

# School Garden Manual

Teaching Gardens is a cross-curricular tool to teach about nutrition, language arts, science, social studies, mathematics and the arts.

*Come forth into the light  
of things, Let Nature be  
your teacher.*

— William Wordsworth

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Some excerpts taken from *The Growing Classroom* and *Sowing the Seeds of Wonder*, © Life Lab Science Program, published by National Gardening Association, [www.kidsgardening.org](http://www.kidsgardening.org).

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## Section I. **Why a Teaching Garden?**

### **Growing Healthy Habits:**

Our children are facing a health crisis unlike anything we've seen before. Nearly one in three American children and adolescents is overweight or obese. Being overweight or obese has a negative impact on almost every organ system in the body. Among children today, obesity is causing a broad range of health problems that previously weren't seen until adulthood. These include high blood pressure, type 2 diabetes, asthma, sleep apnea and elevated blood cholesterol. There are also psychological effects: Obese children are more prone to low self-esteem, negative body image and depression. Although there is no one cause of obesity, diet and nutrition habits play a large role. Many American children are suffering from a modern-day "malnutrition," with diets full of foods with minimal or no nutritional value. Less than 0.5 percent of children and youths between the ages 5 of and 19 meet the American Heart Association's definition of an ideal healthy diet. Fewer than one in 10 high school students get the recommended servings of fruits and vegetables daily.

To address this problem, the American Heart Association is partnering with elementary schools across the U.S. to establish Teaching Gardens to teach positive nutrition habits. Numerous studies have shown that school garden programs can improve students' attitudes toward fruits and vegetables, and may increase consumption. Community and school gardens may also teach and reinforce responsibility, leadership, group cohesion/team building, eco-literacy, basic life-science, problem-solving skills, math skills, pride, confidence and self-esteem. Students learn and build higher-order thinking skills through experiential, reality- and project- based learning.

### **Implementing American Heart Association Teaching Gardens and Improving Nutrition in Your School**

Research has shown that children who grow and harvest their own vegetables are more willing to taste and like them. Just by engaging in a school garden project, students are exposed to the pleasure of eating freshly picked produce. For many students, this may be the only really fresh food they consume. Educators can increase the likelihood that students will learn to like and choose these foods by involving them in preparing meals with fresh ingredients from the garden, and integrating lessons on nutrition into their classroom curriculum.

Nutrition activities can easily be incorporated into core subject areas in the garden. In science, for example, students can classify foods by their nutritional category, learn which parts of plants

they eat, compare the color of vegetables when cooked “al dente” vs. overcooked and make graphs of class food preferences. Harvesting and cooking food provides wonderful fodder for class creative writing projects, recipe books, plays and oral presentations. Young mathematicians can calculate how many calories they should consume, estimate how much lettuce they will need for a class salad and learn to convert recipes. Preparing a wide variety of meals with crops from the school garden is also a great way to excite students about other cultures and civilizations. Creating and sustaining a school garden presents an exciting opportunity and challenge for any school. It requires creativity, commitment and collaboration from everyone involved. As we have seen in school gardens across the country, the time and energy invested yields tremendous rewards. So grab a shovel and let’s dig in!

## Section II. **From the Ground Up**

School gardens thrive everywhere — in cold and warm climates, and in urban, suburban and rural communities. They are in schools with no bare ground and in schools with acres of land. Schools of all types have adapted strategies that work for them, tailoring gardens to fit their needs.

Start your garden program off on the right foot by establishing goals and a plan for achieving them.

### **APPOINTING LEADERSHIP FOR YOUR TEACHING GARDEN**

#### Step 1: Designate a Teaching Garden Champion

The first step for planning and establishing a Teaching Garden in your school is to appoint a Teaching Garden Champion. This person will serve as the primary coordinator for your garden. This person probably will be a staff member at your school and will be responsible for leading/coordinating the activities of the Teaching Garden Committee (see page 5), as well as serving as the primary point of contact with the American Heart Association staff in your community. First and foremost, this person must be committed and passionate about the opportunities to improve the health and learning opportunities available to your student population through gardening. (Note: the Teaching Garden Champion does not have to be an expert gardener!)

### **SETTING GOALS FOR YOUR TEACHING GARDEN**

#### Step 2: Establishing a Common Vision

The Teaching Garden Champion, possibly along with a school leader or administrator, will create a vision for the Teaching Garden and begin setting basic goals for how the garden will be integrated into the school community. Ask yourselves: What, ultimately, do we want this garden to be? What is its purpose? How will it connect to curriculum? How will it be used by students and staff? What will it look like in three to five years? How will we get there? Share this vision with the school community and begin to plan the steps for achieving it.

### **Unique Solutions**

Teaching Gardens are functional additions to schools. Every Teaching Garden can be as unique as the school community it serves. Each American Heart Association Teaching Garden, no matter the shape or location, has the potential to become an integrated part of the community and serve as a tool to explore the world and its possibilities.

### **Some Teaching Garden Outcomes**

- Students regularly experience opportunities to try new vegetables and herbs
- Students understand the origins of food
- The Teaching Garden becomes a Service Learning project
- Increased environmental-literacy
- Increased community cohesion and interpersonal skills
- Students strengthen observational skills

### Step 3: Setting Goals

Dream big, but start small. It is essential for your program to start with a vision that excites all stakeholders and is also manageable for all of the people involved. Consider developing a three-year plan, with realistic objectives for each year. While you may have visions of a mini-farm or a greenhouse, the best way to realize your dreams may be to start with the basic American Heart Association Teaching Gardens structure of several above-ground bed boxes. Remember, a tremendous amount of learning and discovery can happen with just a few seeds.

#### Breaking it Down: Planning Your Next Steps

One goal your team has agreed to accomplish *by one year from now*:

	List each task required to accomplish the goal	Materials or resources needed	Lead person/assistant	Date to be completed
1				
2				
3				
4				



## Step 4: Building Your Teaching Garden Committee

Teamwork is essential for a thriving school garden program. Now that you have established basic goals, the next step is to build a Teaching Garden Committee to help you implement your plans.

### Who to Recruit?

The committee can be composed entirely of school personnel, but the best approach is to include representatives from the school board, administrators, school staff (particularly a member already on the school's Wellness Council), the school nurse, local doctors or nurses, some parents (including PTA/PTO members) and some community members who do not have children in school. Tap into parents who are dietitians, gardening experts and health enthusiasts. And don't forget to reach out to local American Heart Association volunteers or staff. Adding people who do not have kids in the school is a great way to get community members involved and bring them together for a common goal. This committee should have between five and eight members.

### Essential people to join your Teaching Garden Committee

**Administrators:** An enthusiastic and supportive principal is key to the development of your Teaching 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 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 local government officials and even state and federal lawmakers. It's worth your while to make them part of your school garden "family." Invite them to your groundbreaking or dedication ceremony. Send project updates regularly to keep their attention, and invite your superintendent and other school board members to observe firsthand how garden activities enhance classroom instruction and student learning.

**Teachers:** At most schools a core group of teachers will be the catalyst for your 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 garden will look like, how it will be used, 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

### Steps for Creating a Teaching Garden Committee:

1. Identify key stakeholders.
2. Recruit and invite members to join.
3. Host a kickoff meeting.

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:** Student representation in planning and building the outdoor classroom will enhance the sense of ownership students feel toward the garden. Involve them as much as possible in every step of the process, from designing a garden plan to planning events.

**Parents:** Encourage a team of parents to participate as volunteers. Recruit parents of younger students who will stay in the school for several years. Parent volunteers can help teachers gather materials and teach garden lessons in small groups. They can also assist with general garden maintenance, fundraising and ordering supplies.

**Community:** Community members not previously associated with your school may be happy to share their skills with your garden program. For example, at one school a landscaper volunteered to build a pond in the garden, and at another an entomologist taught lessons on insects to students. Schools can get connected to the larger community by contacting garden clubs, soliciting local media coverage and starting email campaigns.

**Roles Within the School Garden Committee**

These individuals have vested interest in Teaching Gardens. By identifying those who have an interest in seeing the school's environment change, you can better recruit people willing to take a part in implementing Teaching Gardens. Potential stakeholders/committee members could be involved in the following ways:

Stakeholder	Interest/Investment in Teaching Gardens	Potential Roles in Teaching Gardens
Principal	<ul style="list-style-type: none"> <li>• Improved health of the students and school as a whole</li> <li>• Reduced absenteeism due to illness of students</li> <li>• Improved tests scores and academic performance of students</li> <li>• Increased attention span, reduction in behavioral problems and improved mood of students</li> </ul>	<ul style="list-style-type: none"> <li>• Be a role model of healthy eating habits for students,</li> <li>• Be an ambassador for school garden(s) to your school district and community,</li> <li>• Serve on the School Garden Committee and participate in garden planning,</li> <li>• Arrange time for teacher/staff training and make the Teaching Garden a priority for the school,</li> <li>• Oversee garden development and maintenance, evaluate successes, troubleshoot, and organize volunteers and community support.</li> <li>• Incorporate garden planning into school's short- and long-range goals and objectives.</li> </ul>

Stakeholder	Interest/Investment in Teaching Gardens	Potential Roles in Teaching Gardens
<p>Teachers/School Faculty</p>	<ul style="list-style-type: none"> <li>• Improved health of the students and school as a whole</li> <li>• Improved test scores and academic performance of students</li> <li>• Increased attention span, reduction in behavioral problems and improved mood of students</li> </ul>	<ul style="list-style-type: none"> <li>• Be a role model of healthy eating habits for students.</li> <li>• Serve on the School Garden Committee planning committee to steer garden planning, development and maintenance; evaluate success; troubleshoot; and organize volunteers and community support.</li> <li>• Serve as a reference point for other school faculty and staff when planning garden activities.</li> </ul>
<p>Master Gardener and Local Agriculture Extension Group</p>	<ul style="list-style-type: none"> <li>• Promote gardening and health</li> </ul>	<ul style="list-style-type: none"> <li>• Serve on School Garden Committee to oversee garden development and maintenance.</li> <li>• Provide resources and training to school staff on gardening basics.</li> </ul>
<p>Facilities/Maintenance Manager</p>	<ul style="list-style-type: none"> <li>• Improved health of school faculty and students</li> </ul>	<ul style="list-style-type: none"> <li>• Serve on the School Garden Committee and participate in garden planning.</li> <li>• Oversee garden development and maintenance.</li> <li>• Work with internal and external team on garden site selection, planting and harvesting.</li> </ul>
<p>Parents</p>	<ul style="list-style-type: none"> <li>• Increased consumption of fruits and vegetables by their children</li> <li>• Reduced risk of overweight/obesity of their children</li> <li>• Improved overall health and academic performance of their children</li> <li>• Formation of a healthier home</li> </ul>	<ul style="list-style-type: none"> <li>• Be a role model of healthy eating habits for students.</li> <li>• Serve on School Garden Committee and participate in garden planning and volunteer recruitment.</li> <li>• Volunteer to help teachers gather materials and teach garden lessons in small groups.</li> <li>• Assist with general garden maintenance and ordering supplies.</li> <li>• Provide motivation to school and help promote school garden initiative.</li> </ul>

Stakeholder	Interest/Investment in Teaching Gardens	Potential Roles in Teaching Gardens
Students	<ul style="list-style-type: none"> <li>• Increased pride and ownership in school garden</li> <li>• Increased knowledge of fruits and vegetables; increase consumption of healthy fruits and vegetables</li> <li>• Increased overall health and reduce absenteeism due to illness</li> </ul>	<ul style="list-style-type: none"> <li>• Serve as student liaison to School Garden Committee.</li> <li>• Help design a garden plan.</li> <li>• Help plan garden activities/events.</li> </ul>
Registered Dietitian and/or School Food Service Director	<ul style="list-style-type: none"> <li>• Increased motivation among students and their families to eat healthy</li> <li>• Decreased illness and absenteeism due to illness</li> <li>• Improved health and decreased health risks of students</li> <li>• Better body mass index scores of students</li> </ul>	<ul style="list-style-type: none"> <li>• Be a role model of healthy eating habits for students.</li> <li>• Provide healthy diet education to students and parents.</li> <li>• Serve as a reference point for other school faculty and staff when planning garden activities.</li> <li>• Serve on School Garden Committee and participate in garden planning.</li> <li>• Encourage students and parents to be eat more fruits and vegetables.</li> </ul>
Community Members	<ul style="list-style-type: none"> <li>• Improved school environment</li> <li>• Healthier community</li> <li>• Decreased risk of childhood obesity in their community</li> <li>• A healthier environment to raise children</li> </ul>	<ul style="list-style-type: none"> <li>• Be a role model of healthy eating habits for students.</li> <li>• Donate finances or materials to school's garden efforts.</li> <li>• Help build community awareness and excitement.</li> </ul>

**Extend Invitations to Join the Committee:** After you identify stakeholders, contact them and discuss how you want them to be involved in the school Teaching Garden.

## Sample Meeting Agenda No. 1

### **First Teaching Garden Committee Meeting**

#### **Welcome and Introductions**

- Establish start and end times.
- Have everyone in the group share names, roles and why they are involved in the committee.

#### **The Importance of American Heart Association Teaching Gardens**

##### **Who are we and why are we here?**

- The Teaching Garden Committee is made up of people from the school and community, including parents. The committee collaborates to identify concerns, set priorities and design solutions in regard to the health environment and opportunities to offer experiential, project-based learning in the school. We will act collectively to establish, maintain and integrate the Teaching Garden into our school community.

#### **Functions and Benefits of an American Heart Association Teaching Garden**

##### **Teaching Garden Committee Membership Exploration**

##### **Creating our Teaching Garden Committee**

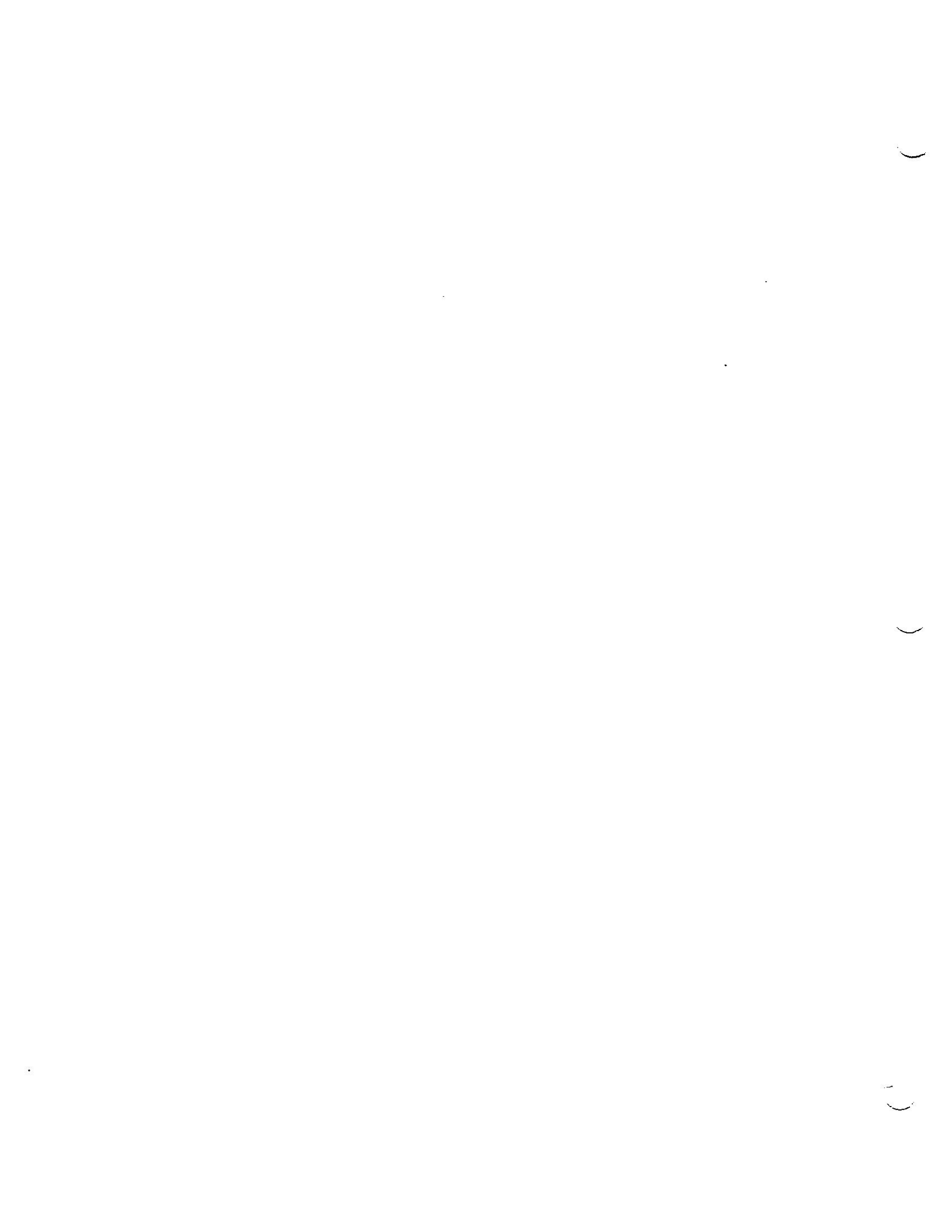
- Identify our purpose.
- Establish group agreements.
- Draft roles and responsibilities.
- Plan the meeting structure – how often, how long, decision-making process.

#### **Overview of the American Heart Association Teaching Garden Program and Resources**

##### **Garden Build and Plant Day**

- Discuss plans for building, including the site within the school, key stakeholders, teaching training and curriculum overview. Begin planning Plant Day (set date, assign roles, send invitations, etc.).

##### **Next Steps and Adjourn**



## Section III. **Planning Your Garden**

### Step 5: Choosing Your Garden Site

Thriving school gardens come in all shapes and sizes, from a planter box outside the classroom to an edible jungle overtaking the corner of a field. A dedicated team can transform almost any site, from a dirt parking lot to a school courtyard, into a flourishing school garden. Your American Heart Association Teaching Garden will consist of 8-10 above-ground planter boxes. The cedar boxes are available in various shapes and sizes and can be arranged to accommodate almost any unique space. They can be set up on dirt, concrete, rooftops, parking lots or the lawn and they are ADA compliant.

