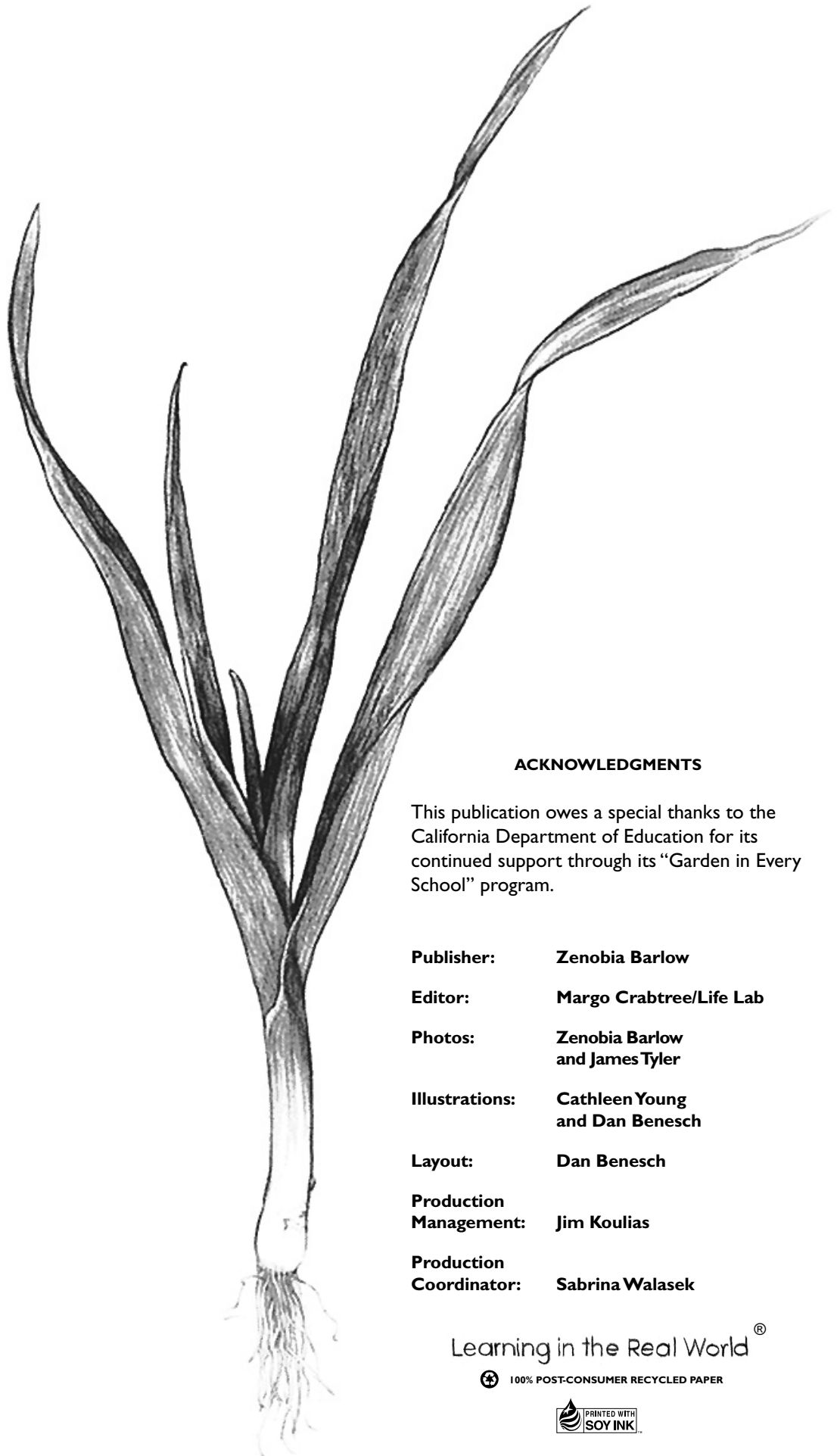
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LIFE LAB SCIENCE PROGRAM

Life Lab Science Program is a national leader in garden-based education. Life Lab, founded in Santa Cruz, California in 1979, is dedicated to developing and using school gardens as "living laboratories" where students can integrate and apply what they are learning in the classroom. Life Lab has trained tens of thousands of educators in science, math, language arts, visual arts, and environmental education in the garden. Hundreds of thousands of Life Lab's garden-based activity guides and curricula have been sold nationwide. Life Lab hosts over ten thousand students and educators each year in their Garden Classroom for workshops, field trips, summer camps, and youth internships. Visit www.lifelab.org for more information on garden-based learning resources, workshops, and publications.



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Learning in the Real World[®]

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