Whichever arrangement you choose, here are some things to consider when selecting your garden site:

**Sunlight:** Most vegetables, herbs and flowers need at least six hours of full sun every day. Check possible garden sites for sun exposure at different times of the day. Take note of objects (such as buildings or trees) that might block light in different seasons, when the sun is lower or higher in the sky. If you decide to include shady spots in your garden, you can use them for shade gardens, wildlife habitat or teaching areas on hot, sunny days.

**Water:** The garden should be close to a water faucet. Carrying water in watering cans might work for a small container garden, but is not a good option for a larger garden. See page 43 for information on watering.

**Drainage:** Both slope and soil type affect drainage. Avoid steep slopes. Also, don't plan a garden in a low spot where puddles form in wet weather.

**Soil:** If you choose to plant additional vegetables outside of your provided American Heart Association Teaching Garden bed boxes, it's important to test any potential in-ground site for lead contamination and underground pipelines and cables. Soil naturally contains low levels of lead, but exposure to paint or other building materials predating 1978, or exposure to runoff from roads or parking lots, can increase lead to harmful levels. Contact your county health department or Cooperative Extension office for information on testing or visit [www.epa.gov/lead](http://www.epa.gov/lead). If your soil is toxic, it will be important to keep the entire garden in the provided containers, where the toxins cannot leach into the garden soil.

It's also a good idea to test your soil for nutrient content, pH and texture (sand, silt, and clay content). You can buy a do-it-yourself soil test kit at a garden center, or contact your local Cooperative Extension office for information on where you can send your soil for testing. This information will help later in determining what, if any, amendments you should add when preparing to plant.

**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 classrooms makes it more convenient, more visible and easier to incorporate into the curriculum on a regular basis. Student 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.

## Step 6: Designing Your Garden

Once the site is selected, it's time to design the garden. 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. While you may have visions of a giant garden or a greenhouse for those cold winter months, the best way to realize your dreams is to build them step-by-step.

You can organize your garden 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, many school gardens include sinks, tables, gathering areas and other components.

### **Involving Students and Community**

Designing the garden is a great opportunity to heighten students' interest. Many schools encourage students in each class to design their own vision of the garden, and then pick the best elements of each for the final plan.

Mapping the school garden provides hands-on opportunities to integrate and apply geography and math skills. Have students 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 and include it on the map. Use a compass to figure out which direction is north and show that on the map.



When planning your site, be sure to seek out parents or other community members who will lend their expertise. You may find a garden supply store owner or garden club member who will volunteer to help lay out the garden plan. You may also find 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.

## Garden Components

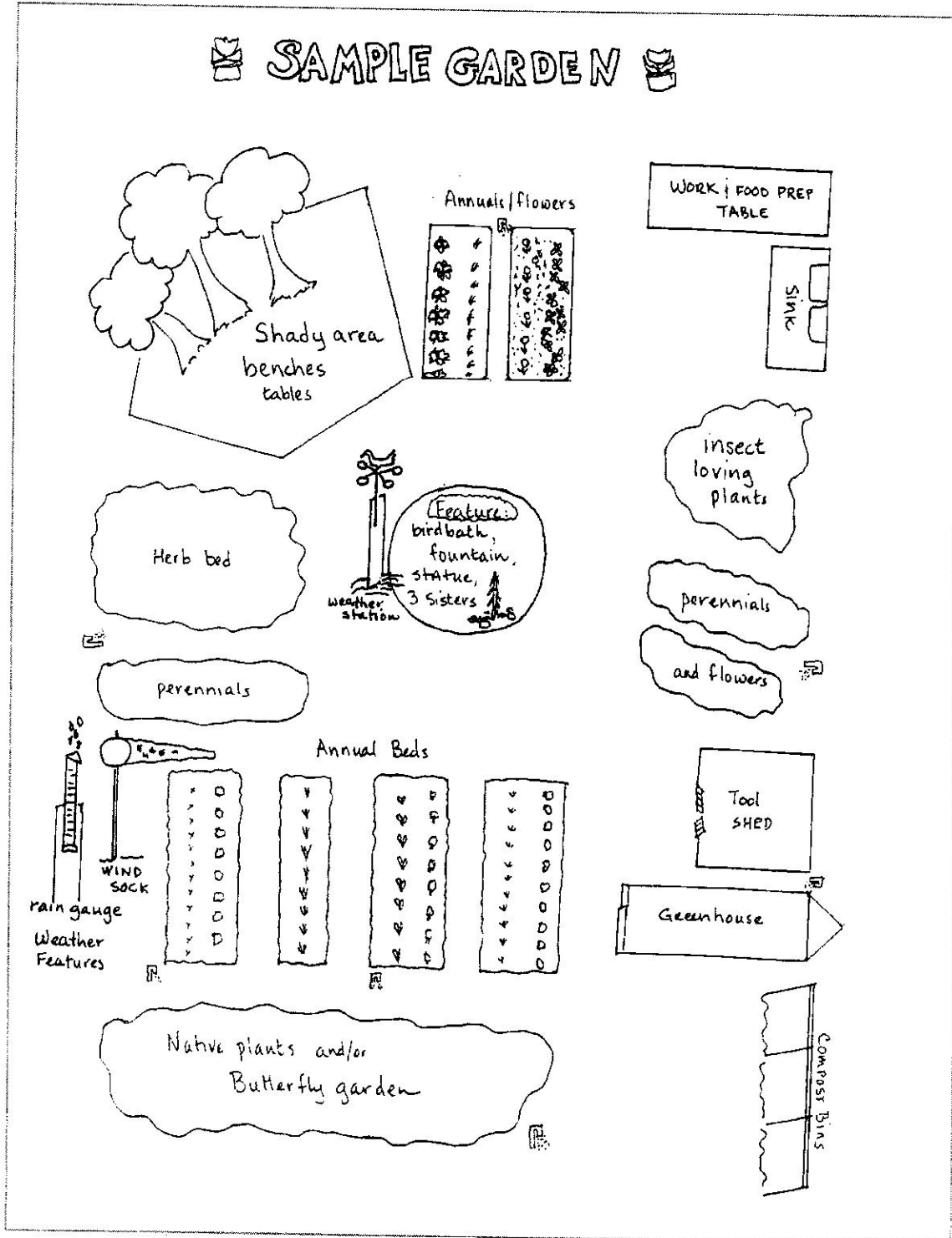
### The Basics:

- **Outdoor class meeting area.** 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.
- **Small group gathering areas.** Leave some spaces open in the garden so you have room for students to gather in small groups at activity stations.
- **Bed(s) for each classroom.** Assigning beds to specific classrooms or grades is a great way to promote ownership and divide labor.
- **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.
- **Compost area.** Composting is a fundamental garden activity and a great way to turn garden waste into 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.
- **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. If you plan to build a structure, be sure to consult whoever in your district oversees building for building codes and regulations. Make sure all projects meet fire and electrical safety code requirements.
- **Sink(s).** A sink in the garden makes washing hands and produce much easier. Make sure the water is potable (drinkable). Some school gardens use an old donated sink and build a simple stand for it with 2-by-4s, with a drainage pipe running under the nearest tree.
- **Garden Sign.** No matter what size your garden is, make a sign to give it an identity within the school and neighborhood. Signs help identify your school garden as an outdoor learning center, announce times the garden is open, and provide rules and guidelines. Ask students to design the logo or drawing that will appear on their sign. Let a student construction committee make the sign. Also have students design signs for their class beds.
- **Work tables.** Tables are essential for many garden lessons and projects.

**Other elements your plan might include:**

- **Special project area for student experiments.** Dedicate a portion of the garden for individual projects. Signs can tell visitors what student scientists are investigating.
- **Greenhouse or cold frame.** A greenhouse or cold frame is a protected place for starting seedlings in a controlled environment, which helps to extend the growing season. You can also set up an indoor growing area in your classroom.
- **Theme beds.** Theme beds can include all the ingredients for a recipe, such as a salad bed, salsa bed or pizza bed. Theme beds also may contain plants that have something in common, such as a bed of butterfly-attracting plants or a bed for tea plants. Nutrition-themed beds could include an Eat-the-Rainbow Bed or a Vitamin A Bed, for example.
- **Animal habitats.** Including elements such as bird baths, bird houses, native shrubs, trees or a pond can welcome beneficial wildlife to your garden and provide opportunities for your students to observe ecological interactions.
- **Elements of whimsy and play.** Students easily connect with a garden that includes unique and kid-centered elements such as animal footprints in a cement path, wind chimes, sun catchers, a tunnel covered in vines, a special spot reserved for digging or a tree with musical instruments hanging from its branches.

Sample School Garden Map



**BED TYPES****Raised Beds**

Your basic American Heart Association Teaching Garden will consist of raised bed boxes. Raised beds are essentially in-ground beds with a significantly raised soil level and sometimes a frame built of wood. (They can also be plastic lumber, cinder blocks or other materials, but the boxes provided by the American Heart Association are cedar.)

**Benefits:**

- In areas with poor soil, raised beds offer the opportunity to garden in better, imported soil.
- Raised beds have obvious borders, which help students know where they can and cannot step.
- Depending on their height, framed raised beds can be made wheelchair accessible. Other users may find the higher soil surface level more convenient as well.
- Gopher wire is easily attached to the bottom edge of the frame prior to filling it with soil.

*If you choose to expand your school's Teaching Garden beyond the basic raised bed boxes provided by the American Heart Association, here are some options to consider:*

**Containers**

Plants can grow indoors or outdoors in containers of varying sizes. Planting containers need drainage holes in the bottom and should be made from materials that hold up well when wet and left outdoors. Ceramic and plastic pots are available at nursery centers. Many other items can also work as plant containers, as long as you make sure they have adequate holes for drainage (old wheelbarrows, buckets or even old boots, for example).

**Pros:**

- Containers can be used on top of asphalt or where there is no soil.
- Containers can be strategically placed to beautify school grounds or follow the sun seasonally.
- Tall containers can be wheelchair accessible.
- Small containers or containers on wheels can be moved inside to protect them from weather or vandalism.
- Containers can be used inside at schools with limited outdoor space.

**Cons:**

- Containers (or the materials to construct them) can be costly.
- Containers require potting soil, which must be purchased or made from purchased ingredients.
- Containers need to be watered and fertilized more often than in-ground beds.

### **In-Ground Beds**

If you choose to expand your Teaching Garden to include in-ground planting, here is some additional information to consider: In-ground beds are dug directly into the ground and are level with the soil surface. There may be a visible edge or physical border (such as a line of rocks or driftwood), but the soil surface is not significantly higher than surrounding areas. This type of bed relies on the existing soil, although amendments such as compost or other fertilizers may be added to improve the soil. These beds should be no more than 3 feet wide so students can easily reach into the middle of them to work the soil, weed or harvest.

#### **Pros:**

- No building materials or imported soil are required to start these beds.
- Less labor is required to start these beds because you don't have to build anything.
- It's relatively easy to expand or change the layout of your garden.
- In-ground beds make good use of the water and nutrients in the existing soil.

#### **Cons:**

- You need a site with workable, uncontaminated soil.
- It is difficult to install gopher wire under in-ground beds.

## Container Gardens & Indoor Gardens

Container gardens can be successful indoors or outdoors.

### **Outdoor Container Gardens**

You can create a productive outdoor garden using containers filled with soil. These mini-gardens can provide herbs, vegetables and flowers for your students all year long. Set up your garden in a safe spot, such as a balcony or patio, that receives at least six hours of sunlight per day. If you don't have a spot outdoors where you can safely leave plants overnight, consider creating a mobile garden of containers on a cart or wagon, which can be wheeled into the classroom at the end of the day.

Brainstorm with students and gather recycled materials to use as containers. A wide variety of containers can be used, including fruit crates, barrels, cement blocks, buckets, trash cans, old baskets, bathtubs, coolers, wheelbarrows and even old boots. One seaside school grows plants in an old rowboat. Tires are a popular type of container for growing flowers, but don't use them to grow food because they can leach harmful chemicals into the soil.

Large plants such as tomatoes or squash should be grown in containers that hold more than 4 gallons of soil. Smaller containers are suitable for shallow-rooted crops such as lettuce, spinach, onions, strawberries and herbs.

Punch holes in the bottom of your container for drainage. Line any containers that need lining (such as baskets or fruit crates) with a double layer of plastic, and punch holes through the plastic. Fill containers with a light planting mix rather than soil. You can make your own by combining one-third compost, one-third coco pith and one-third horticultural sand.

Choose your plants carefully. Consider smaller plant varieties that are suited to containers. (Visit [www.reneesgarden.com/seeds/seeds-hm/seeds.html](http://www.reneesgarden.com/seeds/seeds-hm/seeds.html) to browse a collection of seeds suggested for container gardening.) Think about how big the mature plants will be when deciding how many to plant per container. Also consider how many plants of a certain type you will need for your class. For example, you might want to plant plenty of carrots so each student can enjoy a carrot snack, but you might only want six lettuce plants for class salads. Brighten the mix with an edible flower like a miniature cascading nasturtium.

If you are using any large containers, consider doing your filling and planting in the area you'll be keeping your container garden, so you don't have to move heavy containers full of planting mix. Provide students with trowels or old containers for scooping and help them fill the containers, leaving an inch at the top. Gently tap the containers on the ground to let the planting mix settle, and add more if the level is too low.

Return to your container garden regularly to check on the plants' growth. Harvest vegetables and flowers as soon as they are ready, to keep plants producing. Plant new seeds or seedlings when you remove plants. Add compost, worm castings or a liquid organic fertilizer such as fish emulsion every other week. Check soil moisture frequently; plants in containers need to be watered more often than plants in the ground.

### **Indoor Container Gardens**

If space issues or climate make it impossible to set up an outdoor garden, consider gardening in the classroom. An indoor garden has the advantage of being accessible to students even when time is short or weather is uncooperative.

Consult a manual such as the *National Gardening Association's GrowLab: A Complete Guide to Gardening in the Classroom* for detailed information and design ideas. Or visit [www.gardeningwithkids.org/growlab.html](http://www.gardeningwithkids.org/growlab.html) for information on pre-made indoor garden setups.

Delivering enough light to your plants is the primary consideration in designing an indoor garden. Most windowsills don't get enough light to grow vegetables but may be able to grow a variety of houseplants. If you want to grow vegetables, flowers or herbs, hang fluorescent lights over your indoor garden. The height of your fluorescent fixtures should be adjustable, so you can keep the lights just a few inches above your plants as they grow. Using half cool white fluorescent tubes and half warm white fluorescent tubes is a less-expensive alternative to buying "grow" lights. To create the necessary light intensity, use at least four tubes over a 2-foot-by-8-foot indoor garden. Purchase a timer and set it to keep the lights on for about 15 hours each day.

## Equipment and Supplies

### Basic Garden Tools and Supplies

shovel	hand trowels
rake	hand tines
hose	clippers
nozzle	gloves
painters bucket	

The American Heart Association will provide these basic items, which are enough to establish and maintain a thriving Teaching Garden. If your school needs additional supplies, a local garden supply business may donate tools. Many schools have found garden tools at local flea markets and garage sales. One school placed a small notice in the local paper and was given the contents of a barn full of equipment. Other schools have had success using tools such as Freecycle, a network connecting people who have a need with people who have an item to give away. Visit [www.freecycle.org/](http://www.freecycle.org/) to find a Freecycle group in your area.

Consider borrowing items you may only need once in a while (such as a wheelbarrow).

### Lumber and Other Building Supplies

Approach a local lumber company about providing materials or offering a discount on materials for fencing, raised beds or a tool shed. A parent may have the skills needed to design these elements and/or lead a volunteer work party in construction.

### Seeds and Plants

Seeds are an ongoing need for a school garden. Many seed companies are happy to give away expired seeds, and most seeds are still viable the year after they expire. Some are viable for many years. Initiate a letter-writing campaign with your students to contact seed companies requesting donations.

Sometimes you will want to acquire plants for your garden instead of sowing seeds yourself. Home gardeners in the area may be delighted to pass on divisions of their perennials; garden centers may be willing to donate seedlings.

### Compost

Check with your local waste management department. Green waste is often composted and distributed for free or at a low cost. Mulch, in the form of wood chips, may also be available.

## Funding Your Garden

Donations of money, materials and services from community members, businesses and charitable organizations can enhance your garden program tremendously. Fundraising may provide a garden aide's salary, cooking equipment or reference books. Even if you can't get district funds for 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. Here are some strategies that schools have found fruitful.

### **Approaches to Soliciting Donations**

For simple garden needs such as straw bales or empty six-pack containers, you may be able to get your needs met with a few phone calls or a letter home to parents. Larger projects, however, call for a more formal approach. Let's say you plan to build a greenhouse or irrigation system and need donated materials from local businesses. Put together a specific project request that includes a project description, a list of needed materials, an estimated budget, a letter of support from your principal or director, photos of the site and samples of student work. Compile a list of businesses that could supply the materials or services you need. Make multiple copies of your project request so you can leave one at each business you approach. Next, make an appointment to meet with the owners or managers.

During the meeting, describe the purpose of your garden as it relates to student learning. Show the business people the materials list and ask if they can contribute any of the items. 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. Handwritten letters illustrated by students are usually appreciated. Keep a record of all donations. Many schools acknowledge large donations with a more elaborate thank you, such as a certificate presented at a special event at the school garden, or even a permanent fixture in the garden such as a sign or plaque recognizing donors.

Establish relationships with garden-related businesses. For example, encourage local nurseries to give you a call whenever they plan to discard plants, flats or seedlings. Stables and farms can be a regular source of straw or compost. One Washington, D.C., school found that even the local zoo was a valuable resource, providing manure for the compost pile.

Be sure to document your garden's progress with photos. In addition to providing a valuable historical record for your students and your school, a good set of photos can be a valuable component in fundraising proposals.



### **Sources for Donations: Start Locally**

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 community for help — parents, contacts of faculty and staff, and neighborhood businesses.

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

- **Local businesses:** nurseries, home supply stores, lumber companies, irrigation or bulldozing contractors; any business that has or does something you need.
- **Local farmers:** Parents or other school supporters in the farming business can be a valuable source of expertise, services (such as rototilling) and goods (seedlings used tools, or even historic farm equipment for a display).
- **Garden clubs:** Members of these organizations can be sources of expertise, goods and services.
- **Individuals:** Parents and other community members may present unexpected talents and resources.

Sometimes you need 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 straw for mulch.

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.

Look for small grants from local sources. Research whether your city sponsors beautification projects. For example, several schools in San Jose, Calif., have received matching grants from a city program called “San Jose Beautiful.” Health-based organizations may have funds for a school garden used to teach nutrition. Consider contacting the large businesses and corporations in your area. Most large companies have a “charitable arm” or even a foundation that funds local projects. In addition, large companies (and even some small ones) have Adopt-a-School programs that you can modify to “Adopt-a-School-Garden.”

There are a variety of ways to get the word out to the community about what your school garden needs, including public service announcements in the local media or student letters to local merchants.

## State and Federal Funds

Money is often available from state and federal sources. Your school district office should be able to provide you with a list of possibilities on an annual basis. In the past, these programs have provided school gardens with support:

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

- Eisenhower funds (for developing a science program and/or staff development) are available to each school district nationwide.
- Chapter I funds are available to schools with low socioeconomic status.
- Chapter II funds for materials and staff development are administered by each state.

**State funds:** Sources may include:

- environmental education funds
- lottery money
- mentor teacher program

## Cultivating Volunteers

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, help set up garden activities or even teach in the garden. For many schools, this volunteer support takes the form of 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 garden.

Keep parents informed as you plan your garden. Send home fliers letting them know about your new school garden and how they might get involved. Ask for specific types of expert help, such as gardening, design or carpentry. Also ask for specific donations of tools, materials and supplies. Including a garden "wish list" in your letter home, with items of varying costs (from a rototiller to buckets and baskets). This may boost your garden supplies quickly.

Some schools have found enthusiastic and knowledgeable volunteers in local garden clubs. Universities, community colleges and high schools are also good sources, most specifically their education and science departments. Environmental studies and horticulture departments often offer internships, work-study programs or other community involvement opportunities to 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 school garden programs.

## **Organizing Volunteers**

Ideally, coordinating garden volunteers will be a task for volunteers. An ongoing volunteer support committee 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 different types of experience. Some may have experience with children, some with gardening and others with both. Decide on a few basic roles for volunteers, and ask each new volunteer where he or she might fit in. Depending on each volunteer's chosen role, provide information on your school's basic gardening practices, garden safety rules and discipline policies. Create a schedule for volunteers and a regular method of communicating with them.

If any volunteers will work directly with students, let them observe your teaching. Work with them 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 allow you to discuss upcoming lessons or tasks, address problems and questions, and also let the volunteers know how valuable they are. Make volunteer appreciation a major theme of garden events, and assign students to write thank-you letters to garden volunteers.

## **Media Coverage**

One way to generate increased community attention and support is through media coverage. Local newspapers, as well as radio and TV stations around the country, are often eager to publicize their communities' school garden programs. Be sure to invite members of the local media to any school garden events you organize, or give the paper a call whenever something interesting is happening at your school. Let the paper know of any photo opportunities that might be of interest. A weekend work party at one school was featured in the local daily paper, and many people in town wanted to know more about the school garden program and how they could help. Consider the political angle: Invite the mayor or other local officials, state legislators or members of Congress 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 garden activities to the public's attention: One sixth-grade class compiled and called in weather reports to a 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 news release about an upcoming garden work party.

**Sample Press Release**

(Use School Letterhead)

FOR IMMEDIATE RELEASE

(today's date)

Contact:

Name

School Name

Phone Number

Email Address

**(Your School Name) Announces its American Heart Association Teaching Garden Plant Day Celebration!**

(School Name) of (City, State) is pleased to announce the opening of its new American Heart Association Teaching Garden. We're celebrating with a Plant Day Celebration on (date, time) at (School Name), which will include (activities, for example "garden crafts, refreshments and live music from the Garden Girls String Quartet"). All are welcome!

The (School Name) Teaching Garden was created with the guidance of the American Heart Association, combining nutrition education with garden-based learning. Numerous studies have shown that participation in school garden programs can improve student attitudes toward fruits and vegetables. (School Name) staff and students are excited to cultivate healthy bodies and minds in the garden!

(School Name) is located at (address), and can be reached by (general driving directions).

Call (School Name) at (phone number) for more information about this event or to find out how you can contribute to the school's gardening efforts.

-END-

## Section IV. **Preparing Your Garden** **– Host a Plant Day Celebration!**

It's an exciting day when your garden plan is finalized and you're ready to prepare your site for planting! If you are building raised beds with frames, preparing your garden will begin with a day (or several!) of construction, putting your raised bed frames together, putting them in place and filling them with soil.

If you decide to dig in-ground beds in addition to the raised-bed boxes provided by the American Heart Association, check with your school district or local utility companies to make sure there are no underground pipelines or cables where you plan to dig. Also make sure you've had the soil tested for lead.

### Marking Off Beds & Paths

Mark off the garden plots with stakes and string or sidewalk chalk if boxes are to be situated on a hard service such as rooftop or cement. The planting areas get cultivated; paths get mulched and compacted year after year. For this task you'll need:

- 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, marking off the perimeter.

Once you have the outside perimeter in place, use your garden map and measuring tapes to plot the paths and the boundaries between garden beds. Pound stakes into these points. Allow about three feet between beds. Make paths wide enough for wheelchairs and wheelbarrows to pass through, and for students to move about and explore their garden with ease. String twine around the stakes to mark the boundaries of each bed.

This method applies to garden designs with rectangular beds and plots, and straight pathways. If your school has opted for octagonal or circular boxes, plot these beds by pounding a stake into the center point and tying a string to the stake. Cut the string to the length of your bed's radius, then walk in a circle with the string, using it to find the edge of the circle where stakes should be placed every couple of feet. Whatever the shape of your beds, leave the twine boundaries around beds until garden paths are well established, so students know where to step. You may opt to mulch the garden paths to keep weeds in check and minimize mud. Wood chips from tree-pruning companies are an excellent, and often free, source of mulch for paths.

## Soil & Bed Preparation

### Preparing Soil for Planting

Bed preparation is one of the most important steps toward a thriving garden. Healthy, living soil will produce healthy plants less prone to pest and disease problems. Your primary goal in bed preparation is to loosen the soil so that roots, water and air can easily penetrate it. Bed preparation also includes mixing in compost or other soil amendments.

### Checking Soil Moisture

Once you fill the boxes, but before you start planting, check the soil moisture by squeezing a handful of soil into a ball in the palm of your hand. The soil 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 leave you with huge dirt clods instead of the crumbly texture ideal for gardening. If your soil is too wet, wait and check moisture daily until the optimum moisture level is reached. On the other hand, if your soil is very dry and dusty, water it thoroughly and let the area sit for a few days to attain the ideal moisture level.

### Soil Amendments

If you tested your garden soil for nutrient content and texture (sand, silt and clay content) when planning your garden, use the test results to determine if you need to add any soil amendments.

Adding organic matter can improve the fertility and texture of any soil, and is especially helpful if your soil has a high clay or sand content. You can add organic matter in the form of compost, sterilized manure, mulches or cover crops. (See Cover Cropping, pages 51 and 52.) As these materials break down in the soil, they slowly release a wealth of nutrients to your plants. When you harvest your crops, you remove those nutrients, so it is a good idea to replace them by adding organic matter each time

you plant.

If your soil test found deficiency in a particular nutrient, various amendments can remedy the problem. If your soil is low in nitrogen, possible amendments include fish meal, fish emulsion, kelp meal, blood or bone meal, soybean or cottonseed meal. If your soil lacks phosphorous, bone meal, cottonseed meal and rock or soft phosphates are good sources. Potassium can be added in the form of wood ashes, granite dust, cottonseed meal or greensand. Plants also need calcium, magnesium, and sulfur, as well as small amounts of other minerals. These nutrients can be added with lime, kelp meal, soil sulfur and greensand. Follow label instructions on all amendments.

If you plan to use manure to amend your soil, purchase only manure that has been sterilized or fully composted (not just “aged”). Manure can contain E. coli or other disease-causing pathogens if it hasn’t been sterilized or fully composted.

### **Digging Methods**

If you are digging by hand, you can either single-dig or double-dig your beds. Single-digging means loosening the soil to the depth of one shovel blade. This is a great method for soil that is already loose, as some sandy soils may be, or for preparing beds that have already been grown in for a season or more. Double-digging involves loosening the soil to twice the depth of a shovel blade. This method allows roots to grow down rather than out, giving plants access to water and nutrients deeper in the soil and reducing the amount of space needed between plants. Double-digging is labor-intensive. While it may be the best choice when starting a new bed, it is not necessary every time you plant.

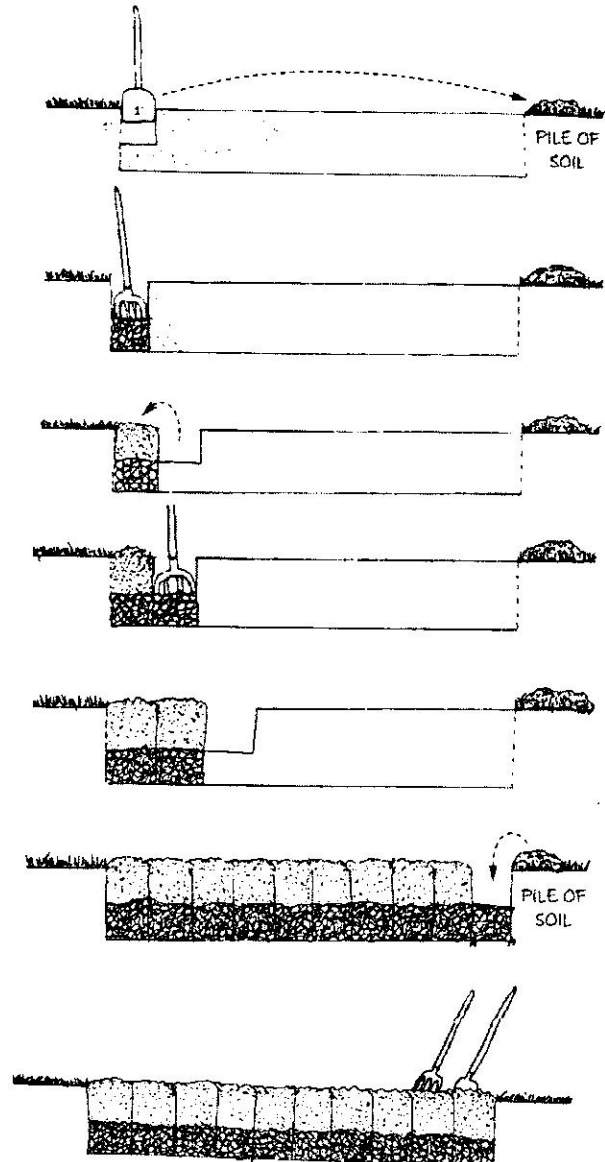
### **Steps for Single-Digging a Bed**

1. Clear all plants and other debris off the bed.
2. Add compost and any other amendments to the surface.
3. Thoroughly turn over and loosen the soil using a digging fork or spading fork to a depth of 12 inches, breaking up any clods.
4. Rake the surface smooth and level.

Once you have grown in your beds for a season or more, the above steps become quick and easy.

**Steps for Double-Digging a Bed***(see illustration)*

1. Clear all plants and other debris off the bed.
2. Dig a trench across the width of one end of the bed, about 1 foot deep and 1 foot wide. Pile this soil next to the opposite end of the bed (or in a wheelbarrow), not on the bed. This soil will be used later.
3. Loosen the subsoil across the entire bottom of the trench with your digging fork, without removing it. If desired, add a sprinkle of compost to the bottom of the trench.
4. Dig another trench next to the first one. This time, use this soil to fill the first trench. Remember, trenches should be about a foot wide and a foot deep. Repeat Step 3 for this trench.
5. Continue as in Step 4 along the length of the bed until it is completed. When you have emptied the last trench and loosened the subsoil, fill that trench with the soil you laid aside from the first trench.
6. If desired, put down a layer of compost or other amendments over the entire bed, and turn under the surface of the soil with a hoe or rake.
7. Rake the surface smooth and level.





**Tips for Working the Soil with Students**

- When demonstrating how to use a tool, always review safety rules such as not leaving tools on the ground and keeping metal parts of tools below the hips.
- Students can add a layer of compost by scooping handfuls from a pile or wheelbarrow and sprinkling them over the bed.
- Space students more than an arm's reach apart when digging or raking.
- Younger students can help dig beds with hand trowels. They may not make much progress, but they will get the idea of bed preparation and be excited to be involved. Review tool guidelines and demonstrate how to dig without flinging dirt into the air (and others' faces).
- After digging, it is important that beds not be stepped on, as this will compact the soil and hinder plant growth. See "My Finger as a Root" on page 88 for an activity that demonstrates this concept to students.

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## Section V. **Planting Your Garden**

### Choosing Plants & Planting Times

When choosing plants for your garden, encourage students to think about the purpose of each garden bed. Is it for food, flowers, seeds to conduct science experiments or to beautify the school grounds? Many school gardens include some beds just for perennials, perhaps around the perimeter of the garden, and some beds just for annuals. Involve students in researching plant requirements. For instance, they can find out the soil needs, space needs, hours of sunlight and hardiness zones for plants they want to grow.

#### **Perennial Plants**

Perennial plants last two or more seasons. Perennial plantings serve as a foundation for your garden and can attract wildlife, provide habitat for beneficial insects, produce fruit or surround your garden with flowers. Perennial plants are usually easier to maintain than annual vegetable crops. Once planted, perennials provide beauty and interest for years.

There are many things to consider when selecting perennials:

- Evergreen vs. deciduous — do you want a plant that stays green all year or one that drops its leaves in winter?
- Flowering or fruiting times — choose plants that fruit or flower when school is in session.
- Size and structure — will the mature size of the plant fit in the space available?
- Uses of plant — some perennials are selected for culinary herbs, ornamental uses, medicinal uses, habitat, food production, special themes or study purposes.
- Light requirements — will the plant receive the appropriate amount of sunlight throughout the year?
- Climatic zones — will the plant survive your winter cold?

You can find out your planting zone by consulting the USDA Plant Hardiness Zone Map, available at the website of the National Arboretum, <http://www.usna.usda.gov/Hardzone/ushzmap.html>, or at the National Gardening Association website, <http://www.garden.org/zipzone/>. Once you know your zone, you can choose perennials that survive the temperatures in your area by checking plant tags at the nursery, or looking up the zones of potential plant choices online.

## **Annual Plants**

Annual plants live their entire life cycle (emerging from a seed to making a seed) in a year or less.

Annual plants make up most of our vegetable crops, and most of them can be harvested within two to three months after sowing. Bi-annual plants are similar to annuals but may live up to two years.

Annuals are generally classified as either "warm season" or "cool season" crops. Cool season crops, such as broccoli, cauliflower and cabbage, thrive in cool areas or during cooler months of the year; they are usually root, stem, leaf and flower bud crops. Many of these crops can over-winter in mild climates if planted in the fall, or can be planted in early spring for a late spring harvest. Warm season crops, such as tomatoes, peppers and melons, thrive in warm areas or during the hotter months of the year. They are usually fruit and seed crops. They are often planted in mid-spring to early summer.

**Planting Chart**

Crop	Warm weather	Cool weather	Sow in container	Sow direct	Spring Planting		Fall Planting	Days to emerge	Days to maturity	Spacing of plants (inches)	Depth to plant seeds (inches)
					Start seeds indoors (weeks before last spring frost)	Plant seeds/ transplants outdoors (weeks before or after last spring frost)	Sow seeds indoors or outdoors (weeks before first fall frost)				
Beans, bush	*		*	*		2 after		8-10	55	6	1
Beans, pole	*		*	*		2 after		8-10	75-90	6-8	1
Beets	*	*		*		4 before	8-10 before	7-10	55-65	2-4	1/2
Broccoli		*	*		4-6 before	3-5 before	10-12 before	7-10	55-85	15-18	1/4
Brussel sprouts		*	*		4-6 before	3-5 before	12-16 before	7-10	75-90	18	1/4
Cabbage	*	*	*		4-6 before	3-5 before	10-12 before	7-10	65-110	18	1/4
Carrots	*	*		*		2 before	8-10 before	14-21	65-75	2	1/4
Cauliflower		*	*		4-6 before	3-5 before	10-12 before	7-10	55-85	15-18	1/4
Chard	*	*	*	*	3-4 before	2 before	8-10 before	10-14	50-55	8-12	1
Corn	*			*		2 after		10-14	60-100	12-15	1
Cucumber	*		*	*	2-3 before	2-3 after		7-10	50-70	12	1/2
Eggplant	*		*		6-8 before	2-3 after		7-10	70-90	12-18	1/2
Kale		*	*	*	5-8 before	5 before	10-12 before	7-10	55-65	12-15	1/2
Kohlrabi		*	*		4-6 before	3-5 before	8-10 before	10-14	50-55	10-12	1/4
Lettuce		*	*	*	6 before	3 before	4-10 before	10	40-75	10-12	1/8
Parsley	*		*	*	5-7 before	2-3 before		14-21	70-90	6	1/4
Peas		*	*	*		6 before	10-12 before	10-14	55-75	4	1
Peppers	*		*		4 before	4 after		14-21	65-90	10-12	1/2
Potatoes	*			*		4 before		14	120	10-12	6
Pumpkins	*			*		2 after		10	100-110	36	1
Radishes		*		*		5 before	8-10 before	5-10	20-60	1-2	1/4
Spinach		*	*	*	7-10 before	3-6 before	4-10 before	10-14	40-70	4-8	1/4
Squash, summer	*		*	*	1 before	3 after		7-10	50-65	15-24	1/2
Squash, winter	*			*		2 after		7-10	75-120	24-36	1/2-1
Tomatoes	*		*		4 before	4 after		7-10	55-90	24-36	1/4-1/2

Cool-weather crops are planted in early spring or early fall, and harvested in late spring or late fall (through winter in mild climates).

Warm-weather crops are planted in spring for summer and fall harvests.

Days to maturity is the number of days from planting the seed to the first harvest. This number varies depending on variety, care and weather conditions.

## When to Plant Annuals

You can determine when to plant annuals by referring to the Planting Chart on page 37 or the information found on seed packets. The planting chart, and most seed packets, refer to weeks before or after frost dates as a guide for when to sow seeds or plant transplants outdoors.

The “average last frost date” of the season lands in the late winter or spring. The “average first frost date” lands in the fall or early winter. Planting charts and seed packets will usually instruct you to plant seeds directly into the garden or transplant seedlings a certain number of weeks before a first frost and before or after a last frost.

Contact your local Master Gardeners (found at [www.mastergardeners.org](http://www.mastergardeners.org)), Cooperative Extension or a local nursery professional to find out your region’s frost dates.

## Planning Your School-Year Edible Harvest

One mistake many new school gardeners make is planting a garden that matures during summer while students are away. There are at least two strategies for planting a garden that is ready to harvest during the school year.

One strategy is to grow a spring garden of cool-season, quickly growing crops that are harvested before school ends, and then to plant again in late summer for a fall harvest. For example, many schools grow a salad garden in spring or fall, with a salad party at harvest time. Good crops for a salad garden are lettuce, spinach, radishes and peas. See the Planting Chart on page 37 for additional plants that can be grown in late summer or fall.

Another strategy is to plant in late spring, just before school lets out, using long-season vegetable varieties that mature in fall. Read the “days to harvest” listing on the back of seed packages and plan accordingly. “Days to harvest” indicates how many days it takes from the seed being put into the soil (either in a container or directly in the ground) until the crop is ready to harvest. If you want to eat fresh corn in September with your students, plant long-season corn (90-100 days to harvest) in late May, instead of short-season (65 day) corn. Alternatively, you could plant popcorn, which can dry in the garden for weeks once mature, instead of needing to be harvested within a week or two of maturity. See Summer Garden Maintenance on page 53 for more ideas on keeping your garden going over the summer.

Try planting some of these crops in late May or June. You’ll come back to school with something to harvest.

- amaranth
- carrots  
(Healthmaster)
- eggplant
- melons
- parsnips
- peppers
- popcorn
- potatoes
- shelling beans  
(dry beans)
- sunflowers
- tomatoes
- winter squash  
or pumpkins

Try planting a 3 Sisters Garden (see Lesson Plans section) with popcorn, winter squash and dry beans, all of which can wait in the garden until students are back in school.

If you would like a crop to be ready at a certain time, or you would like several crops to be ready at the same time, you may want to use a crop-planning chart.

### **Crop Planning Chart**

1. Find the average first and last frost dates for your area.
2. Use a regional planting guide to review what kinds of crops can be planted in your region for each season. You can often obtain a regional planting guide from your local Cooperative Extension Agency or garden center.
3. Based on your planting or harvesting options for the season, choose a garden activity that you would like to do with your students (e.g., a 3 Sisters day).
4. List crops that thrive in your area, and that you would like to use for the activity in the chart on page 36 (e.g., popcorn, winter squash, and dry beans).
5. Based on your academic calendar and the general seasonality of the crop, set a target harvest date. Record this in the chart.
6. Use seed packets or the Planting Chart on page 37 to find the number of “days to harvest” for each of the crops you listed and enter this on the chart. If you are planting a nursery transplant, subtract about 30 days from the days to harvest. Of course, the actual number of days to harvest varies with weather, soil conditions and a number of other factors.
7. From your target harvest date, use a calendar to count backward the number of “days to harvest” to find your planting date. Enter this on the chart.
8. Use the Planting Chart or seed packets to ensure that your planting date falls within the suggested planting time for this plant. Adjust accordingly. Congratulations! You now have your planting dates.

**Frost Dates:**

Average First Frost (Fall):

Average Last Frost (Spring):

**Seasonal Activity:** \_\_\_\_\_

Crops Needed	Target Harvest Date	Number of Days to Harvest	Planting Date
Example: Pumpkins	10/1	110-130	6/1

If there is an unexpected late spring frost forecast after you have planted, or an early fall frost forecast before you are done harvesting your fall garden, protect your plants from frost damage. You can cover your plants with cloth, newspaper, plastic or floating row cover (thin, lightweight fabric available at garden centers). The row cover can be left on your plants day and night because sunlight and water go through it.

## Seed-Sowing Methods

### Drill Method

The drill method is appropriate for planting large seeds like peas or sunflowers. Place the seeds on the surface of the soil to get the spacing you want. Then push each seed into the soil to its correct depth (about two times its width) and cover with soil. This method is often easiest for younger students.

### Furrow Method

The furrow method works for mid-sized seeds, such as beet or radish seeds. Have students use their fingers or a stick to make a furrow, or small ditch, the length of the container and the depth the seed should be planted. Drop the seeds into the furrow, spacing them as evenly as possible. Have students cover the furrow with the soil that they pushed to the sides. Have them pat down gently to press the seeds into the soil.



### **Broadcast or Scatter Method**

The broadcast or scatter method works well for tiny seeds, such as lettuce seeds, which are hard to distribute one by one. Essentially, students take a handful of seeds and gently sprinkle them across the soil surface, trying to spread them evenly. This may sound simple, but it can be tricky for small hands. A helpful strategy is to mix your seeds with sand so each student has a big handful to scatter but only a few seeds. Another method is to give students handfuls of seeds and let them throw them out over the bed like confetti, in which case you will have some thinning to do later on. Once the seeds are scattered, have students sprinkle more soil mix on top to just cover them. Finally, have them press down gently on the soil with their hands.

## Seed Starting & Transplanting

### **Starting Seeds Indoors**

Starting seedlings indoors allows students to observe germination and provides a more controlled environment for young plants. By starting plants indoors in spring, you can give your garden an early start while the weather is still cold. Refer to the Planting Chart for suggestions on which plants can be started indoors in containers.

### **Seed-Starting Containers**

Start your seeds in any container that is 2-3 inches deep with drainage holes. Yogurt containers, small milk cartons and similar small containers work well. Old six-pack seedling containers are ideal and can be brought in by students or donated by nurseries.

Many gardeners who have limited greenhouse space, or limited space under grow lights, sow seeds close together in wider containers called flats. Then they transplant plants into individual containers once they are 1-2 inches tall. This saves space in the beginning, but results in a more labor-intensive process that involves transplanting twice.

### **Seed-Starting Mix**

It is best to use designated seed-starting mix when starting seeds because it is light, absorbent, weed-free and sterile. Typical potting soil may be too light to keep seeds consistently moist, and garden soil is often too heavy for proper transplant root development. You can make your own seed-starting mix by mixing one-third horticultural sand, one-third compost and one-third coco pith fiber.

## Planting Seeds

Before planting, wet the soil mix so that it is as damp as a wrung-out sponge. Fill your containers, then lightly tap them on a surface to settle the soil. Fill in with more soil if this process reveals that they are not full enough.

A good rule of thumb is to plant seeds about two to three times as deep as they are wide. Check the Planting Chart or seed packet for specific guidelines. After planting your seeds to the appropriate depth, water them with a gentle spray of water, let the water soak in, and repeat until water has penetrated to the depth of the seeds.

## Germinating Seeds

Seeds need moisture, warmth and in some cases light to germinate (sprout). Once seeds sprout, these same factors are essential for healthy seedling development.

- **Moisture.** Keep the soil surrounding your germinating seeds moist, but not soggy. Check frequently by gently probing to the depth of the seed or young root to make sure the soil is moist below the surface (be careful not to disturb seedling roots). It is best to water seedlings when they need it rather than on a regular schedule. Gently sprinkle them regularly so they don't dry out. A spray bottle works well in the classroom. Once seeds have sprouted, have students test soil moisture with a finger, and water only when the top half inch of soil is dry.
- **Fertilizing.** You can begin fertilizing seedlings with an organic fertilizer such as fish emulsion or kelp extract once the first true leaves have formed (after the cotyledons). Be careful not to overdo it. The right amount of fertilizer will keep seedlings looking dark green (rather than pale yellow), but too much can be harmful. A good rule of thumb is to fertilize with half the recommended dose once every 10 to 14 days. Students may want to experiment to discover for themselves the consequences of too much of a good thing!
- **Warmth.** Most seeds need temperatures of 60 degrees or above to germinate.
- **Light.** A few types of seeds need light to germinate and should be covered with little or no soil; this is indicated on the seed packet. Seedlings grow best with 14 to 16 hours of light a day, much more than most windows can supply. Seedlings grown on windowsills tend to be "leggy." Three other options will result in healthier seedlings: putting them outside in the daytime, keeping them in a greenhouse or keeping them under grow lights. If daytime temperatures are above 60 degrees, you can put your seedlings outside in full sun all day each day and bring them inside at night. If you have access to a greenhouse, your seedlings will have an ideal amount of light. If you plan to grow your seedlings indoors, put them under grow lights. See *Indoor Container Gardens*, page 22, for more information on growing under lights.

## Transplanting

### **Transplanting to Larger Containers**

If you planted many seeds in a container close together to save space, you will have to move them out to individual containers with more space. Wait until after the first true leaves appear. Gently tease out the seedlings with a pencil point, popsicle stick or butter knife, then plant them in individual containers where they have more space to develop. Lift seedlings by their cotyledons or leaves rather than by their tender stems.

### **When Are Your Plants Ready to Transplant to the Garden?**

Your seedlings are ready to be transplanted to the garden when they have at least two sets of true leaves and their root systems are established enough to hold soil around them.

### **Hardening Off**

“Hardening off” refers to getting seedlings accustomed to outdoor conditions before moving them outdoors permanently. Do this by setting them outside for progressively longer periods each day, starting with a few hours and increasing to a full day over the course of a week or so. Leave them outside day and night for a few days before planting, but be sure they are protected from deer or aspiring gardeners.

### **Transplanting Pointers**

Plan well for transplanting success. Transplant in early morning or late afternoon, not during mid-day heat. Make sure your seedlings are watered well before removing them from their containers, and make sure the garden soil is neither too dry nor soggy. If your transplants are root-bound, with a large mass of roots at the bottom of the plant, gently break up the root ball before transplanting.

Transplant your plants to the same depth that they were in their containers. Refer to the Planting Guide or your seed packets to determine appropriate spacing.

Water your transplants with many passes using a gentle spray, letting the water seep in between passes, or by trickling water directly around the transplant’s root zone. Use your finger to make sure there is moisture at the depth of the roots.

Protect your transplants from pests like birds by covering the young plants with upside down strawberry baskets, netting or floating row cover.

### **Tips for Transplanting with Students**

- You can mark the spots to be planted by setting the transplants on the garden bed, by marking the spaces with labels or by pre-digging holes at the appropriate intervals.

- You can also have students measure the distance from one planting hole to the next by using the distance from their thumb to their pinkie on their open hand. Or you can have them measure and mark inches on their trowels.
- For transplants that grow into large spaces (such as cabbage or tomato plants), you can place 4-inch plastic nursery pots upside down in configurations that create spaces for the plants to grow. This way, students can visualize the space needed for a full-grown plant.

## Direct Sowing & Thinning

### **Sowing Seeds Directly in the Garden**

Some crops prefer to be started directly in the garden. Root crops such as carrots, radishes and beets don't transplant well, nor do other crops such as corn, beans, peas, squash, melons and cucumbers. If caring for seeds directly sown in the garden is a challenge at your school (because of vulnerability to pests, or inability to water the seed bed frequently), you can start corn, beans, peas, squash, melons and cucumbers in containers. But you should do so in individual containers rather than sowing them in a flat and then pricking them out, a method described in *Transplanting* on page 43.

### **Moisture Needs for Directly Sown Seeds**

After you have directly sown your seeds in the ground, it is important to keep them moist until they germinate. Water with a watering can or hose attachment that delivers a gentle sprinkle. You may have to make many passes of light sprinklings to be sure the soil is moist beyond the depth of the newly planted seed. Avoid flooding your newly planted area. This can wash away seeds and/or cause your soil to form a crust on the top, which makes it difficult for some seeds to push through the soil.

Keep an eye on your seedbed, and keep it constantly moist. Depending on the weather, you might need to water daily.

### **Pest Protection for Young Seedlings**

Young sprouts are often tempting to birds and other critters! Try covering your seedbeds with floating row cover, bird netting or upside-down strawberry baskets, or hang bird flash tape over your bed.

### **Thinning**

When you sow seeds directly in the garden, you often end up with crowding. Seed packets provide information about how closely seedlings should be spaced, and when to thin them, such as "thin to 18 inches apart when plants are 1-2 inches tall." Spacing varies from crop to crop.

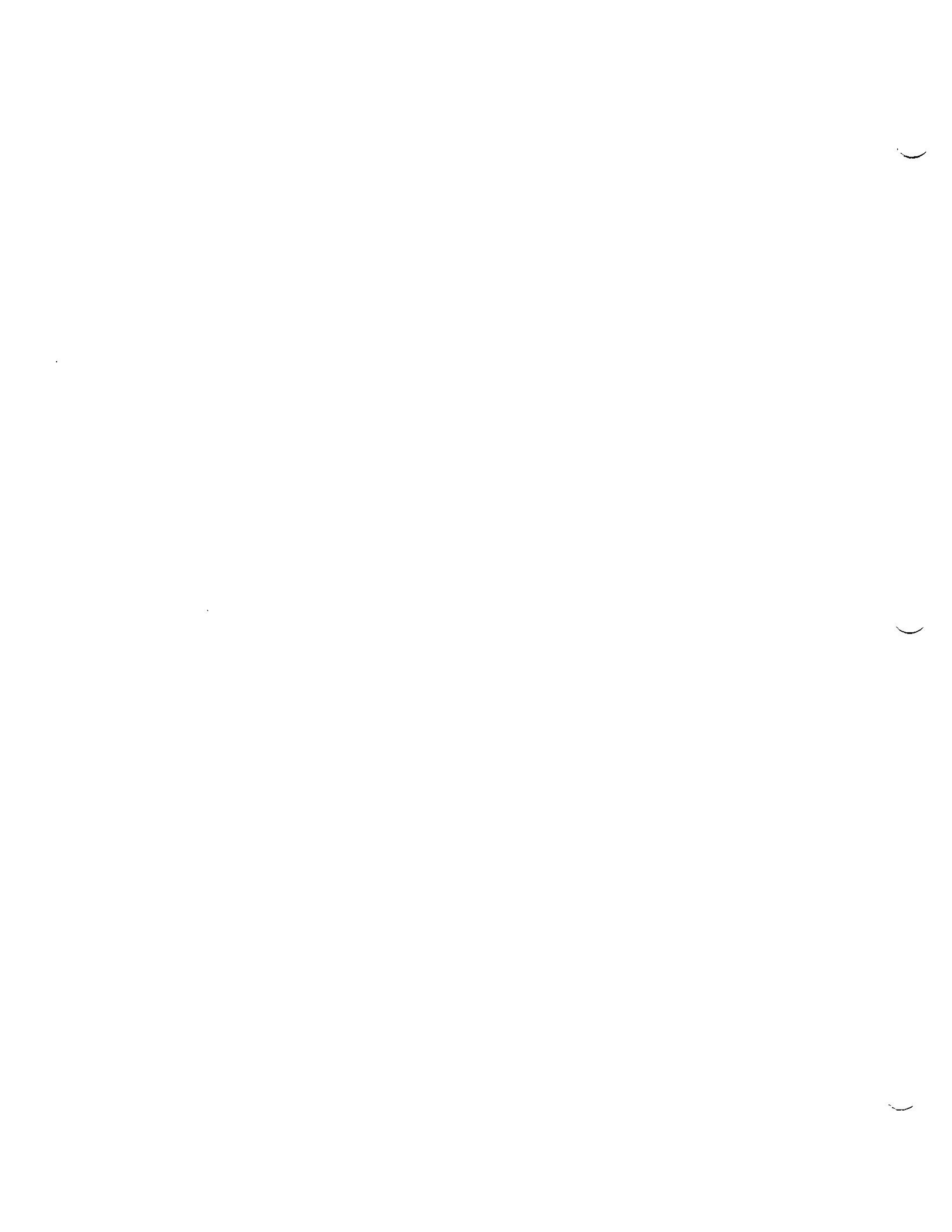
### Tips for Sowing Seeds with Students

- Help younger students properly space their plantings by using a sowing string (a string staked down with knots or tape marking where the plant should be planted).
- Alternatively, you can have students measure the distance from one planting hole to the next by using the distance from their thumb to their pinkie on their open hand. Or you can have them measure and mark inches on their trowels.
- See Seed-Sowing Methods on pages 40 and 41 for more ideas for planting seeds with students.

### What About When Plants Die?

Everything in the gardening process is an experiment, and everything that happens is an opportunity for learning. For example, a salad garden sometimes turns into a study of snails and slugs! Students can research how to prevent the same outcome in the future, and in the meantime observe the fascinating habits of these garden-munching creatures. You can even draw attention to the nutrient cycle by discussing how the munched plants will decompose in the compost pile and return their nutrients to the soil for a new plant to use. Emphasize the process of gardening with your students, not just the product.

The book *Ten Seeds*, by Ruth Brown, illustrates the joyfully imperfect reality of gardening with children. After a child plants 10 sunflower seeds, we watch the seeds developing, even as one seedling is lost with each turn of the page. They're lost to garden creatures, a stray baseball, even a romping dog. By the end, one sunflower survives to bloom. It is pollinated by a bee and produces 10 seeds, which the child is delighted to collect.



## Section VI. **Maintaining Your Garden**

### Making a Garden Maintenance Plan

An overall plan for maintaining your garden might include:

- A schedule for class use of the garden (if it is a shared area); each class should be allotted at least 45 minutes to an hour once a week, with open time available for special projects.
- A volunteer work schedule
- A watering schedule
- A plan for weeding, fertilizing and composting
- A supply-ordering system
- A summer maintenance program

Ideally, much of the garden maintenance, such as weeding, watering and composting, will be done by students as part of their activities in the garden. For any remaining maintenance, make a task list that rotates among participating classes. Or use volunteers to help with these tasks.

### Watering

Water is the most basic plant growth requirement. Plants use a lot of it! It comes in through the roots and exits the plant through small openings in the leaves. A plant is like a big vacuum, continually sucking water from the ground and depositing it into the atmosphere. When water is limited, the plant grows less and produces less. Without enough water, garden plants ultimately die.

Soil type has a big impact on how water moves and how much is available for the plant roots. In a sandy soil, water moves quickly and vertically. In a loam soil, it moves at a moderate speed and flows both downward and sideways. In a clay soil, water moves very slowly and as far horizontally as vertically, so it may take a long time to penetrate deeply. Knowing your soil type will help you decide how to water.

Water thoroughly and deeply. When you irrigate, make sure water soaks the soil well below the surface, into the zone where the roots are growing. Depending upon the plant type and growth stage, this may be either a few inches or several feet down. Deep, thorough irrigation encourages roots to grow even deeper, increasing their ability to absorb water, mine nutrients and anchor themselves firmly.

Once plants are past the seedling stage, water more thoroughly and less often. The following is a general rule of thumb for watering frequency during the growing season at average temperatures in most climates (adjust for weather conditions):

- Seeds: one to five times daily, depending on the depth of the seeds
- Newly transplanted starts: once a day
- Established starts/ "adolescent" plants: every third day
- Mature plants: once a week

How do you know if your plants need more water? Visually checking on them is the first step. If you see the leaves looking dull or less vibrant, that can be the first sign that plants need more water. Wilting indicates water is seriously limited. These problems could also be symptoms of damage caused by a pest or disease, so also check the soil moisture. How it appears on the surface is no indication of what is available to the roots, so use a trowel or your hand to get below the surface where the roots are and check visually or by feeling the soil.

The squeeze test can also help you determine whether the soil needs water. Dig down a few inches and grab a handful of soil. If your soil won't form a ball when lightly squeezed, it needs water.

### **Three Methods of Irrigation**

When you choose an irrigation method, remember to consider the growth stage of your plant, your soil type and the resources you have available (supplies, water source, funding and volunteers).

#### **1. Sprinkler or Overhead Irrigation**

This refers to any method of spraying or misting the plant and soil surface. You can achieve this with a watering can, a fan sprayer attached to a hose, an oscillator (lawn sprinkler) or other sprinkler or mister systems. This method can be fun and satisfying for the young gardener. It's also great for seedbeds or small transplants with shallow roots. However, this is generally not the best method for a thorough, regular irrigation on mature plants. Water is wasted because some of it evaporates in the air; some water falls on paths, encouraging weed growth; and water that lands on leaves can contribute to plant disease. (This can be mitigated by watering in the morning, not late in the day, because the water will evaporate more quickly from the leaves in the daytime.)



## 2. Furrow or Flood Irrigation

This is any method in which water is applied in large quantities and slowly soaks into the soil. This is a common method for large-scale crop irrigation in which water moves down long furrows across fields. This method can be used in a garden setting as well to provide deep, thorough irrigation. It generally requires moving soil to build dirt berms (walls) to create basins or contained areas that hold the water until it soaks into the soil. Basins can be filled with water from a garden hose. This method requires very little in the way of material resources, but a lot of labor to set up and manage. It is more effective in silt or clay soils rather than sandy soils. It is a good method for established plants, but not for a seedbed because large amounts of water can wash seeds out of place, or cause the soil to form a crust on top that is hard for newly emerging seedlings to break through.

## 3. Drip Irrigation

This refers to systems that slowly drip water onto the soil surface at roughly the same rate as it soaks into the ground. This method effectively meets most watering needs in garden settings. It is water-saving, time-efficient and thoroughly irrigates seedbeds and mature plants. Systems are easily designed to keep water out of non-crop areas to prevent future weed problems.

The challenge of drip irrigation is that it requires more know-how and supplies to set up initially than the other two methods. The simplest drip system is a soaker hose run through a planted area, attached to a garden hose. A more complex system waters several beds and can include drip-line, filters, pressure regulators and timers. Timers can be set to water your garden automatically during vacations. If you are interested in installing drip irrigation and need help figuring out which supplies you need, bring your garden plan to your local garden center or ask a gardening parent or volunteer to make recommendations. Visit [www.savingwater.org](http://www.savingwater.org) for information on effective irrigation. Or visit [www.dripworks.com](http://www.dripworks.com) for irrigation supplies with a 10 percent discount for school gardens and a free irrigation system design service.

### Tips for Watering With Students

Many students enjoy watering a garden. If you have a large garden, it is not the best practice to rely on students with watering cans as your primary means of irrigation. However, it is valuable for students to water in specific garden areas (such as containers) or at certain times (such as just after transplanting). Before sending them out with a watering can or hose, make sure they understand a few watering basics:

- It's best to make many passes with a gentle spray of water, rather than flood an area, especially when there are newly planted seeds in the soil. Teach students to make a pass with the water, wait for it to completely soak in, then make another pass, wait again, etc.

- Teach students to make sure they have watered to the level of the roots rather than just the surface by poking a finger into the soil to root depth and feeling for moisture.
- After transplanting, students can make sure each young plant has enough water by doing a root soak. With small cups students gently pour a little water at the base of the plant. Providing a bucket of water where students can fill their cups makes this easy to manage.

## Mulching

Mulching is the practice of adding a layer of material to cover the soil, such as straw, leaves or other organic materials. Mulching can benefit your garden by reducing weed growth and keeping moisture in the soil.

When choosing a mulch, consider availability, possibility of weed seeds and possibility of plant-discouraging qualities. Finding a local, abundant source of mulch saves money and resources. Collect leaves from a tree at your school to use as mulch, or ask parents to send their old newspapers or cardboard boxes. Straw is a great mulch and inexpensive; one bale goes a long way.

Some mulching materials could have a large number of weed seeds, adding to the weed problem. Hay generally has more seeds than straw. Grass clippings work as mulch, but watch out for clippings that contain weeds that have gone to seed.

Some plants, such as walnut, redwood, laurel or eucalyptus trees, contain biochemicals that discourage the growth of other plants. It's best not to use leaves, wood chips or shredded bark from these plants as mulch in your garden because they may stunt the plants you are trying to grow.

Another consideration in the selection of mulch is the permanence of the plants you are mulching. In an annual bed, straw is an excellent mulch, but in a perennial bed you may want to put down a longer-lasting mulch such as wood chips or wood chips over cardboard.

Mulching too heavily, too early in the year before the soil has warmed up or too closely to the plants can promote pests and disease. Be selective about mulching in very damp climates. Wait to mulch tomatoes and cucumbers until the soil has warmed in the early summer. And be sure to leave an opening around the base of each plant so air can circulate around the stem.

### **Mulching Methods**

Remove existing weeds before mulching. You can discourage weeds by laying down a layer of mulch at least 2 inches thick. Weed seeds will not grow where there is no light. When you think you have a deep enough layer, look closely to see whether soil is visible through the layer of mulch. If you can see the soil, then the sun can reach the soil and weeds can grow. In areas with persistent weeds, you can take an extra precaution by first laying down several layers of newspaper, then covering the newspaper with straw or leaves. Make sure your water source can still reach the soil.

### **Tips for Mulching With Students**

Mulching is an ideal task for a large group of students. Many small hands can easily do the work of tucking handfuls of straw around and between plants.

- Teach students to fill in around plants with a thick layer of mulch. Have them lightly press it down to create a compact layer and tuck it neatly into the edges of the bed, as if they were tucking the plants in for bedtime!
- Teach students to peer through the mulch looking for soil, and to add more mulch if they do see soil.

## Cover Cropping

Cover cropping is the practice of planting an area with a crop that covers the soil surface to prevent or reduce erosion, and then, once turned under the soil, improves soil structure and fertility. This is a way to enrich an area of the garden that is not currently being used for harvestable crops (such as a bed that will not be used for the summer, for example). This practice has many benefits for the soil, as well as potential benefits for pest management. Cover crops increase soil organic matter, fix atmospheric nitrogen into a form that plants can use, improve soil structure and soil-water relations, prevent erosion and nutrient leaching, and help minimize weed growth. Most cover crops are relatively easy to grow and can be interesting, low-maintenance annuals in the school garden. One school creates a fava bean labyrinth each fall, in the same spot where pumpkins grow each spring and summer. Students love to walk the paths of the labyrinth, especially once the plants are taller than they are!

Cover crops can be chopped into the soil or removed and turned into compost that can be added back into the bed. Ideally cover crops are cut down before they set seed, so they don't sow a new, undesired crop. If you turn them under the soil, wait two to three weeks for the cover crops to break down before planting in the bed.

There are two types of commonly grown cover crops: legumes and grasses. Legumes convert nitrogen in the air pockets in the soil into a plant-available form, so they contribute to the nitrogen content of the soil when turned under. Grasses tend to be better for adding to soil organic matter content.

In mild climates, gardeners and farmers typically sow their cover crops in the fall, let them grow all winter and chop them into the soil in spring. In colder climates, sowing grass cover crops in the fall is a good idea because they grow quickly, hold onto soil and nutrients even if they are killed by snow, and can then be turned under in the spring. In a school garden, it might make sense to plant any beds that will not be used all summer with a summer cover crop.

For information about cover crops that work well for your area, and when to plant them, contact your local Cooperative Extension Service or garden center.

Easy Cover Crops for School Gardens		
	Legumes	Grasses
<b>Winter</b>	vetches bell or fava beans peas berseem clover	oats wheat barley rye
<b>Summer</b>	cowpeas (black-eyed peas)	sudan grass sorghum corn annual buckwheat

**Tips for Cover Cropping with Students**

- Many legume cover crops have large seeds that are easy for students to plant using the drill method. (See pages 40 and 41 for information on planting methods.)
- Grass cover crops have small seeds that are fun to broadcast and then lightly rake into the soil.
- When legume cover crops mature, pull up a plant to show students the nitrogen-fixing nodules on the roots.

**Weed Management**

A weed is any plant growing where it is not wanted. Common garden weeds tend to be plants that are hardy, reproduce easily and are very competitive with other plant species.

Weeds are problematic in gardens because they compete with the crop plants for sunlight, water, soil nutrients and space. They can also serve as habitats for garden pests, or make the garden look untidy. On the other hand, sometimes weed species play a beneficial role in the garden. They can improve the soil through root penetration and increased organic matter; they can provide habitat for birds, worms, insects and other animals; and some are edible or can be used as medicinal plants. Weeds are also useful for student investigations. For example, students studying roots can pull up a variety of weeds, and compare and contrast their root structures. So before deciding that every weed must be pulled, weigh the potential benefits against problems they may be causing.

### **Weed Prevention Strategies**

- Water only where you want to see plants growing. As much as possible, keep water off non-crop areas such as paths.
- Mulch paths heavily with a material that keeps weed seeds from germinating and seedlings from emerging. Cardboard or landscape fabric, covered with wood chips, works well.
- Eliminate weeds when they are small; it's easier than removing big weeds later.
- As a last resort, remove weeds before they go to seed or otherwise spread.
- If you have many weeds and few helpers, decide which weeds should be given highest priority and tackle those first.

### **Weed Elimination Methods**

When choosing weeding methods, consider which will work best with your weeds, your students or volunteers, and the conditions in your garden, such as soil moisture and weather. You may want to use different methods in different areas of your garden.

- hand pulling
- digging (for big weeds with deep roots)
- hoeing
- mulching (With some species this works even when weeds are already growing if you mulch thickly enough.)
- mowing or using a weed whip
- solarizing (covering with clear plastic for several weeks during warm weather to let heat kill weeds)

### **Recycling Weeds**

If the weeds you remove do not have seeds and will not re-root easily (like creeping grasses do), they can serve as mulch or compost material. Pile them around trees or other perennials where you want to cover bare soil, either to prevent new weeds or to keep the soil shaded, cool and wet during hot months. If you have a compost system that stays hot (135 degrees and above) for several days, even seedy weeds can go into it because heat kills seeds. If you are not sure if your compost is maintained at a high temperature, it is best not to include weed seeds or persistent weeds in your compost pile.

### **Tips for Weeding With Students**

- Before weeding with students, water well so the weeds come up more easily. Students get frustrated if they can't pull the weeds out but feel great satisfaction if they can!

- Give students a weeding demo. Assign a “Weed Manager.” Designate sections for different groups. Have buckets ready for collecting weeds.
- Have student count their weeds and make a weed chart.
- Teach students the difference between noxious weeds that cannot be composted and those that are OK to compost.

## Pest Management

Remember, healthy plants have fewer pest problems. Keeping soil fertile and irrigating adequately will prevent many pest problems from occurring. Follow the guidelines below for ecologically sound pest control.

### **Start by Monitoring**

Monitor regularly for pests because insect and disease problems are easiest to fix if caught early. Check plants for pests such as aphids, scale or the larval stages of several pest species. Look out for leaf spots that can be a sign of fungal or bacterial disease. If you identify a pest problem, try to find out the cause. This can be an exciting investigative activity for your students. Decide whether the damage is significant enough to warrant action.

In an instructional garden, you should tolerate some plant damage. Observing species interactions or the unchecked impact of a pest can be a part of the learning process, just as important as harvesting a crop. Many plant pests have natural predators, and if you remove the pests, your students will never get to see the predators in action.

### **Discourage Excess Moisture on Foliage**

Most fungal and bacterial diseases can infect plant surfaces only if moisture is present. In regions where the growing season is humid, give plants enough space so air can circulate freely. Water in the morning hours, because the water will evaporate more quickly in the daytime. Plants such as tomatoes, potatoes, squash and cucumbers should not be watered from above. This is less of a concern in arid climates.

### **Look for Disease and Pest-Resistant Varieties**

Many crop varieties are less susceptible to disease and pest problems. Information on resistance is generally available in catalogs and on seed packets.

### **Choose Appropriate Crops for Your Region and Season**

Many plants will succumb to pest attacks if they are grown in the wrong climate zone or during the wrong time of year. You can avoid pest problems down the road if you start by doing your research and making careful choices.

### **Clean up Your Garden**

Diseases and pests can remain on infected and dead plant material where they can survive until attacking another host crop. Remove infected plant leaves, keep weeds to a minimum and clean up the garden regularly.

### **Encourage Beneficial Organisms**

Make the garden inviting to beneficial species such as ladybugs, wasps, lacewings and birds that eat pests. Plant appropriate habitat species, choosing perennials that have consecutive flowering periods and limiting the use of insecticides that can kill beneficial species as well as pests. Adding a birdhouse or a water feature, such as a fountain or bath, can also help to attract birds.

### **Practice Crop Rotation**

Pests and diseases that affect certain crops build up in the soil if the same crop is grown in the same location repeatedly. By planting a different crop each year in any one location, on a three-year cycle, you can avoid many disease problems.

### **Use Non-Chemical Pest Control Methods and/or Barriers**

There are many fun and effective non-chemical pest control methods that are particularly appropriate in school garden programs.

- Hand-picking pests is a method that is rarely viable in commercial operations but effective when you have 20 students with bright eyes and small fingers. (Make sure to warn students about pests they should not handle, and monitor to ensure safety from bites.)
- Row covers can keep flying pests off an entire bed.
- Sticky barriers can inhibit ants.
- A board laid on the soil is good for collecting snails and slugs. Turn it over in the morning and pick off the mollusks that have gathered there.
- A short section of old hose or rolled-up newspaper will attract nighttime marauders like earwigs, which can be collected in the morning.
- Mix one tablespoon of liquid dishwashing soap with a quart of water and spray the soapy solution on plants to get rid of aphids and whiteflies. As a variation, try adding garlic to this concoction (blend with raw garlic and then strain).

### **Use Physical Barriers for Vertebrate Pests**

Often the most damaging pests to our gardens are rabbits, squirrels and gophers. When properly secured, row cover is an effective barrier to non-burrowing vertebrates. Gophers can be kept out of beds lined underground with gopher baskets or hardware cloth (wire screen). Most traps and poisons are potentially dangerous to children and other species and must be used with discretion. Check regulations at your school and district to find out what is allowed.

### **Tips for Managing Pests With Students**

- Involve students in using rolled up newspaper or boards to capture critters. Students will enjoy turning over a board to find creepy crawlies.
- Let students research and identify beneficial insects and pests (aka “good” and “bad” bugs). The more they learn, the less likely they will be to indiscriminately squish insects.

## Summer Garden Maintenance

Here are some ideas to keep your garden going during the summer so you'll be ready to harvest treats instead of weeds in the fall.

### **Garden Guardians**

Ask families or neighbors to sign up to “adopt” the garden for a week or two during the summer. Leave simple directions on where to water and weed, and encourage your garden guardians to harvest the veggies and flowers that are ready for picking. This will serve as a simple thank you and encourage your plants to keep producing fruit and flowers. Make a schedule for the summer, complete with phone numbers of the weekly caretakers, so they can find substitutes if summer plans change.

### **Weed Now, Not Later**

Make sure weeds are under control before the garden takes its summer break. The smallest of weeds in June may be producing (and spreading) seeds by mid-summer. If possible, remove all visible weeds before your break so they don't haunt you in fall.

### **Use Mulches**

Mulching for weed suppression and water conservation is a great strategy that is well worth the extra work. See Mulching on page 50 for more information.



### **Auto-Water**

If you install a drip irrigation system and automatic timer, you will know your plants are getting the water they need over the summer. Equipment for irrigating a small school garden with an automatic timer can cost less than \$100 at your local garden center. See *Watering* on page 43 for more information.

### **Host a Summer Program in the Garden**

If your school is home to a summer school or summer camp, ask organizers if they would be interested in maintaining the garden with their students.

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## Section VII. **Composting**

### Why compost?

There are two main reasons to compost our leftover food waste and garden waste: to reduce the amount of material being sent to our landfills and to improve soil structure. This provides plants with a great source of necessary nutrients for growth and development.

Composting allows students to see that what we call waste may be nutrients in disguise. Food and garden waste can be added to the compost pile and retrieved a few months later as valuable fertilizer. Composting gives students an opportunity to experience the nutrient cycle and create abundant fertilizer that builds the garden soil — and it's free!

### How does composting work?

Decomposition in the compost pile is a result of the efforts of billions of microorganisms, mainly bacteria and fungi. They eat the coarse materials and break them into smaller, simpler molecules that become available as nutrients for plants. As the microorganisms eat their way through the compost, they give off heat that can be felt and measured by the students. When the pile begins to cool down, larger decomposers such as mites, beetles, sow bugs and worms continue to break down the pile.

A compost pile is built by layering equal amounts of “greens” (food scraps or fresh plant material) and “browns” (dried plant material such as leaves or straw). The alternating layers should be about 4-to-6 inches thick.

There are two basic methods for making compost, the fast method and the slow method. (There are also many variations in between.) The fast method produces compost in just a few weeks. The layered pile is built all in one day and turned every few days so the materials on the outside of the pile get mixed into the middle frequently. This method speeds up the decomposition process and results in a hot pile up to 160 degrees. The heat can kill plant diseases and weed seeds. This fast method is labor-intensive and is not the best approach for most school gardens. Most schools prefer the slow method, which takes a few months to produce finished compost. In this method, a layered pile is built either all at once or over time. It is left to decompose until it is ready for use in the garden (and perhaps turned once or twice to help the process along). Weed seeds, pernicious weeds and diseased plant parts should not be included because this type of pile doesn't get hot enough to

eliminate the risk of spreading them back to the garden when the compost is used later. Talk to your local garden center professional or Master Gardeners to find out which weeds in your area should be kept out of compost piles.

Any compost pile should be at least 3 feet-by-3 feet-by-3 feet. This size is essential for optimum decomposition and adequate heat retention. The maximum height should be 5 feet. If any taller, the pile becomes too compressed and is deprived of air. The pile should be square or rectangular. You can accomplish this by forking materials out to the corners and edges with each added layer. Otherwise, the pile becomes narrow toward the top and takes on a pyramid shape, which allows heat, moisture and nitrogen to escape.

Composting is most efficient when aerobic decomposition is taking place. This is decomposition in the presence of air. If the pile is too dense or wet, anaerobic decomposition will occur and produce a strong smell. Incorporate coarse and bulky materials to help air circulation. If anaerobic decomposition develops, turn the pile and add coarse material. Also take measures to maintain the compost pile at about the dampness of a wrung-out sponge. If the pile gets too wet, add straw and porous materials and mix them in well to soak up the moisture. If rain is a problem, put a roof over the compost area or cover the pile with a tarp. If the pile gets too dry, this will also slow decomposition. During dry months, water your compost pile periodically to maintain an environment conducive to decomposers.

Some schools build their piles in compost bins. Many types of compost bins are commercially available, and some schools build their own. Besides the aesthetic appeal of having all of your compost neatly contained, compost bins that are pest-proof are especially useful if you are including food scraps in your pile.

### **Compost Materials**

Traditionally, compost is made in the fall when there is an abundant supply of materials, such as leaves that have fallen and plants that are being cleared from the garden. However, building compost piles throughout the year will provide your garden with compost year-round. The more materials you gather, the more compost you can make.

Be creative in finding sources of compost materials. One teacher organizes a post-Halloween "pumpkin drop" to collect a plentiful supply of greens for building piles. Check stables for donations of manure and straw bedding. Ask produce companies for food waste. Ask parents to bring in bagged leaves in the fall. Check to see if your school or district has any composting guidelines or restrictions before you begin collecting materials.

The smaller the materials, the faster they will decompose. Chop larger materials with a spade before adding them to the pile.

<b>Browns</b> (Carbon-rich dried plant material)	<b>Greens</b> (Nitrogen-rich fresh material)
Straw	Kitchen scraps, including egg shells, coffee grounds and coffee filters
Dried Leaves or other plant parts	Fresh leaves or other plant parts
Dried grass clippings	Fresh grass clippings
Sawdust	Manure (chicken, goat, horse or cow)

### Materials to Keep Out of Compost Piles

Avoid adding dairy products, meat or oily foods to your compost pile. They are smelly while decomposing and can attract wild animals. Never add human, cat or dog feces because they can spread disease. Also avoid adding large amounts of material from conifers, eucalyptus, laurel and walnut trees.

Manure, pernicious weeds, weed seeds or diseased plant parts should only be added if you are using the fast system and expect your pile to be hot enough to kill pathogens and seeds.

### Composting With Students

Working with students to build a compost pile and monitor it over time can be a valuable part of a greater conversation on decomposition and nutrient cycling.

- Before building a compost pile, gather all the necessary materials.
- Demonstrate how to make a compost pile by making a mini-pile (just a few inches square). Show students how to layer browns and greens and pull materials out to the edges and corners to keep the pile square.
- When you're ready to build the real pile, assign all but five of your students to teams of Browns and Greens. Designate one student to be the waterer and four students to be the corner makers. Ask for a volunteer to loosen the soil underneath the pile. Then ask the Browns team to add a layer of browns, the Greens team to add a layer, etc. The student in charge of watering sprinkles each layer. The corner makers make sure the pile is staying square, pulling the materials out to the corners and sides as each layer is added.

### Worm Composting

Another type of composting, which can be done even in the classroom, is vermicomposting, or worm composting. Worm composting involves purchasing a supply of worms and then filling a bin or large tub with damp bedding for the worms, such as shredded newspaper or leaves. Food scraps can then be buried in the bedding every few days, and over time the worms eat their way through the food scraps and the bedding. The resulting worm compost is a rich source of nutrients for your garden. For more information on worm composting, visit [www.lifelab.org/2009/12/worm-composting/](http://www.lifelab.org/2009/12/worm-composting/).

- Using tools to transfer materials can be dangerous if several students crowd around one compost pile. Avoid this by asking students to use their hands to add material to the pile. If you are using food scraps, students can pour the scraps from buckets onto the pile.
- If you are using plant materials more than a few inches long, older students can lay them on the ground and chop them into smaller pieces with a spade before adding them to the pile. Be sure that students do this task with plenty of space around them.
- Monitor the pile's temperature, moisture level and dimensions with your students. How does it change over time? What creatures can they find living in it? How do these creatures help?

### **When is Compost Ready to Use?**

In general, the pile is done decomposing when the compost is dark brown, looks like soil and has an earthy, humus-like odor. The exterior will not fully decompose, so check at least 6 inches into the pile to observe its characteristics. Once the pile is ready it should be sifted through a heavy gauge wire screen to get rid of sticks and other items that haven't decomposed. It is then ready to be used.

### **How Do We Use it in the Garden?**

Compost adds plant nutrients, organic matter and beneficial microbes to the soil. When starting a new garden area, dig a 2-inch layer of compost into the top 12 inches of soil. If your soil is high in clay content, use more. In established beds, dig in a 1-inch layer of compost before planting. You can also use compost as an ingredient in seed-sowing mixes and potting soil, or as a mulch around fruit trees and perennials. Be generous. According to an old adage, the less your soil looks like compost, the more compost you need to add!

## Section VIII. **Students in the Garden**

### Garden Safety

Gardening can be a very positive experience for everyone when safety rules are in place and all school staff members are proactive about safety hazards. In general, school gardens should not use chemical pesticides and fertilizers. Even natural pesticides can be toxic if ingested or handled; keep any such products locked away from students. Two major safety issues in the school garden are toxic plants and tool use.

#### **Toxic Plants**

Teach your students from Day 1 not to eat plant parts from the garden without permission. Even common garden crops such as tomatoes can be toxic if the wrong part is eaten. Throughout their lives, students will meet up with plants they shouldn't eat. The garden is a good place to teach this important lesson. With adequate supervision and training, students can learn to eat only what is edible, and only with adult permission.

It is important for everyone teaching in the garden to know which plants are toxic and which are edible. The following list of some common toxic plants is by no means comprehensive. Before planting anything in the garden, check its toxicity with a reliable source.

#### **Flowers**

- azalea (*azalea indica*)
- bleeding heart (*dicentra formosa*)
- calla lily (*zantedeschia aethiopica*)
- carnation (*dianthus caryophyllus*)
- castor-oil plant (*ricinus communis*)
- Chinese or Japanese lantern (*physalis*)
- chrysanthemum (*chrysanthemum*)
- clematis (*clematis*)
- crocus (*colchicum autumnale*)
- daffodil (*narcissus*)

- delphinium (*dephinium*)
- foxglove (*digitalis purpurea*)
- gladiola bulbs (*gladiola*)
- hyacinth (*hyacinthus orientalis*)
- iris (*iris*)
- jonquil (*narcissus*)
- lily of the valley (*convallaria*)
- morning glory (*ipomaea tricolour*)
- narcissus (*narcissus*)
- oleander (*nerium oleander*)
- pansy (seeds) (*viola tricolour*)
- peony (root) (*paeonia officinalis*)
- poison hemlock (*conium, cicuta*)
- primrose (*primula*)
- sweet pea (*lathyrus odoratus*)
- sweet william (*dianthus barbatus*)

### **Mushrooms**

- While some mushrooms are edible, many others are extremely toxic and even fatal. Because they are difficult to tell apart, all mushrooms in a school garden should be considered off limits for eating.

### **Vegetables**

- potato—above-ground parts and green patches on tubers (*solanum tuberosum*)
- rhubarb leaves (*rheum*)
- tomato leaves and stems (*solanum lycopersicum*)



### Hedges and Bushes

- black locust (*robinia pseudoacacia*)
- buckthorn (*rhamnus cathartica*)
- cherry laurel (*laurocerasus officinalis*)
- daphne (*daphne mezereum*)
- elderberry—all parts except berries (*sambucus*)
- horse chestnut (*aesculus hippocastanum*)
- hydrangea (*hydrangea*)
- laburnum (*laburnum anagyroides*)
- poison oak, poison ivy (*toxicodendron*)
- privet (*ligustrum vulgare*)
- virginia creeper (*ampelopsis brevipedunculata*)

### Vegetables Toxic When Raw

- buckwheat greens (*fagopyrum esculentum*)
- eggplant (*solanum melongena*)
- kidney beans, including sprouts (*phaseolus vulgaris*)
- parsnips (*pastinaca sativa*)
- potatoes (*solanum tuberosum*)

### Tool Use

Using garden tools safely means providing appropriately sized tools, discussing safe tool use with students often (every time tools are used, at least at first), spacing students well when using tools, taking turns and supervision.

Child-sized tools are easier for young students to handle and use safely. These tools are available online at sites such as [www.forsmallhands.com/store/](http://www.forsmallhands.com/store/) or [www.kidsgardening.com](http://www.kidsgardening.com). Even with these tools, it is essential to demonstrate how to use them safely. Older students can use larger tools with appropriate training.

When discussing safe tool use with your students, model the behavior that you expect them to display. Show them how to carry and use the tools before handing them out. See Safe Tool Use Demonstration on page 87 for more details on introducing tool use.

Plan your garden projects so only a few students will work in any one area at one time. It's easy to imagine why students need plenty of space when digging in a bed or loading wood chips into a wheelbarrow. It's not as easy to figure out how to do this when you may only have one bed for your entire class. Plan simultaneous activities or projects in different areas of the garden, rotating students until everyone has had a chance to do everything. Or assign each small group a different task.

Taking turns is useful when there are too many students wanting to do the same garden task. For example, if your students are loading wood chips into a wheelbarrow, let two or three students shovel wood chips at once, then rotate so all students get the same amount of shoveling. When more than one student wants to push the wheelbarrow, let each student push it for a certain distance.

Here are some general guidelines for safe tool use:

- **Keep Toes Safe:** Spading forks and shovels should be used only by those with closed-toe shoes.
- **Walk With Tools:** Don't run when carrying tools or using the wheelbarrow.
- **Low and Slow:** Keep the metal part of tools below waist level, and take your time.
- **Elbow Room:** Be sure there is plenty of space around you in every direction before using a tool. How much space you need depends on the task and the tool.
- **Keep 'Em Clean:** Always clean a tool before you put it away.
- **No Tripping Hazards Here:** Never leave tools on the ground. Always stand them up or put them away.

## Managing an Effective Outdoor Classroom

Outdoor classroom management is an integral part of a successful school garden program. Many teachers find it challenging to work with their classes outside because of students' high energy and distractions. However, by channeling students' energy and enthusiasm toward focused learning activities, using distractions such as spiderwebs or bird calls as teaching tools, the garden becomes an exceptionally effective and exciting space for learning. Ultimately, a well-managed garden provides new ways to motivate students and demonstrate concepts. It also provides opportunities for students to explore the natural world, apply skills learned in multiple academic areas, learn about nutrition and work together. Educators have identified the following management strategies for making garden-based learning effective and enjoyable.

### Garden Rules

The garden is a special kind of classroom and requires special rules for effective learning and safety. Establish a set of school-wide rules for the garden. When students are part of the process of establishing these rules, they are more likely to understand and uphold them.

The following is a simple set of rules commonly used in school gardens:

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

In addition, create specific rules for using garden tools. Your garden may require certain other rules, such as “Always keep the gate shut,” “Always wipe your feet and wash your hands before returning to class,” or “Tree climbing by special permission only.” Phrase the rules positively and try to keep them simple — the fewer the better.

Post your garden rules prominently, where all students, teachers, volunteers and visitors can see them. See Garden Rules Role-Play on page 87 for a detailed method for introducing the garden rules to your students.

Working outdoors is generally viewed as a privilege by students. Reward their good behavior with more time outdoors when possible.

### **Cooperative Learning**

Spend your first session in the garden, or part of each of your first few sessions, working on cooperation and communication skills. See Getting to Know the Garden: Introductory Activities for ideas on page 87.

### **Lesson Structure and Tone-Setting**

Students will be more focused in the garden if they know what to expect. Before heading out to the garden, go over the plan for the day. Introduce the lesson, explain the flow of the stations if applicable and ask students to help you review guidelines for behavior in the garden.

### **Providing for Students' Physical Comfort**

Students will have an easier time focusing on lessons and garden tasks if they are not distracted by physical discomforts. For instance, it will be much easier for them to look at you and listen to you if you stand so that the sun is in your eyes, not theirs. Create a place for the entire class to be seated when you want to give instructions or lead a discussion. When working in a bed, be sure there is enough space for students to kneel around it. Make sure students are warm enough or have a shady spot to retreat to in hot weather. Provide clipboards when students will write in the garden. All of these measures will help students engage in learning in the garden.

## **Group Size and Structure**

Teachers use a variety of creative strategies to make their class sizes more manageable in the garden, including bringing in additional adults, small-group cooperative learning, rotating activity stations, team-teaching and buddy classes.

Many teachers manage class time in the garden by increasing the adult-to-student ratio. If possible, ask a volunteer who is trained and comfortable working with students to help once a week. While the volunteer helps manage a gardening activity such as weeding or watering with one group, the teacher can present an academic lesson for another group.

Small-group cooperative learning is especially effective in the school garden setting. For example, if your students are observing how insects help pollinate plants in the garden, try dividing the class into groups of five. Give each group instructions to find one plant and quietly observe any visitor insects. You can give members of the group 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. This allows students to learn while developing cooperative learning skills (such as listening, explaining, suggesting and group decision making). And you become a resource for six groups rather than 30 individuals.

Another approach is to set up stations so that students can rotate through different activities. Here is a sample schedule of 20-minute stations:

**Station 1)** Students work with the teacher to harvest and prepare a garden snack.

**Station 2)** Students work independently on a math activity, measuring and answering questions about plant growth on a worksheet.

**Station 3)** Students work on an independent writing or drawing project.

Some teachers choose to team-teach, temporarily reducing their 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 with the other half of the class.)

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.

## **Gardening Tasks and Tips for Large Groups of Students**

Gardening with an entire class at once is often a matter of taking a simple task and breaking it down into many steps for many hands.

## **Mulching**

Scattering mulch over a designated area is a great garden activity for large groups of students. They can transport mulch from a big pile and spread it with small tools, or with their hands and feet. By using gallon-sized buckets instead of wheelbarrows, you can divide the task among many hands.

## **Watering**

Because gardens need lots of water to grow, it can be very helpful to set up timed irrigation, or a watering schedule shared by teachers and volunteers. Nonetheless, it is nice for students to nurture their plants with water. But how can we get 20-30 students involved at once? One great way is to provide a spigot or bucket with lots of small cups. Students fill their cups, carry them to the plants, water the plants and return for more. To avoid flooding the plants, give students two cups – one with a hole in the bottom, placed inside an intact cup. After filling the top cup and finding the plant they want to water, they remove the bottom cup to let the water trickle through the hole.

## **Weeding**

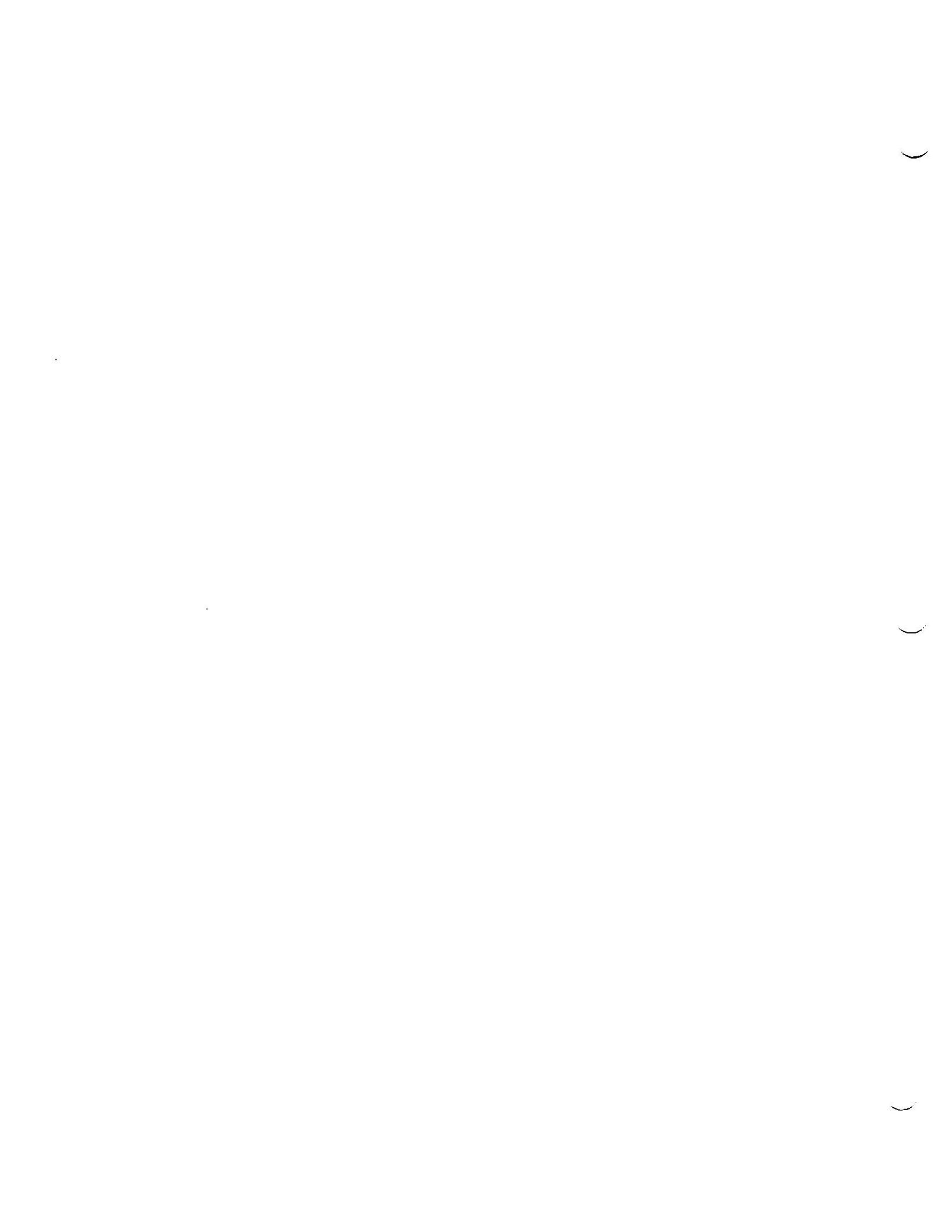
Some teachers like to weed a little every day, having their students pull five weeds on the way into the garden and five before they go. If you're going to the garden less frequently, another option is to have an all-out weeding extravaganza. Everyone pulls weeds and adds them to the compost pile for about 20 minutes, then gathers to admire their work. It can even be a contest. This works great if used occasionally, but make sure weeding doesn't become a main focus in the garden.

## **Deadheading and Seed Saving**

A simple task for large groups is to cut the dead flowers from plants using scissors or garden clippers. They can open up the spent flowers to find the seeds, which they can save in seed envelopes. Finally, they can decorate these seed envelopes with pictures of the plant in bloom and information about growth requirements.

## **Collecting Pests**

One of the best methods of organic pest control in a school garden is simply removing pests by hand, and many students will jump at the opportunity to do so! First, decide what you are going to do with the pests. Some teachers relocate buckets of snails to wild areas far from the garden. Make sure students know how to identify the pests they are looking for and don't collect creatures indiscriminately. Give students small containers to collect the pests.



## Section IX. **Harvesting and Cooking from the Garden**

### Harvesting and Preparation Tips

#### **Beans, Bush**

- Keep sowing every 2-4 weeks during the growing season for a constant supply of beans. Plants may stop producing during extreme heat but will begin again when temperatures fall.
- Pick bean pods before you can see the beans swelling in the pod. The best way to know which size bean pod to harvest is to taste different sizes and decide which you like best.
- Be sure to pick beans frequently (every 3-5 days) so the crop keeps producing.
- Eat beans raw, steamed, boiled or pickled in vinegar.

#### **Beans, Pole**

- Pole beans often produce for a longer period than bush beans.
- Pick bean pods before you can see the beans swelling in the pod.
- Pick beans frequently (every 3-5 days) for a continual harvest.
- Eat beans raw, steamed, boiled or pickled in vinegar.

#### **Beans, Shelling (Dry)**

- Shelling beans are grown until the bean and pod are dry. Let the beans completely dry on the plant before harvesting.
- Place dried bean pods on a tarp and have students stomp on them to remove the pods, or place them in a sack and strike the sack to break the beans from their shells. Some students like to shell each pod by hand.
- These beans need to be boiled before eating.

**Beets**

- Sow seeds directly in the garden every 2-4 weeks for a continual harvest.
- Harvest beets when they are 1 to 2½ inches in diameter; they can have a woody texture when overly mature.
- Beets can stay in the ground through frosts.
- Store beets in the refrigerator with their greens removed.
- Eat raw, pureed, marinated, stewed, boiled, sautéed or pickled in vinegar. Beet greens are delicious when cooked like spinach.

**Broccoli**

- Harvest broccoli when the heads stop enlarging and the flower buds are still mostly tight. Some buds will start to enlarge, getting ready to open. Harvest before the florets get loose and open.
- Cut off the head with 6 inches of stem attached. Side heads will form after the first head is cut.
- Eat florets and stems raw, boiled or steamed. Peeling the stems makes them more palatable, and many students prefer the peeled stems to the florets.

**Brussels Sprouts**

- Exposure to frost improves the flavor and sweetness.
- To harvest, twist the sprouts off the stem when they are 1½ inches wide. Start with the lower ones. Remaining sprouts will keep on the plants through part of winter.
- Eat boiled, sautéed or baked.

**Cabbage**

- Harvest cabbage heads when they have formed tight, firm heads. Each head should feel hard like a baseball.
- Harvest the whole head from its base with a sharp knife. Strip off tough outer leaves if necessary.
- Eat raw, boiled, steamed or pickled as sauerkraut.



**Carrots**

- Harvest carrots at almost any time in the growth cycle. Carrots will keep in the garden after the first frost, right up until ground freezes in winter.
- If needed, loosen carrots with a digging fork before pulling.
- Store carrots in a bag in the refrigerator with their tops removed.
- Eat raw, boiled, baked, pureed or pickled in vinegar.

**Cauliflower**

- Tie outer leaves around the head to protect the cauliflower from the sun.
- Cauliflower is ready to harvest when the florets are tightly formed and dense. Cut the head off the main stem.
- Eat raw, cooked, boiled or pureed.

**Celery**

- Harvest after the stalks have reached a foot or more in height.
- The inner stalks are the most tender and taste best uncooked.

**Chard**

- Cut the outer leaves close to ground when 8-10 inches tall. Leave 4-6 leaves on the plant so it can continue to grow.
- Refrigerate in a plastic bag for up to two weeks.
- Cook stems and leaves by boiling, steaming or stir-frying.

**Corn (Sweet)**

- Ears are ready to harvest about 20 days after the silks appear or when the silks turn brown.
- Peel back the husk to and puncture a kernel with your fingernail. If the kernels are fat and the juice is milky white, the ear is ready to harvest.
- Eat raw, steamed or boiled. For best flavor, eat within two days of harvesting.

**Corn (Pop)**

- Allow the kernels to dry in the field as long as possible before winter rains.
- Harvest the ears when the kernels are hard and the husks are dry. Remove the husks and place the ears in mesh bags. Hang the bags in a warm, dry location.
- Once a week, take a few kernels and try popping them. When test kernels are popping well, store ears in a cool dark dry place or remove the kernels and store them in airtight containers.

**Cucumbers**

- Cucumbers are tastiest when they have reached optimum size for their variety but before the seeds fully develop.
- Harvest lemon cucumbers when they are light green with just a blush of lemon color.
- Harvest cucumbers often to keep plants producing.
- Eat raw or pickled.

**Eggplant**

- In northern gardens where the growing season is short, start with large transplants.
- Eggplant may develop a bitter flavor when grown in stressful conditions. Harvest eggplants while the skins are glossy and before seeds form inside.
- Cut the stem, rather than pulling it from the plant.
- Soak sliced eggplant in water for 15 minutes, or salt eggplant slices and let them sit before cooking to reduce bitterness. Eat baked, sautéed, puréed, stuffed or roasted.

**Garlic**

- Harvest when half to three-quarters of the leaves turn yellowish brown.
- Loosen the soil beneath the bulb before pulling.
- Tie garlic together in bundles of 6-10 bulbs; hang them for four to six weeks in a shaded, dry area to cure.
- Mince and use in any dish as flavoring.

### Kale

- Pluck the outer leaves of the kale plant when leaves are 10 inches or longer.
- Always leave at least 4-6 leaves on the plant so it can continue to produce.
- To keep the plants in production, avoid cutting the center bud or leaves.
- Frost enhances the flavor.
- Eat puréed, boiled, steamed or sautéed.

### Kohlrabi

- For best texture, harvest kohlrabi bulbs when they reach 2-3 inches in diameter. Bulbs become tougher as they grow and age.
- Pull up or cut at the top of the root. The bulbous stem and leaves are edible; peel off the skin of the bulb before eating.
- Eat raw, steamed, boiled, pureed or grated into salads.

### Leeks

- Harvest when they are about 1 inch in diameter and before they make their flower stalk.
- Slice open lengthwise and rinse inner leaves.
- Eat in soups, salads or baked dishes. Use only the white and light green parts; the dark green parts are too tough.

### Lettuce

- Harvest a few outer leaves of leaf lettuce early to encourage growth.
- Head lettuce is ready to harvest when heads are firm and tight. Once a head is ready, it must be harvested within a few days or it will bolt (send up a flower stalk) and the entire head will take on a bitter taste.

### Melons

- Refer to seed packet information for harvesting tips for particular varieties.
- **Cantaloupes:** Pick when heavy and tan. Look for “netting” that is hard and raised and a crack that forms around the stem where it touches the fruit. The stem should slip easily off the vines with a quick pull, but should not have fallen off by itself.
- **Honeydews:** Should have a slight yellow blush and get a bit softer on the blossom end.

- **Watermelons:** Develop a dull green cast and have a light patch at the bottom that changes from green to light yellow when mature. Also, the leaf on the tendril nearest the fruit turns brown and withers. The skin should be hard, difficult to pierce with a fingernail.
- Eat melons right in the garden for ultimate satisfaction!

### **Onions**

- Harvest when tops fall over and tips of leaves start to turn brown.
- Pull onions, shake off any soil, but do not wash them or pull off outside wrapper leaves. Store in a dry area to cure for about a week.
- Use raw, blanched, boiled or baked, on just about any dish.

### **Parsley**

- Harvest parsley as soon as plants are growing vigorously.
- Snip outer stems from plants; they will produce new growth.
- Parsley dries and freezes well. Can be eaten dried or fresh.

### **Peas**

- Harvest peas daily to encourage vines to keep producing.
- **Shelling Peas:** Pick them when the pods are rounded and the peas have filled in the pod, but before they grow tough. Pods are not edible.
- **Snap Peas:** Pick when their edible pods begin to grow rounded, plump and juicy, but before they get tough.
- **Snow Peas:** Pick them when the pods have grown to 2-3 inches long but are still flat.
- Eat raw, boiled, steamed or stir-fried.

### **Peppers**

- Peppers are sensitive to cold and harsh sunlight. In extreme heat, shade them by planting in a dense block, or suspending shade cloth over the plants.
- Peppers are edible when they're green, but most don't develop full flavor and mineral content until they turn from green to orange, yellow or red.
- Eat raw, boiled, baked, stuffed or stir-fried.

**Potatoes**

- A couple of weeks after the foliage starts to wither and die, the tubers should be fully grown and ready to harvest. Let the soil dry down a bit to help cure the potato skin. Dig up the potatoes with a spading fork before the first frost. To avoid puncturing the potatoes, put your spading fork into the soil at least a foot away from the plant. Look through the soil all around the plant thoroughly; potatoes hide easily.
- Do not wash potatoes before storing; just brush off the dirt.
- Potatoes that are nicked or bruised during harvest don't store well, so eat them as soon as possible.
- "New potatoes" can be harvested before the plant begins to die back. New potatoes should be washed and eaten shortly after harvest.
- Always cook potatoes; the raw starch is mostly indigestible. Boil, steam, or bake. Potato leaves are not edible.

**Pumpkins**

- Do not pick pumpkins until the vine begins to turn brown and dry. Then cut the vine 3-4 inches above each pumpkin.
- Leave pumpkins in sun for a week or two to cure, to help them keep longer.
- Eat baked, boiled or puréed. It is easiest to remove pumpkin flesh from the skin after baking.

**Radishes**

- Sow radishes every week or two for continual harvest.
- Spring radishes should be checked frequently because of quick maturation. Pull radishes when they are 1-2 inches in diameter; they take on a woody texture when over-mature.
- Eat raw, stir-fried or pickled in vinegar.

**Spinach**

- Plant every two weeks in spring or fall for continual harvest.
- Harvest larger outer leaves early in the morning when they are crisp, or cut the whole plant at the base.
- Wash well. Eat raw, puréed, stir-fried, steamed, boiled or in baked dishes.

**Squash, Summer**

- Pick frequently when fruits are small (bigger squash have less flavor and tougher texture). Skins should be tender enough to poke a fingernail through. Squash grow quickly and may need to be harvested every day.
- Pick zucchini no larger than 6-7 inches, patty pan squash at 2-3 inches and round zucchini at 3-4 inches.
- Skin can be eaten along with the inside. Eat raw, boiled, baked, roasted or in soups.

**Squash, Winter**

- Grow throughout the season and harvest when the vines die back in fall and the squash skin is hard.
- Leave a long stem on each squash.
- Most winter squash store well. After harvest, store in a cool dry area, and set them apart so that they are not touching each other.
- Eat boiled, baked or puréed in soups. It is easiest to remove squash flesh from the skin after baking.

**Tomatoes**

- Harvest when fruits are full color.
- Eat raw, stuffed, stewed, boiled, baked or puréed. Leaves are not edible.

**Turnips**

- Harvest turnip greens about a month after sowing; harvest turnip roots when they are 2-3 inches in diameter.
- Spring turnips should be pulled before hot weather, so they don't get woody.
- Fall turnips develop a sweeter flavor after a frost.
- Eat turnips raw, baked, boiled, sautéed or steamed.

More information on harvesting and preparing vegetables can be found at <http://www.burpee.com>.

**Enjoying Food with Students**

Enjoying a fresh harvest is one of the best parts of gardening with students. Many teachers have noticed that students who help grow, harvest and prepare fruits or vegetables are more likely to try them, like them and want to eat them again.

However, this openness does not come from teachers *requiring* their students to try new foods. Doing so may actually get in the way of students developing more positive attitudes toward fruits and vegetables. Let your students know that you hope they will try new things, but that they will not be required to eat anything or finish anything they don't like. Some teachers tell students that if they take a bite of something and don't care for it, they can spit it out onto the soil, where it will decompose and help new plants grow. Many students, when given this freedom, feel less apprehensive about trying new fruits and vegetables.

Don't be discouraged if students don't try something the first or even the third time it is offered. Some students may need to see a food many times (experts say up to three) before they accept it enough to try it; and they may need to try it a few times before they come to like it. Keep offering fresh snacks from the garden, and make sure the students see you enjoying the snacks yourself!

## Cooking Supplies

The following is a list of supplies for cooking in the classroom or in the garden. Quantities are geared toward cooking in up to five small groups. Some schools keep their cooking supplies on a rolling utility cart, which allows them to be shared among classes, put away easily or even rolled outside for an outdoor cooking project.

Many of the supplies below can be bought inexpensively at second-hand stores, or donated by parents.

### *The basics for simple food preparation projects:*

- 10 cutting boards, thin plastic
- 10 round-tipped steak knives
- small, medium and large pots with lids
- 5 wooden spoons
- 5 liquid measuring cups
- 5 sets of dry measuring cups
- 5 sets of measuring spoons
- 5 mixing bowls
- 1 bottle of dishwashing soap
- 5 sponges with scrubbing side
- 3 large dish tubs (for washing, rinsing and sanitizing)
- 2 large dish-drying racks
- 5 kitchen towels
- 1 bottle of chlorine bleach
- 1 blender
- 1 first aid kit

### *Other supplies you might wish to acquire:*

- 20-30 plates, bowls, forks and spoons
- 1 steamer basket
- 1 ladle
- 2 large skillets
- 5 baking sheets
- 2 9 x13 baking pans
- 1 colander
- 5 cheese graters
- 5 spatulas
- 5 vegetable peelers
- 5 whisks
- 1 can opener
- 2 manual citrus juicers
- 4 potholders
- 2 rolling pins
- 1 salad spinner
- 1 electric skillet
- 1 hand mixer
- 2 electric hotplates

## Food Safety

Safety concerns should always be foremost in your mind when cooking with students. Be informed about any food allergies in your class, as well as your district's policies on food and health. Establish hand-washing routines and safety rules with your class.

### Washing Hands

All participants should wash their hands before cooking, after taking a break from cooking; after touching their faces, sneezing or coughing; and before drying or putting away dishes. Teach students to wash with warm water and soap for 20 seconds, then dry their hands with a clean cloth towel or paper towel. Demonstrate for students coughing into your shoulder, or "scratching" an itchy nose with your upper arm.

### Safe Food Handling

- Cover all cuts on hands with bandages or gloves while cooking.
- Tie long hair back during cooking.
- Consider excluding ill students from cooking activities.
- Wash the sink with hot soapy water before and after washing fresh produce.
- Wash produce under running water, just before preparing or eating, unless it comes in a package that says it is pre-washed.
- Rub produce with clean hands or scrub with a clean vegetable brush under running water. Scrubbing is even important for foods with peels, such as melons, to remove any bacteria that may be on the rind before slicing through the rind and spreading the bacteria to the interior of the fruit. Sanitize your vegetable brush by placing it in boiling water for 20 seconds or rinsing in a weak bleach solution (1 teaspoon chlorine bleach in a quart jar of water). Don't use dish soap or hand soap for washing produce, as it may remain on the fruit after rinsing.
- If you need to dry fruits or vegetables after washing, use paper towels.
- Wash cutting boards before and after food preparation. If you have access to a dishwasher, use it to clean and sanitize cutting boards. If not, cutting boards can be sanitized by rinsing them in a weak bleach solution (see above). Use separate cutting boards for produce and meat. Do not place cooked foods on the same surface that was used to prepare the foods when raw. This is especially important for meat but also applies to vegetables.
- Designate one person to serve each dish rather than allowing every person to touch the same serving utensil.
- Keep hot foods hot if serving over an extended period of time.
- Store all cut vegetables or fruits and prepared foods in the refrigerator.



## General Cooking Safety

- Turn pot handles to the back of the stove.
- Turn burners off when not in use.
- Keep flammable items away from the stove.
- Keep electrical cords away from water and wet hands, and tape them down along the ground to reduce the tripping hazard.
- Keep the cooking area free of things that students might trip over.
- Ask students to walk, not run, in the cooking area.
- Warn students when items such as electric skillets are turned on.
- Wait to serve hot food until it is cool enough to safely eat.

## Knife Use and Safety

Check into your school's policy on knife use before introducing knives in the classroom. Make a poster of simple knife use rules, and discuss knife safety every time knives are used.

### Knife Selection

When selecting knives for use with students, consider age level and the tasks at hand. Round-tipped steak knives are great for older elementary students and work well for most vegetables. The serrated edge works well with a sawing motion. For younger students cutting soft foods, some teachers use nylon knives or pumpkin-carving knives, which are serrated but not sharp.

### Basic Knife Safety Rules

- **Elbow Room:** Make sure you have plenty of space before starting to use a knife. Some teachers advocate spacing students more than an arm's reach apart. Students should not share cutting boards when using knives.
- **Eyes on the Task:** Watch what you are doing while using a knife. If you need to look up, stop cutting for a moment.
- **Claw & Saw:** The hand holding the food should be in a claw shape, with fingers curved and the thumb behind the fingers. The cutting hand "saws" with the knife, well away from the fingers.
- **Low & Slow:** Take your time when cutting, and keep your knife at the cutting board, not waving through the air.

- **Cut Away From Yourself:** Keep the knife tip facing the center of the table, and the blade facing down toward the cutting board.
- **Knives in the Basket:** When you are done with your knife, place it in the knife basket in the center of the table. Never walk away with your knife, and never place knives in a sink or dish tub full of water; someone washing dishes could accidentally take hold of a knife and get hurt.
- **Hand it Over Carefully:** If you need to hand someone a knife, offer the handle and point the blade toward the floor.

Before allowing students to cut round, hard things like beets or carrots, have an adult cut the items in half length-wise. That way, the food will have a flat surface that can be placed on the cutting board and the food won't roll around. For younger students, boiling or steaming vegetables first makes them easier to cut.

Even when rules are in place and regularly reviewed, an adult should actively watch students who are using knives. When planning a cooking project using knives, arrange to have an adult to supervise each group of eight or fewer students. Either involve volunteers or rotate groups through a cooking activity while the rest of the class works on an independent project.

For more information on using knives and other kitchen tools with kids, visit:

[www.whatscookingwithkids.com/2010/08/18/teaching-knife-skills-to-kids-and-suggestions-for-cutting-tools/](http://www.whatscookingwithkids.com/2010/08/18/teaching-knife-skills-to-kids-and-suggestions-for-cutting-tools/).

## Strategies for Cooking With Students Successfully

Cooking with students requires thorough preparation and a plan for organizing the activity. Make sure you have all ingredients, equipment and enough copies of the recipe. Also figure out how you will divide up the tasks in the recipe.

### Getting Organized

There are several ways to organize a cooking activity. One way is to divide students into small groups and have each group prepare the same recipe. Another way is to divide into small groups and have each group prepare a different recipe, or a different part of the same recipe. Another method is to imitate a cooking show, with the teacher at the front of the class doing the bulk of the cooking but inviting students to help with certain tasks. This method is less participatory, but can be fun and appropriate for certain recipes. One last method, useful for simple recipes such as trail mix or salads, uses an assembly-line approach. The ingredients are lined up in one location, and students travel down the line adding each item to their plates or bowls.

When planning to cook in small groups, some teachers place all supplies and ingredients on one central table so one student from each group can get each item for the group. Other teachers prefer to give each group a tray loaded with everything they need. Give each group a large-print copy of the recipe so the whole group can read it together. Laminating these copies will make it easy to reuse them next year.

It is ideal to have one adult per group of 5-10 students. You can invite parent volunteers to lead the lesson with small groups simultaneously, or engage your class in an independent learning activity while you do the lesson with one small group at a time.

Prepare the cooking area ahead of time, so students can wash their hands right away, watch a demonstration and split into groups to complete the tasks. Depending on grade level and abilities, you may choose to assign each student specific tasks. Or you may find that it works to allow them to choose their own tasks within their small groups.

When deciding how to break a recipe into individual tasks, remember that students will be more concerned with having jobs than efficiency. So, for example, if a recipe calls for 2½ cups of flour and your students are working in groups of five, ask each student to add one-half cup instead of having one student measure all the flour. Rotating the task of stirring is also helpful.

### **Modeling Cooking Skills**

Model good cooking skills, and ask classroom volunteers to do the same. When beginning a recipe, ask students to read through the recipe out loud to check that they have everything they need and the steps of the recipe. Before allowing students to measure, demonstrate using a dry measuring cup for dry ingredients and leveling it off. Demonstrate using a liquid measuring cup for wet ingredients, setting it on a level surface and getting your eyes level with the liquid to judge the accuracy of the measurement. Demonstrate how to measure accurately with measuring spoons by holding the spoon over a separate bowl while filling it. If the spoon is overfilled, the empty bowl will catch the mess and the excess will not end up in the recipe.

For a recipe that calls for tasting to adjust seasonings, model a way to taste without sharing germs. Use a clean spoon, take a small amount of food, exaggerate blowing on it and checking the temperature and taste, then deposit the spoon in the dish tub. (Give an enthusiastic “Mmm!” or “Needs a bit more salt!”)

## **Age-Specific Tips for Food Preparation**

### **Early Elementary:**

- Pre-measure an ingredient such as flour (without students' knowledge) into a container and then let them scoop from the container and add the ingredient to the mixing bowl. If there is flour left in the container, you can add it yourself. This allows students to practice measuring while still experiencing success.
- Snip, tear and grate (with supervision).
- Steam or boil vegetables to make them soft for easier cutting.

### **Upper Elementary:**

- Pre-cut so everything has a flat surface.
- Teach knife safety and introduce cutting with knives.

### **Secondary:**

- Have a complex job for each person.

## **Serving**

Once the meal is prepared, we recommend cleaning the entire cooking area first. (In many cooking activities, this can be done while the meal is on the stove or in the oven.) Then make sure students are seated before serving the food. Give them a few minutes to enjoy what they have made before guiding further discussions. Allow students to share what they liked and what they might do differently next time. Conclude with relevant discussion topics such as where the ingredients came from.

**Cleaning Up**

Use a set of laminated “Clean-Up Cards” that students pull from a hat to assign and guide them in clean-up tasks. Of course, you may need to adapt these cards to fit the specific clean-up needs of your food preparation area, but the following is a sample set of clean-up cards:

Dish Washer: Scrub all dishes with soap and warm water	Counter Cleaner: Bring dirty dishes to sink and clean counter
Dish Rinser: Rinse soap off of dishes and dip them in sanitizing solution (if desired)—¼ cup bleach to 3 gallons water	Store Food, Compost, Recycle, Garbage: Put leftover food in refrigerator, food scraps in compost bin and recycle or throw away any remaining garbage
Dish Dryer: Dry each dish with a clean dish towel	Supply Organizer: Put away aprons, cooking equipment, unused ingredients, stools, etc.
Dish Organizer: Put away dry dishes	Sweeper: Sweep the floor



## Section X. **Getting to Know the Garden: Introductory Activities**

### Garden Caretaking Activities

#### **Garden Rules Role-Play**

Once your school garden rules have been established, post them so all students can see them. Ask students to read each rule aloud. Then ask for a volunteer to come up and role-play a rule. Whisper the rule to the student and watch as he or she acts it out. Then ask the rest of the class to guess which rule the student was role-playing. Repeat with different examples. As a variation, the teacher could role-play behavior that goes against the garden rules and the students could tell the teacher to freeze when they notice something wrong. Then they would tell the teacher what was wrong and the teacher could rewind and role-play the same situation, only this time following the rules. The key is to make rule-following look more fun than rule-breaking.

#### **Safe Tool Use Demonstration**

Before beginning this activity, prepare several garden tasks that could be done with tools by groups of 4-5 students, such as loosening the soil in a bed, turning compost, weeding, etc. Gather students in a comfortable spot in the garden, near the tool storage area if possible. Take out one tool at a time and introduce it to the students. Ask for a student volunteer to demonstrate how to use the tool. Ask other students to contribute suggestions for using the tool safely. Repeat this process with a different volunteer for each tool. Then demonstrate how to clean a tool and put it away.

Next, divide your students into groups of four or five and assign a garden task to each group. You may want to assign half your class to a writing task or another independent non-gardening task, then have the two groups switch, to increase safety and lessen crowding. Observe your students working. If you see someone using a tool unsafely, ask the student, "How could you use that tool more safely?" When all students have had a chance to work with tools, clean them, and put them away, ask them to reflect on how they did. How safely did they use the tools? How safe did they feel around others using tools? What could happen if they use tools in ways that are unsafe?

### **My Pet Plant**

Students each receive a small plant to care for until it is ready to be transplanted into the garden. These can be plants that your class started from seed, or young seedlings purchased from a nursery. Each should be transplanted into a small pot so it can be cared for individually. Give each student a craft stick and ask them to write their names on one end and place it in their pot. Ask how caring for a plant might be similar or different from caring for a pet. What will the plant need?

Ask students to observe their plants thoroughly, noticing the number and shape of leaves, colors, the size of the plant, and any unique characteristics such as spots or holes. Then turn over the craft sticks and rearrange the plants, and let students find their plants again.

Demonstrate making a detailed drawing of a plant, including the shape and number of leaves, size, color, etc., and then ask students to draw their pet plants.

Students' daily care of plants can include checking the soil moisture by touching it with their fingers. (The soil should be about as damp as a wrung-out sponge.) Students also should water if needed (with a spray bottle to cut down on over-watering and water messes) and take their plants outside for the day if it is warm enough. They can even talk to their plants to give them carbon dioxide.

Weekly observations could include measuring their plants' height and counting the number of leaves (including even the tiniest leaves). One week prior to transplanting, leave the plants outside day and night to get them used to outdoor conditions before they are transplanted. Choose a sunny spot where they will be protected from wind and animals.

### **My Finger as a Root**

This activity is a good way to help students understand why it's important to keep their feet on the paths in the garden. Have everyone hold up one index finger and then imagine it has become a root. Ask students to try to "plant" it in the path that they are standing on. Why is this soil so hard? Then ask students to plant their root in a garden bed. What a difference! Ask students what would happen to the soil in the beds if they stepped there. Why does this make a difference to the plants? Not only is compacted soil more difficult for roots to penetrate, but it allows less air and water to get to the roots.



## Team-Building Activities

### Turning It Over Together

- Break students into groups of 8-10 and gather them near a tarp.
- Ask them what qualities would help their group work together (helping each other, listening, honoring differences, etc.). To inspire ideas, ask questions such as: How do you want to be treated by others in the group? How do you want to treat others?
- Write their answers on masking tape strips and stick them on one side of the tarp.
- When students run out of ideas, turn the tarp over so that the masking tape is on the bottom.
- Ask the students to step onto the tarp.
- Tell them that their challenge is to work as a group to turn the tarp over and get to the teamwork side, without stepping off the tarp.
- As they work, compliment them out loud when they do something that fits in with the qualities they listed. (“Shelby is helping Leticia keep her balance ... You are all listening to one another’s ideas ... Gabe is showing appreciation to Marcus ...”
- In a simpler variation, the group has to get all its members onto the tarp several times, each time with the tarp folded in half.

### Inner Tube Pass

- Have the entire class form a circle and hold hands.
- The teacher is part of the circle and has one arm through an empty bike inner tube (with nozzle cut out) or a hula hoop.
- The teacher demonstrates how to pass the inner tube over his or her head and step through it without letting go of hands.
- The inner tube should now be on the other arm and ready for the student on that side to pass through.
- The teacher starts a timer and the inner tube is passed around the entire circle, without anyone letting go of his or her neighbor’s hand.
- When it reaches the teacher again, he or she checks the time and then asks the students for ideas on what worked well, and how they could pass the tire more quickly.
- The teacher could also ask students how they feel when someone is cheering for them, and suggest that the class cheer for the person stepping through the tire by name.
- Make the tire travel around the circle again, attempting to beat the previous time.

**Elbow to Elbow**

- For this activity, create a list of questions related to the garden.
- Gather the entire class in a space large enough for everyone to move freely.
- Explain that they will need to find a partner quickly each time you tell them to, and that each time they must find a new partner.
- Call out: "Find a partner! ... Touch elbow to elbow and tell your partner your favorite root vegetable!"
- Find a partner! ... Touch head to head and tell your partner your favorite gardening task!"

**Rotten Tomatoes**

- Assemble students in a grassy field.
- Lay two ropes about 20 feet long parallel, 15-20 feet apart.
- Ask students to name some things that would get in the way of us working well as a group. What behaviors don't help us act as a team? For each thing they mention, throw a "rotten tomato," represented by an object such as a water bottle, into the "garden," the space between the ropes.
- Pair up your students.
- One student from each pair stands behind one rope, blindfolded.
- The students with no blindfolds stand behind the other rope and talk their blindfolded partners through the "garden," avoiding the "rotten tomatoes."

## Communication Skills Activities

**Birthday Line-up**

- Ask students to get in a line in order of their birthdays without talking.
- As a variation, you could use shoe size, shirt color or any number of other factors.
- With younger students, practice first by having them wordlessly line up in order by height.

**A Round of Applause**

Ask students about different ways they communicate. How might they communicate with someone in the same room? Someone far away? In this activity students try out a new method of communicating without speaking.

- Tell students that they will communicate by clapping to help a student figure out what he or she is supposed to do.

- Ask for a volunteer to go out of earshot and ask the rest of the class to come up with a simple task they would like the volunteer to do when he or she returns, such as turn off the light switch or pick and eat a cherry tomato.
- When they agree, instruct them to clap only when the volunteer is on the right track, and stop clapping immediately when the volunteer moves in the wrong direction or tries something that is unrelated to the task. Invite the volunteer back to the group and begin.
- Clap wildly when the goal is reached!

### **Mystery Plant**

- Pick a spacious area with a variety of plants and establish boundaries for this activity.
- Give each student a piece of paper and a pencil. Ask students to find a plant and take five minutes to draw a picture of the plant.
- Their pictures should include anything that distinguishes their plants from others.
- When five minutes is up, call students back and ask them to put their names on their papers and exchange their drawings with a partner.
- Each pair then must find each other's mystery plant by looking at the drawing, one at a time. If needed, the student who is searching may ask for clues.
- When all plants have been found, students come back to the group and share their experiences finding their partner's mystery plant.

You may want to precede the Mystery Plant activity with a discussion on the differing skills and talents of different people, and to point out that the purpose of the drawings in this activity is not beauty but communication. This will prevent students from feeling bad about sloppy or hurried pictures.

## Observation Skills Activities

### **A Bug's-Eye View**

This activity helps students look at the garden from a very different perspective: that of a tiny creature.

- Give each student a magnifying glass and a piece of string that is about 5 feet long.
- Ask students to spread the string out on the ground as a path.
- Demonstrate laying your own string over an interesting piece of ground, with lumps and bumps and a variety of weeds or garden plants, and lying down on your belly to thoroughly investigate your path from the viewpoint of an insect or other small animal.

- As part of your demonstration, narrate your experience out loud to give students an understanding of the activity. “Today I’m an ant. I’m going out in search of some food, and this is the path I’m going to take. Oh, no, there is a huge mountain here! Guess I have to climb. ... Whoa, this tree (small weed) is enormous! I think I’ll rest under it for awhile. What on earth is this gigantic thing (a student’s shoe) — a spaceship?” etc.
- Set boundaries to protect garden plantings. Then ask students to spread out their strings, get down on their bellies, pretend to be the smallish creature of their choice and take their time following their path. They can draw or write in their journals about what they saw and experienced.

*The Snail’s Spell* by Joanne Ryder is a good complement to this activity.

### **Deer Ears**

- Ask students: *What animals have big ears? Why would an animal have big ears? One reason is that many animals that come out at night (deer, for example) need to rely more on their ears than we do because they can’t see well in the dark.*
- Ask students to cup their hands to simulate how bigger ears can gather more sound.
- Have them raise their cupped hands slowly, while you are continuously talking, and place them behind their ears.
- Ask if they notice any change in your voice with their bigger “deer ears”?
- Now challenge them to close their eyes and be silent for 30 seconds, listening with their deer ears.
- Afterward, they can share what they heard. Often students find birds with their ears that they missed with their eyes!

### **I Spy**

This well-known game is a great way to encourage students to take a closer look at the world around them whenever you have an extra minute in the garden.

- While turning in a circle and looking around, say to your students: I spy with my little eye — something small and shiny. Put your finger on your nose when you think you see it. ...
- When a few students have their fingers on their noses, call on a student to make a guess.
- Give them hints that narrow their search until they guess correctly.
- Encourage students to take turns initiating a round, by saying “I spy ...”

**Blind Walk**

We often rely on our eyes to tell us about the world around us, to the neglect of our other senses. This activity gets students tuned in to their other senses and allows them to experience the garden in a new way.

- This works well in groups of four to eight students.
- Ask students to get in a line with their hands on the shoulders of the person in front of them and then close their eyes.
- Take the hands of the student in front and lead them by walking slowly backward so you can make sure they're walking safely.
- Warn students about any bumps, holes or inclines — even a small uphill spot feels like a mountain when you have your eyes closed!
- Stop periodically and instruct students to keep their eyes closed but to touch something. For example, say: “Reach out to your right and touch the leaves of this bush. What does it feel like?” Or stop and pass a fragrant leaf (such as mint) under their noses and ask them what it smells like.
- End the blind walk by stopping at a visual delight.
- Tell students which way to point their heads, then ask them to open their eyes. It's a memorable experience for them to open their eyes to a bed of wildflowers or tree full of fruit that they might not have noticed otherwise.

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## Section XI. **Online Resources**

### **School Gardens:**

[www.lifelab.org/for-educators/schoolgardens/](http://www.lifelab.org/for-educators/schoolgardens/)

Garden-based lessons and many resources on every aspect of school gardens.

[www.kidsgardening.org/](http://www.kidsgardening.org/)

The National Gardening Associations website for garden educators. Extensive resources, grant ideas and online store.

### **Gardening Information:**

[www.organicgardening.com/](http://www.organicgardening.com/)

Get gardening tips, sign up for monthly garden reports for your area and simplified information on the care and harvest of garden plants.

[www.garden.org/foodguide/browse](http://www.garden.org/foodguide/browse)

National Gardening Association's Food Garden Guide: Detailed information on planting, care and harvesting of garden plants.

[www.garden.org/regional/report](http://www.garden.org/regional/report)

National Gardening Association's Regional Reports: Get gardening information for your region, sign up for bimonthly gardening tips.

[www.bonnieplants.com/](http://www.bonnieplants.com/)

Simple and concise information on growing common vegetables and herbs. This site also has tips for harvesting vegetables.

### **Garden-Enhanced Nutrition Education:**

[www.lifelab.org/for-educators/schoolgardens/gene/](http://www.lifelab.org/for-educators/schoolgardens/gene/)

An extensive list of online garden-based nutrition resources.

[www.cfaitc.org/wegarden/](http://www.cfaitc.org/wegarden/)

Garden-based nutrition lessons.

[www.cookingwithkids.net/cgi-bin/cookman/page.cgi?g=:d=1](http://www.cookingwithkids.net/cgi-bin/cookman/page.cgi?g=:d=1)

Educational materials, lessons, recipes and many free downloads.

[www.teamnutrition.usda.gov/educators.html](http://www.teamnutrition.usda.gov/educators.html)

Resources for studying the USDA Food Pyramid and more.

[www.agclassroom.org/teacher/index.htm](http://www.agclassroom.org/teacher/index.htm)

A huge collection of downloadable lessons.

**Children's Literature:**

[www.ahs.org/awards/excellence\\_in\\_childrens\\_literature.htm](http://www.ahs.org/awards/excellence_in_childrens_literature.htm)

The American Horticulture Society's Growing Good Kids Award Winners and Classics list — browse for excellent garden-based children's literature.

[www.agclassroom.org/directory/search\\_advanced.cfm](http://www.agclassroom.org/directory/search_advanced.cfm)

A searchable database — search for “book” media for literature resources.

**Music:**

[www.bananaslugstringband.com/](http://www.bananaslugstringband.com/)

Kids' songs to enrich garden-based learning. CDs include “Singing in the Garden,” “Dirt Made My Lunch” and many more.